ENVIRONMENTAL MANAGEMENT

Paper 0680/11
Paper 1 Theory

Key messages

* Many candidates showed knowledge of a wide range of topics and were able to use and interpret data confidently.
* Some responses were too general in their approach and not specific enough to gain credit at this level. Candidates should take the opportunity to provide sufficient context to any comments made and provide diverse examples.
* The six-mark level of response question is designed to bring together a range of ideas and concepts. Candidates should remember to take this approach with their answer so that their response does not become too narrow.
* There was a general misunderstanding of the impact of pesticides with many confusing these with fertilisers.

General comments

Answers were generally well presented and annotations on questions showed good planning in many cases. However, there were a few instances where candidates would have benefitted from reading the question more carefully. Some candidates did not complete the data plotting activity on the graph.

Most candidates showed confidence in handling information provided within the question to help form their answers, and in many cases used this as a basis for writing a complete answer rather than a simple reiteration of the source material.

Candidates demonstrated good understanding on many topics such as the impacts of flooding and the use of population pyramids although some associated topics, such as the impact of heavy rain or an example of a pronatalist policy, were less understood.

Comments on specific questions

Section A

Question 1

(a)   The majority of candidates were able to understand and interpret the diagram of the water cycle. Most correctly identified **A** as being evaporation although fewer named surface run-off for **B**.

(b)   Most candidates were able to provide reasons why populations could not access large fresh water stores, many citing problems with pipes/infrastructure or the location of the water store. Three distinct reasons were required to obtain full credit.

Question 2

(a)   This question explored the concept of population pyramids. The majority of candidates identified **A** as being the pyramid of an LEDC, though fewer candidates provided a valid reason.

(b)   Most responses correctly identified that the working population would fall, but fewer responses identified the impact that an elderly population would have on healthcare, taxation or pensions.

(c)   A significant proportion of candidates did not understand the term 'pronatalist' and gave responses which cited an antinatalist approach such as the one-child policy. The most common correct responses mentioned either less taxation for larger families or free schooling/healthcare.

(d)   The question required reasons for a sudden change in population, as a result migration was not credited unless it was described within the context of a major event. Many cited a named natural disaster or the spread of disease/pandemic.

Question 3

(a) (i)   Most candidates completed the food chain and incorporated the position of the cormorant correctly.

(ii)   Similarly, most candidates were able to explain the relationship of the herring to the killer whales although some made the link but omitted to state what would happen to the population.

(b)   Most candidates successfully explained strategies to prevent overfishing although some candidates provided two similar examples of legislation rather than separate distinct strategies.

Section B

Question 4

(a)   Most candidates were successful in identifying the link between plate boundaries and the distribution of earthquake zones across the world, and many supported this with specific examples. Descriptions needed to use ordinal directions (north, south, east and west) rather than left, right, above and below.

(b)   Whilst most responses identified that plate boundaries were moving towards each other, fewer mentioned the process of subduction and fewer still adequately described the sudden release of pressure to cause the earthquake.

(c) (i)   The strongest responses identified specific examples such as shock absorbing foundations, pyramidal shapes, shorter buildings and the use of counterweights on the top of the building. Some responses used vague or generic terms such as 'strong'.

(ii)   Most responses successfully suggested a distinct range of reasons for deaths occurring after the initial earthquake event.

Question 5

(a) (i)   Some candidates did not complete the graph, highlighting the need to read all questions carefully. Of those that did, most correctly joined the plots.

(ii)   Some weaker responses gave a detailed commentary of every change in the data rather than responding to the requirement to describe the trends. Some did not identify that the Asian line crossed with the South American line and partially referred to incorrect data.

(iii)   Most responses correctly calculated the percentage change and gave the answer, 145%. The most common error was to use the incorrect denominator.

(b)   The most common response was to identify the opportunity to increase yield, perhaps linking this concept to an increase in profits. The majority of answers were linked to crops although those providing an example of an application on livestock were also given credit. There was often a misconception that the use of pesticides would cause a plant to grow faster or crop earlier.

(c)   This was well answered, and most candidates identified two suitable alternatives to pesticides.

Question 6

(a)   Most candidates made good use of the diagram to describe how an anaerobic digester operated, although some misread the question and included the role of the power station in the generation of electricity.

(b) The majority of candidates identified that the processed organic waste would be useful as a fertiliser for future crops.

