

# ENVIRONMENTAL MANAGEMENT

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Paper 5014/12

Theory

## Key messages

Candidates are reminded to read questions carefully and ensure that responses always answer the question posed.

Candidates should avoid using generic terminology. Ideas such as 'pollution' should be qualified as to the type that would have the impact.

When drawing a graph, as in **Question 8(a)(ii)**, scales should be linear and enable the data to occupy at least half the area provided.

## General comments

The paper followed the pattern of previous series, combining a broad knowledge of the syllabus to specific scenarios, sometimes including images or data as stimulus material. Candidates were generally able to attempt most questions which increased their opportunities to gain marks even if their knowledge was weaker in certain areas.

Mathematical questions were generally well answered and linked questions relating to aspects such as trends were completed well. As with previous series, the final question on the paper was a longer response question and provided the opportunity for candidates to combine a range of concepts from across the syllabus. There were relatively few examples of simple lists within answers; most responses were contained within a structure, an area where candidates have shown improvement.

While candidates were generally well prepared for most questions on the paper, there was a lack of knowledge relating to the operation of extractive reserves and to a lesser extent, seed banks. There were some misunderstandings regarding the formation of tsunamis and a small number of candidates confused the conditions required for the spread of malaria with that for cholera.

There was generally a good understanding of the availability of energy supplies and their impacts on the environment, although the mislabelling of nuclear energy as a renewable resource was often seen.

Many candidates wrote in a clear, concise manner and with sufficient detail to demonstrate knowledge of the diverse range of topics covered within this qualification.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a)** Most candidates were able to make an interpretation of the carbon cycle represented in the diagram. Combustion and respiration were frequently correctly named. **C** (photosynthesis) proved to be more challenging.
- (b)** This was generally well answered, the majority of scripts contained a reference to the role of aquatic plants and algae as a food source. The importance of photosynthesis in the survival of animals was frequently identified.

## Question 2

(a) (i) Most candidates were able to extract the correct data from the table and complete the linked subtraction. A few needed to read the question more carefully and only stated the year the resource was predicted to be used up rather than the correct answer, 66 years.

(ii) The majority of responses gained full credit, often citing the increase in population leading to an increase in the demand for these resources.

(b) Some good descriptions of the formation of coal were seen. Some weaker responses needed to give the role of heat and pressure or identify that plant material is the primary source.

(c) Most candidates were able to successfully name two renewable energy sources.

## Question 3

(a) Carbon monoxide and oxides of nitrogen were common correct responses. A proportion of candidates needed to read the question more carefully, and stated the converted gases from the catalytic converter.

(b) Some candidates used the information from the diagram as a stimulus for their answer. Many correctly identified that there were other sources of pollution which will not be affected by the fitting of catalytic converters in vehicles.

(c) This topic was well known across the cohort and a good range of strategies were cited. The most common error was missing the instruction that responses needed to relate to vehicles.

## Section B

### Question 4

(a) This question required candidates to provide an explanation. Many responses needed more detail or were simply a rephrasing of the wording of the stage in the stimulus image.

(b) (i) The majority of candidates were able to correctly describe the type of mining shown in the photograph. Some chose to provide many different answers which was not required within the question instructions.

(ii) While many candidates understood the issues covered by the question, they were not always successful in clearly articulating these ideas. Some assumed that recycling of metals would have no impact. Some respondents identified that there would be pollution caused by mining but lacked detail as to the type of pollution that was needed for credit to be awarded.

(c) (i) Most candidates were able to complete the graph using the data provided accurately and managed to follow the pattern of the existing bars, both in shading and width.

(ii) While some candidates did not read the question correctly and described the production of new steel, most gave a good interpretation, referring to the trend as requested rather than data relating to a series of years.

(iii) This calculation was completed correctly by the majority of candidates, providing an answer to one decimal place as requested.

(d) Identifying practical ways in which recycling could be promoted was another topic that was well known by a good proportion of candidates. Ideas relating to taxation, increasing the ease of recycling or providing rewards for recycling were common.

