

ENVIRONMENTAL MANAGEMENT

Paper 5014/12 Theory

Key messages

Where a question requires a comparison between two items, candidates must make it clear which item they are referring to throughout their response.

Candidates should show their working for all mathematical calculations, as method marks may still be awarded even if a later error leads to an incorrect final answer.

When a question requires more than one example, each example provided must be clearly different and not a repeat of the same point.

Candidates should ensure that their response meets the requirements of the command word used in the question, such as explain or describe, as this indicates the level of detail and depth expected.

General comments

Stronger candidates were often able to include additional and specific detail in their responses, avoiding generalisations that can make answers too vague to be awarded credit.

The paper included some items that required direct recall from the syllabus, and performance on these was varied. For example, some candidates were able to state the meaning of the term 'carrying capacity' accurately, while others provided incomplete or incorrect definitions.

A recurring feature of this specification is the requirement for candidates to describe locations on a map, such as the distribution of volcanoes. A common weakness was limited ability to apply the points of the compass accurately, which resulted in some responses lacking clarity. Although candidates are not expected to identify specific countries, they are expected to use the names of continents confidently, as required in **Question 6(b)**.

There was evidence in many scripts of candidates planning their answers to the longer response questions, particularly the final six-mark extended writing task. This approach is beneficial as it supports the development of detailed and well-balanced responses that address all key aspects of the question and helps to avoid producing lengthy answers that do not meet the specific requirements.

Comments on specific questions

Section A

Question 1

- (a) The introductory question required candidates to identify and name the three layers of the atmosphere in order to complete the diagram. One layer was provided to make the task more accessible. Candidates achieved this with varying levels of success; weaker candidates often identified one of the layers incorrectly as the ozone layer. Stronger candidates generally named all three layers accurately and in the correct sequence.
- (b) This question proved more challenging for many candidates. While a significant number were able to identify the potential increased risk of cataracts or cancer in humans, fewer were able to explain

the impact on vegetation. Responses often stated simply that plants would die, which was not sufficient to gain further credit, as a more detailed explanation was required.

Question 2

- (a) The question specifically referred to fish, which therefore excluded this from the acceptable range of ocean resources that candidates could provide. A wide variety of appropriate ideas were credited; however, some responses were too vague, such as references to energy without specifying the type, which meant that further credit could not be awarded.
- (b) This question was completed by most candidates, and a wide range of valid reasons for the presence of large numbers of fish on continental shelves was credited. The most common error was confusion between the physical characteristics of the location and how these benefit fish, and the effects of the El Niño Southern Oscillation (ENSO), which were not relevant to this question.

Question 3

- (a) (i) Candidates were required to interpret a pie chart, and this was a skill that most demonstrated competently. There were relatively few incorrect responses, indicating that candidates were generally confident in handling this type of data presentation.
- (ii) This part of the question was more challenging for many candidates. A number of candidates needed to read the question more carefully, as some provided examples that did not form part of the organic content required, which meant that these responses could not be credited.
- (b) (i) A number of candidates were not able to correctly link the mineral particles to their relative size. The variation in responses suggests that this is not a topic with which many candidates were familiar.
- (ii) The source of mineral particles in soil also proved challenging for many candidates. This led to a number of incorrect responses, and in some cases the answer was omitted altogether.
- (iii) Most candidates were able to identify at least one difference between clay soil and sandy soil. In questions requiring a comparison, it is important that candidates clearly indicate which type of soil each characteristic refers to. Some responses were too vague to demonstrate secure understanding and therefore could not be fully credited.

Section B

Question 4

- (a) (i) This question required candidates to interpret some unfamiliar data, in this case relating to the locations and characteristics of national parks. Most candidates were able to complete at least two of the statements correctly. The most challenging aspect was understanding the international boundary shown on the map and identifying the neighbouring country.
- (ii) This calculation-based question proved challenging for a large proportion of candidates. Those who showed their working were able to gain credit for the correct application of numbers, even if their final answer contained an error. Many candidates could have gained further credit by including an appropriate unit with their response, as prompted on the answer line.
- (iii) This graph-based question provided candidates with the plotted data. Stronger candidates completed the task confidently, following all the instructions given in the bullet points and therefore achieving full credit.
- (b) (i) Where candidates showed their working for this percentage-change calculation, they were able to gain credit for a correct first step, even if a subsequent error led to an incorrect final answer.
- (ii) This question required candidates to interpret information and draw conclusions. Responses that simply repeated statements from the stimulus material could not be awarded credit. As the command word was 'suggest', a broad range of plausible answers was accepted.