(c) The role of anaerobic digesters in reducing the spread of disease drew knowledge from a number of different topics within the syllabus. Stronger responses successfully identified the role of reducing the spread of contaminated water and the role of the microorganisms in killing pathogens.

(d) This six-mark level of response question requires candidates to pull together knowledge on a range of subjects. The strongest responses provided a balanced answer looking at the challenges both solutions provided as well as the benefits. Some responses focused on one aspect rather than looking at the broader benefits or drawbacks. Many responses incorrectly stated that using anaerobic digesters to produce electricity did not produce carbon dioxide; however, this is a product of burning the biogas (methane).

Question 7

(a) (i) Most responses made good use of the stimulus article as a basis for answering the question.

(ii) A large proportion of candidates correctly complete this calculation to obtain 81%.

(b) (i) Many candidates successfully described strategies for managing the impacts of flooding, providing a range of distinct examples.

(ii) The requirement of water within the mosquito breeding cycle was well understood, although some responses were confused and linked spread of the malaria parasite directly to the water, omitting the link to the vector's life cycle.

(c) Many responses to this question did not make the link to the fact that such a high level of precipitation would run off and not infiltrate the soil. Similarly, there was a lack of acknowledgement that many years of drought would have caused more significant damage (such as a loss of vegetation) which could not be addressed within this time of heavy rainfall.

Question 8

(a) (i) Many candidates successfully identified the overall trend within the data shown on the graph. The use of supporting data from the graph was inaccurately stated in some responses.

(ii) Some candidates gave correct descriptions of the reasons why a reduction in tree coverage had taken place. A wide range of potential reasons were given credit. Weaker responses simply stated that deforestation had occurred and needed to give reasoning.

(b) Candidates were able to provide a good range of different strategies to preserve forests, from laws and selective logging through to the creation of reserves and some also suggested the use of alternatives to wood.

ENVIRONMENTAL MANAGEMENT

> **Paper 0680/12**
> **Paper 1 Theory**

Key messages

- Candidates should be precise in their answers and avoid generalities such as 'pollution'.
- Responses would benefit from the accurate use of key scientific terms.
- Answers should relate to the command verbs within the question (describe, explain etc.).
- There was a general misunderstanding of the benefits of fish farming.

General comments

The majority of candidates attempted all questions on the paper. Candidates should remember to use the maximum number of marks a question can award as a guide to the number of points they should make in their responses. Similarly, they should ensure they understand the importance of the command words such as 'describe' or 'explain' as these will provide key information about the style of response required.

Answers were generally well presented and annotations on questions showed good planning in many cases. There were occasions when candidates needed to read the questions more carefully. Terms describing maps such as 'above' and 'below' should be replaced with more accurate ordinal terms such as 'north' or 'south'.

Answers to the six-mark level of response question would benefit from a broader approach which considers a range of issues. Candidates should also ensure that their response includes a clear conclusion.

Comments on specific questions

Section A

Question 1

(a)   Most candidates correctly identified the age group (40-44) with the highest percentage of males.

(b)   The majority of candidates attempted to describe the population structure and gained some credit, although some also attempted to interpret the population pyramid which was not a requirement of this question.

(c)   Reasons for migrating from a country were well understood, with many responses giving three distinct reasons, although there were a few instances where the answers were too generic and needed further detail.

Question 2

(a)   Most candidates identified the type of agriculture as pastoral although adding that it was also commercial was less frequently seen.

(b)   Stronger responses to this question gave good accounts of why soil erosion is a risk. A small number of responses instead explained how soil erosion would affect the farm.

Question 3

(a)   A good proportion of candidates were successful in classifying the rock types with the igneous rocks proving the most correctly identified.

(b)   In describing the formation of sedimentary rocks, the processes of weathering and erosion were well described, with transportation and deposition less so. Confusion with the formation of metamorphic rocks was evident in some scripts.

(c)   Candidates were generally successful in describing the impact of the quarry although some responses contained words and phrases that were too generic to gain credit, e.g. 'pollution', and needed to be more specific.

Section B

Question 4

(a) (i)   While the majority of candidates stated the correct answer (India), a significant number chose the event with the largest impact (China).

(ii)   The majority of responses correctly identified the answer as 3.5 million; the most common error was to miss the drought in 1920.

(b)   Responses were generally successful in describing the other long-term impacts of drought and provided a good range of impacts.

(c)   There were many good responses to this question. However, candidates should remember that a four-mark question such as this requires several distinct points to be made.