### Question 5

(a) Candidates were generally able to describe the distribution of population from the information given on the map. There were two common errors: references to 'above' and 'below' rather than north and south and generalities such as high or low population without reference to actual population growth. A few candidates tried to link population distribution to climate or economic development, which was not required.

It is expected that candidates should have knowledge of the locations of continents but there is no requirement to be able to identify specific countries within the scope of this syllabus.

(b) While many candidates understood that an increase in population would reduce the availability of resources, without responding to the question requiring them to link this to the impact on natural resources, they were unable to achieve full credit.

(c) (i) A wide range of responses were credited as examples of a pronatalist strategy. Those who identified that a specific country had one, but did not identify what it was, missed out on the credit available.

(ii) A question attempted by most candidates, some needed to link their answer to the economy of the country as requested to gain the credit available.

### Question 6

(a) Candidates showed confidence in understanding the data in the graph and were successful in providing the correct answer, 74%.

(b) Candidates showed a good level of knowledge and a wide range of different ideas were credited.

(c) (i) A large proportion of candidates gained full credit for this question, naming both chlorination and boiling as methods of treating drinking water which is contaminated with cholera.

(ii) Many candidates showed an awareness of cholera and how it is spread, and needed to go on to clearly state how this disease enters the drinking water to gain credit. There were a few examples of candidates referencing the spread of malaria in error.

(d) This question proved to be more challenging, many responses included an example of water contamination despite the question specifically requesting other reasons.

### Question 7

(a) While the majority of candidates were able to demonstrate a good understanding of how a tsunami forms, there was sometimes confusion with descriptions of tropical cyclones. Some candidates omitted to state what a tsunami was after a detailed description of how they are formed.

(b) A challenging question for many candidates, some counted the number of arrows and assumed this related to the levels of radiation at different points in the ocean. Many creditable answers lacked the use of relevant vocabulary. The strongest responses were able to name bioaccumulation and also explained that radiation had entered the waters of the ocean and the way in which the levels built up at higher trophic levels.

(c) There were a few misconceptions apparent within the responses seen for this question. Many incorrectly stated that nuclear power was renewable, and that it does not produce pollution.

There was also an incorrect assumption that nuclear power stations are cheap to construct. Despite this, some candidates achieved high levels of credit, identifying the lack of carbon dioxide emissions, the ability to produce a large quantity of energy from a small amount of fuel, and also the issues some countries may have in providing the space or location suitable for the generation of renewable energy systems. The idea that nuclear power stations were needed to meet future energy needs was also worthy of credit.

**Question 8**

(a) (i) Most candidates were able to calculate the correct answer, rounded to the nearest whole number.

(ii) The drawing of the graph was completed to a high standard by many candidates, most remembering to use a ruler. The main errors seen were the choice of too small a scale to sufficiently use the grid provided, missing labels for axes and variable widths of bars. There were relatively few plotting errors.

(iii) Many candidates found suggesting additional reasons challenging and provided a rephrasing of the categories included within the stimulus article or an example of these categories.

(b) The quality of responses suggested that candidates were less familiar with these methods of helping to conserve species. Knowledge of extractive reserves was limited; many descriptions were based on knowledge of world biosphere reserves. Similarly, many descriptions of seed banks were limited in scope and did not achieve all of the potential credit available.

(c) The final question of the paper is a longer, six-mark question marked according to the quality of the response provided. Assessment is based upon how well the answer meets the level descriptors within the mark scheme. The mark scheme also includes some indicative content that may be seen in an answer; however credit may also be given for other ideas or concepts within the response, including relevant examples.

Most candidates attempted the question, the majority agreeing with the statement, often identifying the lack of a range of habitats and its effect on biodiversity as reasons. Stronger responses expanded on this and included the lack of genetic diversity and the related danger of pests and diseases.

It was clear that many candidates based their ideas on an understanding of monoculture in agriculture. This sometimes resulted in the inclusion of information that was not directly applicable to forests, such as soil degradation and the use of fertiliser. The arguments against banning commercial forests were generally brief and centered around finance and employment. Consequently, responses were often heavily weighted towards the disadvantages of only growing one type of tree. There were very few examples of candidates concluding that a potential solution would be to use a combination of both allowing for commercial production but retaining suitable habitats and genetic diversity in non-commercial forests.