- (iii) Carrying capacity is a term included in the syllabus and should therefore be a direct recall of learned knowledge. Many candidates did not appear to be familiar with the term, which resulted in a number of incomplete or inaccurate responses.
- (c) The topic of wildlife corridors was not well known across the cohort. Many candidates were able to use the diagram to identify that the corridor allowed tigers to access another national park, but they needed to develop their responses to explain how this would benefit the species. Stronger candidates provided this additional detail, often referring to concepts such as improvements to genetic diversity. However, many responses included incorrect information or did not provide the explanation required by the command word. A common misconception was that the wildlife corridor protects tigers from being hunted.

Question 5

- (a) (i) Most candidates were able to interpret the diagram and successfully calculate the percentage of water sources classified as surface water and other sources.
- (ii) Naming one additional source of fresh water proved challenging for many candidates. A common error was identifying a location of water underground rather than naming a valid source.
- (iii) The command word for this question was 'explain', which required candidates to provide sufficient detail, such as outlining the source of the contamination of water, in order to gain credit. A wide range of different reasons was accepted.
- (iv) This question required candidates to provide two distinct methods for producing safe drinking water. The most common response was boiling or distillation, but candidates were expected to offer two separate methods to gain full credit.
- (b) Most candidates correctly identified the significantly larger volume of water used by a family in an urban area. Additional credit was awarded when candidates supported their answer with a specific example taken from the data.
- (c) (i) Using the information provided in the table, most candidates found this question very accessible and correctly identified village R.
- (ii) Most candidates understood the requirements of the question and correctly named the village where all families used the wells.
- (iii) The command word for this question was 'suggest', meaning that a wide range of plausible reasons was acceptable and awarded credit. Common themes in successful responses included references to differences in rainfall levels and whether the water source was contaminated. As this was a comparison question, it was important for candidates to state clearly which source had more or less of the factor they were discussing.
- (iv) Most candidates were able to explain that fresh water is a basic human need and provided a relevant example to support their response.
- (v) Stronger candidates were able to provide three distinct reasons for the differences in access to safe drinking water. A relatively common error was the assumption that the urban area was located in a more economically developed country (MEDC), which indicated an incorrect reading of the question.
- (d) The question required candidates to focus specifically on the environmental impact of dams, which narrowed the range of acceptable responses. Stronger candidates were able to identify and explain three distinct impacts, while weaker responses tended to be more generic and lacked sufficient detail to demonstrate how the issues described affected the environment.

Question 6

- (a) This question required candidates to label the components of the Earth's structure. In most cases, the four terms provided were used appropriately. The most frequent error was the confusion between the oceanic crust and the continental crust.

- (b) Many candidates were able to describe the location of volcanoes accurately, making effective use of compass points. The inclusion of a north arrow on the map supported this skill. However, the frequent references to Africa indicated that some candidates would benefit from developing a stronger knowledge of world continents.
- (c) For this more challenging question, the strongest candidates were able to clearly explain the relationship between earthquakes, volcanoes, and plate boundaries, with some responses demonstrating an impressive level of detail.
- (d) Many candidates appeared well prepared for a question on this theme, providing responses that included a good range of strategies and enabling them to access all available credit. Others, however, needed to tailor their answers more closely to the specific scenario—particularly the strategies that could be implemented *before* an earthquake occurs. Strategies such as practice drills were credited, whereas responses referring to actions taken *after* an earthquake, such as evacuation, were not.
- (e) The Richter scale appeared to be a less familiar topic for many candidates. This question required accurate interpretation of the diagram, as well as an understanding that the scale is logarithmic—a point explicitly stated in the syllabus.
- (f) The final question provided candidates with the opportunity to write at greater length and to draw upon concepts and ideas from across different areas of the syllabus. Candidates were encouraged to incorporate information from case studies completed during the course, and the question accommodated both a broad range of ideas or, alternatively, fewer points supported by more detailed explanation and examples.