(d)   Another question that was generally well understood, credit was awarded for two distinct points (climate change, increased population) or a development of one of these with some detail.

(e)   A range of suitable responses were given, mostly linked to economic reasons.

Question 5

(a)   The majority of candidates were able to describe areas on the map although there was occasionally a confusion between east and west. Responses relating to the ordinal points of the compass (north, south, east, west) were expected.

(b) (i)   While it was clear that many candidates had knowledge of the impact of pesticides, many responses were muddled or lacked detail. Phrases such as 'causes pollution' were too vague to be given credit.

(ii)   This calculation question was attempted by most candidates; the majority successfully calculated the numerator although some used an incorrect denominator.

(iii)   There was a limited understanding of the impact of the wrasse on either their natural habitat or the area into which they were introduced. Many identified that there would probably be an impact on the ecosystem but were vague in their reasoning.

(iv)   This question was not often clearly explained. Some responses incorrectly focused on disadvantages of fish farming or the impact of catching fish within the oceans. The strongest responses identified control over the fish-keeping conditions and the resultant speed of production.

Question 6

(a)   Responses displayed a good understanding of the carbon cycle and a correct interpretation of the diagram. Decomposition was the most challenging process to name.

(b)   Candidates were generally provided an explanation of why fossil fuels are non-renewable, stating that resources are finite, and they take millions of years to form.

(c) This question asked for impacts of urbanisation on the carbon cycle. Many responses correctly identified the increased use of fossil fuels as increasing the levels of atmospheric carbon dioxide and/or the loss of vegetation meaning less absorption. Fewer responses considered other parts of the carbon cycle such as the loss/exploitation of carbon sinks.

Question 7

(a) (i) Many candidates correctly followed the question instructions to successfully complete the table with the total of 1 245 000.

(ii) Most answers to this question gave the correct value of 48.2%. Some candidates should take care to give an appropriate number of decimal places in their response.

(iii) Some candidates did not adequately answer why the mass of oil spills is estimated, with responses needing to be more specific.

(iv) This question required candidates to complete a bar chart and was answered by most of the cohort. Most responses included labelling of the axes and completion of bar titles; the most common error was in plotting the bars. Candidates needed to draw bars of the same width to those already present on the graph.

(b) This question was generally well answered although some responses were too general and required more specific statements. Responses such as 'kills fish', 'pollutes' and 'contaminates' were insufficient since the question asked candidates to describe the impacts.

(c) This question required candidates to describe strategies to reduce the risk of oil spills. Some responses incorrectly focused on strategies after a spill occurred. The most common correct responses included references to double-hulled tankers.

Question 8

(a) Most candidates attempted to complete the pie chart. Information should be laid out in a clockwise order commencing at the line provided on the chart. Some candidates omitted the key.

(b) Most responses demonstrated a good understanding of the production of acid rain.

(c) The final question of the paper was the six-mark level of response question. This question requires candidates to apply knowledge to develop a conclusion. Stronger responses identified the importance of discussing the role of international laws in reducing impacts. Some responses wrote at length about only one issue such as the impact of acid rain. Candidates are encouraged to plan their responses to ensure they look at a range of aspects and organise their points to produce a clear piece of writing.

(c) This six mark level of response question required candidates to use a range of their knowledge and develop this to come to a conclusion. This proved challenging for many respondents. Whilst many were able to write at length about one issue, such as the impact of acid rain, relatively few looked at the issue more holistically and most importantly the role of international laws in reducing impacts. Candidates are encouraged to plan their responses to ensure they look at a range of aspects and importantly produce a clear opinion to explain their viewpoint.

ENVIRONMENTAL MANAGEMENT

Paper 0680/13
Paper 1 Theory

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- There was a general misunderstanding of the impact of pesticides with many confusing these with fertilisers.

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Answers were generally well presented and annotations on questions showed good planning in many cases. However, there were a few instances where candidates would have benefitted from reading the question more carefully. Some candidates did not complete the data plotting activity on the graph.

Most candidates showed confidence in handling information provided within the question to help form their answers, and in many cases used this as a basis for writing a complete answer rather than a simple reiteration of the source material.

Candidates demonstrated good understanding on many topics such as the impacts of flooding and the use of population pyramids although some associated topics, such as the impact of heavy rain or an example of a pronatalist policy, were less understood.