# ENVIRONMENTAL MANAGEMENT

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**Paper 5014/22**  
**Management in Context**

## **Key messages**

There is a common misconception that carbon dioxide in the atmosphere destroys the ozone layer or contributes to acid rain or smog.

Candidates should avoid repeating the question in their answers. For instance, stating "The scientist can randomly sample the Aral Sea by..." is not an efficient use of examination time.

High-performing candidates are guided by the mark allocation for each question, which indicates the number of distinct marking points needed in a response.

A conclusion should summarise the main findings of an investigation, rather than focusing on a single aspect.

Candidates should read each question carefully to ensure they address what is being asked.

Candidates are encouraged to check their question papers to confirm that all questions have been answered.

Diagrams, charts, and graphs should be drawn using a sharp pencil and ruler, as corrections are more difficult with pen.

Candidates should always show their workings out for calculation questions, as partial credit may be awarded for correct procedures even if the final answer is incorrect.

Candidates should adhere to the rubric of a question. For example, if three reasons are requested, providing a fourth reason may result in an incorrect answer that contradicts a previously correct one.

## **General comments**

Candidates should avoid vague statements such as "causes harm", "causes pollution", "affects the environment", "reduces resources", or "causes death", as these are too unspecific and unlikely to receive credit.

Some candidates could benefit from additional fieldwork experience, as skills in sampling techniques, data interpretation, and drawing sensible conclusions from data were not well demonstrated. Sampling strategies or descriptions should be clear enough for another candidate to replicate the method.

The graph drawing presented some opportunities for improvement, particularly with the use of non-linear scales.

## **Comments on specific questions**

### **Question 1**

(a) (i) Many candidates were able to calculate the population density. Some gave an incorrectly rounded answer, e.g. 69.2 rather than 69.3 or 69.

(ii) Employment was the most commonly seen correct answer. Vague answers referred to 'availability of resources' and needed to state a specific resource such as food for credit to be awarded.

(b) (i) Many candidates read the question carefully and gave the correct answer. A common error was to give the total for either 25–29 or 30–34 instead of the total of these two bars.

(ii) Most identified that between 0–54 the population was similar for males and females. Many candidates were also able to identify that there were more females than males in the 55–100+ age range.

(iii) Most candidates could suggest one reason why there were fewer people aged 10–14 than 25–29. It was less common to see two correct suggestions. Education of women and availability of contraception were the most common correct answers.

(iv) The most common correct response was that there would be a decrease in the future workforce. Vague answers stated government policies without giving a specific example, e.g. antinatalist policies.

(c) Many candidates found this question challenging, with many thinking the answer was ‘services’.

(d) Ways to increase agricultural yields were well known. A few gave answers relating to irrigation despite this being ruled out in the question.

(e) (i) Candidates found using the scale challenging and many incorrect answers were seen.

(ii) Some candidates could determine the percentage decrease and gave the answer of 91%; others were not familiar with this mathematical requirement of the syllabus.

(iii) The most common correct answer was a reduction in fishing industry or reduced fish exports. Candidates who performed less well had not read the question carefully and gave answers that did not relate to economic activities.

(iv) Trickle-drip irrigation and use of bunds were well known. Rainwater harvesting was given by many. Some responses were too vague, such as ‘collect or store water’ without reference to where this water had been obtained, e.g. from rainwater. Other vague answers which did not gain credit included the use of sprinklers.

(v) Random sampling was not well known and many incorrect responses were seen. Some candidates crossed out ‘random sampling’ and gave an answer that related to systematic sampling, which was not asked for in the question. One of the most common misconceptions was suggesting that a quadrat could be used in an aquatic environment; higher-performing candidates realised that picking coordinates using a quadrat overlaid on a map would be more sensible.

(vi) A common answer which did not receive credit was ‘accuracy’; others repeated the information in the question without adding any further detail, e.g. ‘to sample at different times of year.’

(vii) Weaker answers only focused on fish species or shellfish and plants, but not both. A conclusion should encompass all of the data provided. Many answers did not describe that total or overall species had decreased and were, therefore, too vague for any credit.