The strongest responses presented a well-balanced and detailed argument that clearly supported the candidate's viewpoint. In contrast, weaker responses tended to lack depth and relied on only one or two undeveloped points.

It was evident that many candidates had practised this style of extended response question beforehand. Although the topic itself was unfamiliar, they demonstrated effective planning techniques prior to writing their answers. The published mark scheme for this question is intended to be indicative rather than exhaustive; a variety of alternative, relevant ideas were credited, as well as the use of specific examples to strengthen the response.

ENVIRONMENTAL MANAGEMENT

Paper 5014/22 Management in Context
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Key messages

Large numbers of candidates performed very well across this paper, demonstrating strong knowledge and understanding and handling the required skills with a high level of competence. A minority performed less well, often due to difficulties in interpreting questions correctly or in producing detailed and accurate responses. Most candidates were able to attempt all parts of the questions.

Some candidates would benefit from reading questions more carefully, taking time to consider the command words as well as the context and focus of each question. Command words such as *describe* and *explain* have specific meanings. Where the command word is *describe*, explanations are not required and cannot be credited, so candidates should avoid using time to provide them.

Responses should be of an appropriate length, guided by both the space provided in the answer booklet and the mark allocation for each question.

Subject-specific definitions should be learnt so that candidates can recall and use them accurately. When defining a term, candidates should avoid repeating any part of the word itself and instead use different wording that conveys the correct meaning.

When describing a trend on a graph, candidates should focus on identifying clear patterns or relationships, using terms such as *increase*, *decrease*, *constant*, *plateau* and *fluctuate* where appropriate.

When describing the distribution of a feature on a map, such as settlements, candidates should refer, where relevant, to scale, direction and other mapped features.

Candidates should show their workings for all calculations, even when this is not explicitly required, as credit may be awarded for a correct method even if the final answer is not accurate.

Candidates should provide only one response to questions requiring a single answer. If more than one answer is given and one is incorrect, the mark cannot be awarded.

General comments

Overall, candidates generally produced responses of a good standard across the paper. Rubric errors were very rare, and the overall standard was positive, with some excellent responses to individual questions and to the paper as a whole.

Candidates should continue to practise interpreting and using a range of geographical resources, including graphs, bar charts, pie charts, data tables, photographs, diagrams and maps. Graph-completion tasks should be carried out with care, using a ruler and a sharp pencil to ensure precision. When completing a line graph, axes should be labelled accurately using information from the data source, and the graph should make full use of the space provided. Data points should be plotted in pencil and joined using a ruler.

Candidates should aim to answer with precision and clarity, avoiding vague terms or unqualified statements. Such statements should always be expanded or explained. Listing without providing full explanations should also be avoided, and general responses such as 'pollution' should be developed further, for example by referring to 'noise pollution'. Compass directions should be used to describe locations, such as the reference to the Arctic Circle in **Question 1(d)(i)**, rather than less specific terms such as 'above' or 'below'.