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Section A

Question 1

(a) The majority of candidates were able to understand and interpret the diagram of the water cycle. Most correctly identified **A** as being evaporation although fewer named surface run-off for **B**.

(b) Most candidates were able to provide reasons why populations could not access large fresh water stores, many citing problems with pipes/infrastructure or the location of the water store. Three distinct reasons were required to obtain full credit.

Question 2

(a) This question explored the concept of population pyramids. The majority of candidates identified **A** as being the pyramid of an LEDC, though fewer candidates provided a valid reason.

(b) Most responses correctly identified that the working population would fall, but fewer responses identified the impact that an elderly population would have on healthcare, taxation or pensions.

(c)   A significant proportion of candidates did not understand the term 'pronatalist' and gave responses which cited an antinatalist approach such as the one-child policy. The most common correct responses mentioned either less taxation for larger families or free schooling/healthcare.

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(ii)   Most responses successfully suggested a distinct range of reasons for deaths occurring after the initial earthquake event.

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(a) (i)   Some candidates did not complete the graph, highlighting the need to read all questions carefully. Of those that did, most correctly joined the plots.

(ii)   Some weaker responses gave a detailed commentary of every change in the data rather than responding to the requirement to describe the trends. Some did not identify that the Asian line crossed with the South American line and partially referred to incorrect data.

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(d) This six-mark level of response question requires candidates to pull together knowledge on a range of subjects. The strongest responses provided a balanced answer looking at the challenges both solutions provided as well as the benefits. Some responses focused on one aspect rather than looking at the broader benefits or drawbacks. Many responses incorrectly stated that using anaerobic digesters to produce electricity did not produce carbon dioxide; however, this is a product of burning the biogas (methane).

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(c) Many responses to this question did not make the link to the fact that such a high level of precipitation would run off and not infiltrate the soil. Similarly, there was a lack of acknowledgement that many years of drought would have caused more significant damage (such as a loss of vegetation) which could not be addressed within this time of heavy rainfall.

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(b) Candidates were able to provide a good range of different strategies to preserve forests, from laws and selective logging through to the creation of reserves and some also suggested the use of alternatives to wood.

ENVIRONMENTAL MANAGEMENT

> **Paper 0680/21**
> **Paper 2 Management in Context**

Key messages

- Candidates are advised to follow the rubric of the question. If one example is asked for, candidates should provide one example only.
- Bullet pointing answers often leads to concise and accurate responses which are less likely to repeat the text of the question paper.
- Candidates who have had experience of practical investigations are more likely to be able to accurately describe sampling techniques and suggest suitable improvements to investigations.
- Candidates are encouraged to attempt every question, including table completion.

General comments

Candidates should avoid simply copying out the text already given in a question without adding their own interpretation of the information.

Comments on specific questions

Question 1

(a) (i) Many responses correctly calculated the number of people living in urban areas in 2019. A common error was to omit 'million' from the answer.

(ii) The reasons why people want to live in urban areas were well known. Education, employment and good healthcare were common correct answers. 'Better standard of living' was insufficient to gain credit.

(b) (i) A number of candidates did not complete the table to show the average temperature range of 3.9 °C and average annual rainfall of 509 mm. It is important that candidates take the time to check they have answered every question on the paper.

(ii) Strong responses gave comparative answers rather than isolated statements such as '**A** is wet' or '**A** is hot'.

(c) (i) The strongest answers referred to the high temperature and optimum amount of water to allow for more photosynthesis. Weaker responses repeated the information in the question by stating 'to allow plants to grow quickly'.

(ii) Strong responses referred to the large surface area of the leaves and then gave an explanation in terms of absorption of light energy to enable more photosynthesis. The strongest answers linked this to more energy being available for growth.

(d) (i) A minority of candidates did not know the meaning of a cash crop. Weaker responses gave a list of definitions. This approach often led to contradictory answers such as 'for the farmer to eat and to sell'.

(ii) Strong responses supported suggestions with reasons (as asked for in the question), for example, 'to gain income to invest in the farm'.

(e) (i)   Many good explanations were seen. Occasionally, the terms interception and infiltration were confused.

(ii)   A minority did not take note of the instruction to give one benefit and gave a list. This approach should be avoided as it can lead to contradictory answers. A number of responses gave 'reducing soil erosion' which could not be accepted as this was excluded in the question.

(f) (i)   Some responses stated 'random selection' rather than giving descriptive details of a method that could be used.