(f) (i) Some good pie charts were seen. The strongest answers used a sharp pencil with shadings sufficiently different from one another for clarity. However, many poorly plotted examples were also given. Some struggled to plot each sector correctly and included a fifth unknown sector. A ruler and protractor were not used by many candidates. Weaker examples included numbers as the key rather than shadings. Many did not follow the syllabus requirements of starting at ‘noon’ with the largest sector and plotting clockwise in rank order from noon.

(ii) Many good answers were seen that considered all of the data in the table. Weaker responses only quoted the data rather than using this data to support their answer, e.g. ‘cotton uses more water than synthetics’.

## Question 2

(a) (i) Some good explanations included how biosphere reserves conserve biodiversity. Many suggested that human activities were restricted in some way. The strongest answers gave examples such as ‘no hunting’ or ‘no mining’. Many were also able to describe the zones and type of activity allowed

or restricted in each. A common mistake by candidates who performed less well was to explain why rather than how biosphere reserves conserve biodiversity.

(ii) Candidates did not perform well on this line graph. Bar charts were seen and most x-axis scales and some y-axis scales were non-linear. Many wavy lines were drawn between points, rather than using a ruler. It was common to see lines extended before 1980 or after 2020. Many did not label either axes.

(b) (i) Some candidates could recall the meaning of carrying capacity; others appeared unaware of the term.

(ii) Many candidates suggested overcrowding and a shortage of food would impact the deer. Weaker answers referred to 'a shortage of resources' without saying what these resources were.

(c) (i) This was well answered with some good descriptions of what must be done to the mine before deer are introduced.

(ii) Many candidates were able to suggest at least one benefit and one limitation of introducing deer to a new location. The most popular benefit given was that it would increase the deer population. A common answer for negative impacts was that the deer would find it difficult to adapt.

### Question 3

(a) (i) Occasional incorrectly rounded answers were seen, e.g. 254.2 rather than 254.3.

(ii) The majority of candidates could give one reason why Uzbekistan has been slower to invest in renewable energy than some other countries. Weaker answers did not make it clear whether they were referring to renewable or non-renewable resources. A common vague answer was that the country has a lack of money, without qualification that investing in renewable energy is expensive. The stronger answers were able to explain that non-renewable resources are plentiful in Uzbekistan and would last many years, or that their extraction generates money for the country.

(iii) A large number of candidates did not recognise carbon dioxide as a greenhouse gas. There was a common misconception that it is responsible for ozone depletion and a major contributor to acid rain.

(b) (i) Most could determine the percentage electricity consumption correctly.

(ii) Stronger responses were guided by the mark allocation and used bullet points to give three different strategies. Weaker responses repeated points but with different wording or only described one strategy.

(iii) This question was very poorly answered, and few candidates could suggest a sensible reason why a MEDC might consume more electricity in its transport sector than a LEDC. Most answers suggested reasons for differences in transport sectors between LEDCs and MEDCs rather than the electricity consumption differences. Candidates needed to read the question more carefully before responding.

### Question 4

(a) (i) There were some candidates who were unable to determine the range to give the answer of 29 °C.

(ii) Many candidates struggled to interpret the graph correctly, providing either too few, too many or the wrong months.

(iii) Soil erosion was well known by most candidates with the most popular answer being that low rainfall causes soil to dry out.

(b) (i) Many candidates thought mineral particles referred to ions such as potassium rather than sand, silt and clay as stated in the syllabus. These candidates often repeated these ions for the mineral ions section of the table. Most could identify an example of organic matter.

- (ii) It was common for candidates to gain credit for stating one way organic matter improves the fertility of soil. Few gained full credit. Many repeated the content in the question and went no further.
- (iii) The majority of candidates could state two correct processes in the carbon cycle that release carbon dioxide.
- (iv) Two other gases in clean air were well known. Occasional wrong answers included pollutants such as NOx when the question stated 'clean air'.
- (v) The majority could state two ways atmospheric carbon dioxide could be reduced. Weaker answers repeated suggestions with different wording. The strongest responses used bullet points to ensure they gave two ways.

(c) The importance of sustainably managing ecosystems was well known by many candidates and some good explanations were seen in many responses.