Comments on specific questions

Question 1

- (a) (i) Candidates were required to plot a line graph and join the points with straight lines. While the majority selected the correct graph type, some candidates experienced difficulties with choosing an appropriate scale. A few omitted to label the axes fully, and in some cases the dependent variable was incorrectly plotted on the x-axis. Another common error was drawing a line of best fit instead of joining the points sequentially.
- (ii) The vast majority of candidates correctly described the trend, noting not only that population increased but also that it stabilised after 1990. Weaker responses simply stated that the population increased. Dates were not required but, when used appropriately, often strengthened responses.
- (b) (i) Most candidates understood that *migration* refers to the movement of people from one place to another. *Emigration* and *immigration* were also acceptable terms that some candidates used.
- (ii) Candidates were required to consider how the climate, economy and education system in Greenland could lead to out-migration. Credit was also available for recognising how these factors might act as pull factors to other destinations. The impact of climate was generally addressed more effectively than the economy, as successful responses considered how economic conditions affected employment opportunities. Some responses were vague, for example stating that the economy was 'in decline' or that there were 'fewer exports' without explaining how this would lead to out-migration. Many candidates gained credit for education by referring to limited opportunities or a shortage of educational facilities.
- (c) (i) The vast majority of candidates ranked the countries correctly.
- (ii) Many candidates gave the correct percentage.
- (d) (i) Using a map of Greenland, candidates were required to describe the distribution of settlements. Generally, responses outlined the overall pattern effectively. The strongest answers described the broad pattern first before referring to specific features from the resource. Some candidates confused east and west and needed to make full use of the lines of latitude and the north arrow. Others used non-geographical terms such as 'above', 'below', 'left' and 'right', which were not creditworthy. A minority explained the pattern rather than describing the distribution shown.
- (ii) Candidates engaged positively with this question, and many gained full credit. The most common valid responses were travelling by plane and travelling by boat. Weaker responses that referred to 'ports' or 'airports' did not gain credit, as these are facilities rather than methods of transport.
- (iii) Candidates were required to use the map scale to estimate the percentage of Greenland occupied by the national park. A sizeable minority found this challenging and incorrectly estimated the percentage as 30%.
- (e) (i) Some candidates found this question challenging. While most were able to calculate the total annual precipitation for the north of Greenland, many did not calculate the temperature range for the south correctly. Although the temperature range for the north was given, some weaker responses were uncertain about how to calculate a range or were unsure whether maximum and minimum values should be combined or compared.
- (ii) Most candidates successfully identified May, June and July as the summer months in Greenland. The most common error was selecting August as a summer month. In such cases, candidates had not made effective use of the information provided, including the hours of daylight shown in the climate data.
- (iii) The majority of candidates gained full credit for explaining why people in northern Greenland use large amounts of electricity. Most responses correctly linked very low temperatures to the need for heating. Weaker answers stated only that it was 'cold' without explaining why this would increase electricity use.
- (iv) Responses to this question were generally strong. Many candidates demonstrated clear understanding of strategies used in greenhouses to increase crop production and effectively linked

these strategies to conditions that optimise photosynthesis. Nearly all candidates referred to controlling temperature, water and light. Some added valid points about protection from animals or extreme weather. A small minority confused the question and wrote about greenhouse gases increasing production; however, credit was given for correct references to controlling carbon dioxide.

- (f) (i) Most candidates were familiar with food webs. A common misconception was that arrows show which organism eats another, rather than representing the direction of energy flow.
- (ii) Trophic levels were generally well understood. Most candidates correctly identified the trophic levels as phytoplankton, zooplankton, fish, seal and polar bear, and used arrows in the correct direction.
- (iii) Most candidates correctly identified the green pigment that captures light energy.
- (iv) Most candidates were able to complete the word equation for photosynthesis correctly. The most common error was reversing the reactants and products.
- (v) Some candidates found this question challenging. Strong responses used accurate terminology, while weaker answers used vague expressions such as 'pollen egg' for pollen, 'male part of the flower' for anther and 'female part of the flower' for stigma.
- (g) (i) Most candidates placed the statements in the correct order.
- (ii) Responses indicated that some candidates were unfamiliar with sampling methods, resulting in confusion between random and systematic sampling. A common error was spelling *systematic* as 'systemic'.
- (iii) The majority of candidates correctly calculated the number of flowering plants. A common error was giving the answer as 4 000 000.