(ii)   The total mass of 395 was frequently given correctly. Occasionally, the table was left blank.

(iii)   The correct answer was 71.4%. Some answers were incorrectly rounded.

(iv)   The strongest responses gave details such as 'select from more than one bunch', 'sample a different farm location' and 'use different varieties of banana'. Weaker responses gave only one correct improvement, usually 'repeat the investigation' or 'take more samples'.

(g) (i)   Many responses described what the questionnaire showed, and there were few instances of simply copying out of the data already given.

(ii)   Only the strongest responses displayed familiarity with how genetic modification could produce a disease-resistant variety. It was common for responses to confuse GM with selective breeding.

(h)   The stronger responses gave different benefits in each section. Weaker responses tended to repeat the same benefit with different wording.

Question 2

(a) (i)   Candidates who used a linear scale were generally able to plot the points correctly. Some non-linear scales were seen, and some x-axes were too big for the grid provided. Both axes needed to be labelled: the y-axis label sometimes lacked the correct unit. Some responses contained bar charts rather than graphs.

(ii)   Two correct suggestions were not frequently given. The stronger responses noted that the price had been increasing in the last four years and suggested that the cost of running the mine was less than the profit made.

(b) (i)   Many good reasons for why a subsurface mine is expected to cause less damage were seen.

(ii)   A common error in the weaker responses was to refer to environmental benefits rather than benefits to the 'local people'.

(iii)   The need to restore the land was commonly given. Responses that referred to the mining company needing to pay for this work were less frequently seen.

Question 3

(a) (i)   Two economic benefits were usually correctly suggested.

(ii)   Stronger responses were guided by the number of marks available and often used bullet points to ensure at least three different suggestions were included. Weaker responses tended to give only one suggestion.

(b) (i)   The majority of responses correctly gave the months at least risk of flooding. Occasionally, the months at most risk of flooding were given.

(ii)   The majority of candidates knew the risks after a flooding event. Weaker responses stated 'death'; this simple answer should always be qualified with a reason: for example, 'death due to illness from contaminated drinking water' or 'death due to cholera'.

(iii) Many responses used the details given in the syllabus for the location of the formation of a tropical cyclone. Some of these responses needed to clarify what the temperature and depth they quoted referred to, e.g. ocean surface temperature and ocean depth.

(iv) Many candidates provided good answers to this question. The weaker responses only described one strategy.

(c) It was common to see only one undeveloped suggestion. Candidates should be guided by the number of marks allocated for each question.

(d)(i) Many correct tables were given. A common error was to either omit the number of cells needed for the repeats or the column heading of 'number of bottles'.

(ii) Some good suggestions were seen; 'type of plastic' and 'source of plastic' were common correct answers.

(iii) This was often answered correctly. The most common error was toothbrushes.

(iv) Many candidates correctly suggested one suitable improvement. Fewer candidates successfully suggested three.

(v) Many responses contained good explanations of advantages and disadvantages. A common error was to answer in terms of general tourism rather than sustainable tourism. Some responses confused advantages and disadvantages or only gave advantages. Others did not give sufficient detail to explanations.

(v) Some good explanations were seen. A common error was to misread the question and answer in terms of general tourism. Some responses confused advantages and disadvantages or only gave advantages. Some candidates would have benefitted from giving greater detail to their explanations.

ENVIRONMENTAL MANAGEMENT

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Paper 0680/22
Management in Context

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Key messages

* Candidates should look at the command word, mark allocation and the number of answer lines provided for a question before starting to write a response. For instance, a question asking for reasons with an allocation of three marks needs three reasons. A question with the command word 'Describe' and three marks needs at least three pieces of information. The number of answer lines provided can be used as a guide to how much detail needs to be written to answer each question.
* Candidates should read each question carefully to make sure that they answer the question asked, e.g. checking whether a line graph or bar chart is required when plotting.
* Graphs and bar charts should be presented as described in the syllabus.
* Not all answers are written on answer lines, some have to be written in a table or on a diagram.
* All working should be shown when completing calculations, especially when more than one mark is available for the answer.

General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country, The Dominican Republic. Many candidates understood and made good use of the source material, and their written responses were clearly expressed. The mathematical and graphical questions posed some difficulties for a minority of candidates.

Comments on specific questions

Question 1

(a) (i) Most candidates correctly calculated the number of unemployed people in the Dominican Republic in 2019, 649 000. Some gave the answer as 0.649 without 'million'.

(ii) Most candidates suggested tourism and jobs as two ways national parks contribute to economic growth.

(b) (i) This question required candidates to use the climate data provided to complete the table for location **P** and location **Q**. Most candidates completed the table successfully.

(ii) Most candidates correctly described at least one similarity between the climate at location **P** and location **Q** using information from the tables. A few responses described differences.

(c) (i) Many candidates suggested that farmers can use the three-metre strips of land between the rows of banana plants for growing another crop. Some candidates suggested keeping animals.

(ii) Nearly all candidates gained partial credit for describing how pollen can be moved from one flower to another flower by insects or wind. The stronger responses described the process of pollination with clear reference to the pollen being moved from the anther of one flower to the stigma of another.

(iii) The responses to this question requiring a description of the benefits of subsistence farming were variable. The stronger responses showed a sound understanding of how food is mainly grown for the use of the farmers and their families. Stronger candidates put forward the idea that there was

little impact on the environment because subsistence farms are small, and the farmers cannot afford to buy machinery, pesticides and fertilisers.

(d) (i) Most candidates stated either that farmers who grow organic bananas can control pests on their banana plants using biological controls, or that they could use living organisms such as the predator of the pests to kill them.

(ii) Many candidates stated that farmers who grow organic bananas can ensure the soil has enough nutrients by using a natural fertiliser, such as manure or compost. Some candidates misinterpreted the question and referred to testing the soil in their answers.

(iii) Most candidates stated that eutrophication was a negative impact of using chemical fertilisers.

(iv) The most common correct responses referred to wanting the farmers to get a fair price for the bananas or to improve the farmers' lives. Many incorrect responses gave reasons related to the climate of Europe and buying bananas that are cheap.

(e) (i) Some responses defined the term *carbon footprint* correctly; some wrote about global warming.

(ii) Many candidates successfully suggested correct reasons why bananas are kept at 13 °C during the journey to Europe.

(iii) Many candidates correctly calculated the distance the banana ship travels in 20 days. A common error was to not factor in the number of hours the ship travels in 20 days.

(f) (i) The majority of candidates correctly compared the patterns of selected banana plant positions in farm **X** and farm **Y** using suitable words. The pattern in farm **X** was often described as scattered, spread out or dispersed whereas Farm **Y** was clustered or grouped.

(ii) Few responses explained that both the samples are representative of all the banana plants on each farm because the farmer randomly selected 8 banana plants from each plot.

(iii) To record the results of the survey to compare the number of diseased leaves on banana plants, the table needed to have sixteen cells with suitable column and row headings. A common error was to draw a table to show the banana plants on the farms instead of the number of diseased leaves on the 8 selected plants.

(g) (i) The responses to this question, requiring candidates to identify in which months they would expect the fungal disease to spread quickly and give a reason, were variable. The stronger responses identified May, September and October and gave as a reason the high rainfall and high temperatures. Some candidates identified only one month.

(ii) Many candidates successfully suggested an advantage and a disadvantage of controlling black sigatoka fungal disease by removing the diseased leaves from the plants, and then burning the leaves. The most common advantage was that removing the leaves meant the farmers did not have to buy fungicide. The most common disadvantage was the air pollution produced when the leaves were burnt. A minority of candidates wrote about an advantage and a disadvantage of using fungicides.

(iii) This question required candidates to describe one method scientists could use to produce a new variety of banana plant that is resistant to black sigatoka. Some candidates used the term 'genetic modification', or 'genetic engineering'. These responses needed to describe how a gene for resistance to black sigatoka can be identified in a plant and then transferred to a banana plant, to make it resistant. Those who answered with the term 'interbreeding' needed to give details of how the scientist could cross breed a banana plant with another plant that is resistant to black sigatoka, to produce a plant resistant to the fungus.

Question 2

(a) Most candidates successfully suggested that surface run-off after rain washed pollutants from the mine into the stream.

(b)(i) Most candidates plotted the data correctly as a line graph and fully labelled both axes. Some graphs were truncated with the *y*-axis scale correctly labelled with a clear false origin. Some candidates plotted bar charts, while others plotted the data as points but did not connect them with lines. Candidates needed to use sensible intervals for their scales on the *y*-axis which readily fit onto the grid provided.

(ii) Many candidates correctly calculated the average world copper price to be 60 1000 USD per tonne for 2014 to 2019.