Question 2

- (a) (i) This question assessed understanding of how HEP is used to generate electricity. The majority of candidates used the diagram effectively and demonstrated sound knowledge of the process. Stronger responses linked the movement of water from height to the turning of a turbine, which in turn drives a generator to convert kinetic energy into electricity. These candidates used accurate technical terminology and described the full sequence clearly. Weaker responses tended to describe the diagram without explanation. A common misconception was that the water needed to be converted to steam to turn the turbine, which is not the case in this system. Some candidates referred to water movement without mentioning height, while others did not use appropriate terms to describe the rotational movement of the turbine or blades.
- (ii) Few candidates were able to describe permafrost correctly. Common misconceptions included describing it as a layer within a mountain, a sheet of ice, or a frozen forest. The term *frozen ground* alone was considered too vague for credit.
- (iii) Many candidates suggested three valid reasons why the HEP station was automated, with a large proportion gaining full credit. Common correct points included reducing labour costs, compensating for a limited workforce and ensuring continuous operation.
- (iv) Many candidates understood the question and provided well-developed explanations of why people in Greenland were in favour of the HEP station. Frequent credited points were that HEP is renewable, sustainable and does not emit greenhouse gases or cause acid rain.
- (v) Most candidates correctly suggested ways people can use energy efficiently at home, such as using energy-efficient appliances, insulating homes and turning off lights. A small minority misinterpreted the question and discussed energy-efficient transport instead.
- (b) Candidates showed a good understanding of the limitations of relying on solar energy for electricity generation. Many responses referred to weather dependency, high maintenance and battery costs, and the need for extensive land area. Credit was not given for stating that solar panels are expensive to build, as this was mentioned in the question.

- (c) Many candidates answered this question in terms of the general advantages of wind power rather than focusing on why the government of Greenland might wish to build wind turbines. Credit was awarded for noting that wind power does not produce carbon dioxide emissions and that wind is renewable and sustainable. Some candidates also gained credit for stating that wind power does not release sulfur dioxide (SO₂) or nitrogen oxides (NO_x), preventing acid rain. The absence of particulate emissions was also accepted and could have been developed with reference to reduced respiratory illness. A few candidates referred to Greenland being windy.
- (d) Suggestions for why Greenland does not have geothermal power stations were often vague. The strongest responses explained that Greenland lacks active volcanoes or that it is too difficult to access hot rocks deep underground.
- (e) Candidates were required to name one non-renewable energy source that is not a fossil fuel. Responses were mixed. Many candidates incorrectly stated coal, petroleum or natural gas. *Uranium* was also a frequent but incorrect answer, as it must be processed before it becomes a usable energy resource.

Question 3

- (a) (i) This question was very accessible, and most candidates were able to suggest a valid reason why the mines were located close to the coast.
 - (ii) Most candidates made effective use of both the map and the table to identify correctly the two mines and the material extracted in 2022.
 - (iii) A wide variety of responses was seen. Candidates were required to tick the boxes that described an environmental impact assessment, limiting their selection to three boxes only. Any additional boxes ticked negated correct answers.
- (b) The majority of candidates demonstrated a sound understanding of the limitations of sampling methods, and most gained full credit. The most common error was assuming that the process would be time-consuming.
- (c) Candidates generally performed very well, with many gaining full credit. All valid suggestions from the mark scheme appeared in responses. Where marks were lost, it was usually because candidates omitted reference to the magma crystallising, solidifying or hardening.
- (d) Most candidates showed clear understanding of strategies for the sustainable use of rocks and minerals. Many responses correctly identified increasing efficiency in extraction and use, and stronger answers discussed the use of alternatives. Weaker responses referred to legislation but did not explain what the legislation would achieve. A small minority misinterpreted the question and described uses of rocks and minerals, such as in construction or road building. These responses did not address the question and did not gain credit.
- (e) Overall, candidates responded well and were generally able to suggest at least one reason why people in Greenland should be concerned about mercury in water. Bioaccumulation and biomagnification were common correct points, as were impacts on human activity and human health. Common errors included references to eutrophication or waterborne diseases. Responses such as 'killing wildlife', 'death' or 'harmful to health' were too vague and needed further explanation. Mercury poisoning was credited, but simply stating that mercury is toxic was not, as this repeated information provided in the question.

Question 4

- (a) All candidates were able to state two negative environmental impacts of melting ice sheets with confidence. The most commonly cited impacts were sea level rise, flooding, loss of habitat and loss of biodiversity. A minority did not read the question carefully and gave responses such as loss of human life or destruction of property, which were not credited as these are social rather than environmental impacts.
- (b) Candidates generally answered this question well, with many providing detailed explanations of how melting ice sheets and glaciers could benefit Greenland's economy. The most frequently credited points included increased land suitable for agriculture, settlements and infrastructure, and greater

access to minerals, making mining more feasible. Some candidates also referred to the potential for increased HEP production.