(iii) Many candidates suggested several reasons why the mine might not be profitable in 2022, developing ideas about decreasing demand, falling prices and the copper running out or the mine becoming exhausted. Some candidates did not give enough reasons/development for two marks.

(c)(i) This question required candidates to use the key to the map to estimate the area of the waste pond. Stronger responses showed full working.

(ii) Many candidates gave at least one reason for concern related to a leak or burst from the waste pond. The most common reason given was the contamination of the local water resource with water from the waste pond. Fewer candidates gave flooding of the local area as a reason or that the toxic water could have harmful effects on humans, animals and plants. A common mistake was giving the risk of water-related diseases such as typhoid and cholera as a reason.

(iii) This question required candidates to suggest reasons why the government has made the mining company responsible for monitoring the waste pond until 2040. The stronger responses described how this would mean the mining company would have to monitor the waste pond so it did not burst and pollute the local area after the mine had closed. Some candidates suggested that the pollutants were toxic and would take a long time to biodegrade.

Question 3

(a) There were some thoughtful responses to this question which required candidates to explain why it is impossible for ecotourists to have zero impact on the local environment. There was mention of all tourism leading to the development of hotels and roads. The impact of ecotourists was often described as unintentional. Vehicles causing air pollution, people trampling vegetation and compacting soil while walking on footpaths and making noises that frighten wildlife were all good reasons given. There was also the suggestion that litter could be dropped accidentally and that the need for food and drink had an impact on the local area. The weaker responses stated that ecotourists had an impact without providing supporting evidence.

(b)(i) Some candidates correctly named the *type* of sampling as systematic.

(ii) Many candidates were able to suggest at least one reason why the coral survey is repeated every year. The need to count the number of coral, identify new species and record change were the most common suggestions.

(iii) Most candidates gained partial credit for suggesting how data from the surveys of the marine reserve can help to manage the impact of diving at other coastal sites. Stronger responses made specific references to the impacts of diving and the need for regulation.

(iv) Many candidates suggested one benefit and one limitation of using zoos to preserve biodiversity. Common benefits included education about biodiversity, preventing extinction and protecting species from predators. Limitations included captivity causing problems such as breeding, returning animals to the wild and the limited space to house large numbers of species. Some responses suggested advantages and disadvantages of zoos in the Dominican Republic.

(c)(i) The most common suggestions were about providing shelters, medical care, food and clean water. Some candidates described how rescue teams from the centre could rescue people from flooded buildings. Others suggested that the centre could organise the evacuation of people from the area.

(ii) Most responses suggested that burning the plastic waste removed from the beaches would cause air pollution. Few linked the air pollution to toxic gases or particulates that could bioaccumulate up food chains.

(d)(i) This question required candidates to shade an area on the hydrograph, under the graph, to show when the river is flooding. Clear indication of time was needed for credit, identifying the river discharge between 20 and 42 hours on the *x*-axis.

(ii) Many candidates correctly calculated the number of hours after peak rainfall that peak river discharge occurred as 24. A misunderstanding of the position of peak river discharge on the graph was evident in some responses.

(iii) This question required the candidates to suggest reasons why it takes many hours for the river discharge to return to the same level as before the storm event. The strongest responses described how water from run-off, through-flow and ground water flow after the storm took time to reach the river, so it took a long time for flooding to stop and the river to return to its normal level. Some candidates suggested that vegetation and water moving through the soil would reach the river more slowly, after run-off had stopped. Weaker responses included references to evaporation and waste needing to be cleared from the river.

(iv) The strongest responses explained that flooding can be beneficial in some areas because silt is deposited by the flood and makes the soil more fertile.

(v) This question asked candidates to describe a method that the students could use to measure the rate of flow of water in the stream. Many responses described clear methods that utilised and referenced the equipment shown. Some responses lacked clarity in exactly which quantities would be measured and/or how the equipment would be used to make these measurements. Some responses referred only to time rather than rate.

(v) This question asking candidates to describe a method that the students can use to measure the rate of flow of water in the stream was generally well answered. Many candidates gained full credit.

ENVIRONMENTAL MANAGEMENT

> **Paper 0680/23**
> **Paper 2 Management in Context**

Key messages

* Candidates are advised to follow the rubric of the question. If one example is asked for, candidates should provide one example only.
* Bullet pointing answers often leads to concise and accurate responses which are less likely to repeat the text of the question paper.
* Candidates who have had experience of practical investigations are more likely to be able to accurately describe sampling techniques and suggest suitable improvements to investigations.
* Candidates are encouraged to attempt every question, including table completion.

General comments

Candidates should avoid simply copying out the text already given in a question without adding their own interpretation of the information.

Comments on specific questions

Question 1

(a) (i) Many responses correctly calculated the number of people living in urban areas in 2019. A common error was to omit 'million' from the answer.

(ii) The reasons why people want to live in urban areas were well known. Education, employment and good healthcare were common correct answers. 'Better standard of living' was insufficient to gain credit.

(b) (i) A number of candidates did not complete the table to show the average temperature range of 3.9 °C and average annual rainfall of 509 mm. It is important that candidates take the time to check they have answered every question on the paper.

(ii) Strong responses gave comparative answers rather than isolated statements such as '**A** is wet' or '**A** is hot'.

(c) (i) The strongest answers referred to the high temperature and optimum amount of water to allow for more photosynthesis. Weaker responses repeated the information in the question by stating 'to allow plants to grow quickly'.

(ii) Strong responses referred to the large surface area of the leaves and then gave an explanation in terms of absorption of light energy to enable more photosynthesis. The strongest answers linked this to more energy being available for growth.

(d) (i) A minority of candidates did not know the meaning of a cash crop. Weaker responses gave a list of definitions. This approach often led to contradictory answers such as 'for the farmer to eat and to sell'.

(ii) Strong responses supported suggestions with reasons (as asked for in the question), for example, 'to gain income to invest in the farm'.

(e) (i) Many good explanations were seen. Occasionally, the terms interception and infiltration were confused.

(ii) A minority did not take note of the instruction to give one benefit and gave a list. This approach should be avoided as it can lead to contradictory answers. A number of responses gave 'reducing soil erosion' which could not be accepted as this was excluded in the question.

(f) (i) Some responses stated 'random selection' rather than giving descriptive details of a method that could be used.

(ii) The total mass of 395 was frequently given correctly. Occasionally, the table was left blank.

(iii) The correct answer was 71.4%. Some answers were incorrectly rounded.

(iv) The strongest responses gave details such as 'select from more than one bunch', 'sample a different farm location' and 'use different varieties of banana'. Weaker responses gave only one correct improvement, usually 'repeat the investigation' or 'take more samples'.

(g) (i) Many responses described what the questionnaire showed, and there were few instances of simply copying out of the data already given.

(ii) Only the strongest responses displayed familiarity with how genetic modification could produce a disease-resistant variety. It was common for responses to confuse GM with selective breeding.

(h) The stronger responses gave different benefits in each section. Weaker responses tended to repeat the same benefit with different wording.

Question 2

(a) (i) Candidates who used a linear scale were generally able to plot the points correctly. Some non-linear scales were seen, and some *x*-axes were too big for the grid provided. Both axes needed to be labelled: the *y*-axis label sometimes lacked the correct unit. Some responses contained bar charts rather than graphs.

(ii) Two correct suggestions were not frequently given. The stronger responses noted that the price had been increasing in the last four years and suggested that the cost of running the mine was less than the profit made.

(b) (i) Many good reasons for why a subsurface mine is expected to cause less damage were seen.

(ii) A common error in the weaker responses was to refer to environmental benefits rather than benefits to the 'local people'.

(iii) The need to restore the land was commonly given. Responses that referred to the mining company needing to pay for this work were less frequently seen.

Question 3

(a) (i) Two economic benefits were usually correctly suggested.

(ii) Stronger responses were guided by the number of marks available and often used bullet points to ensure at least three different suggestions were included. Weaker responses tended to give only one suggestion.

(b) (i) The majority of responses correctly gave the months at least risk of flooding. Occasionally, the months at most risk of flooding were given.

(ii) The majority of candidates knew the risks after a flooding event. Weaker responses stated 'death'; this simple answer should always be qualified with a reason: for example, 'death due to illness from contaminated drinking water' or 'death due to cholera'.

(iii) Many responses used the details given in the syllabus for the location of the formation of a tropical cyclone. Some of these responses needed to clarify what the temperature and depth they quoted referred to, e.g. ocean surface temperature and ocean depth.

(iv) Many candidates provided good answers to this question. The weaker responses only described one strategy.

(c) It was common to see only one undeveloped suggestion. Candidates should be guided by the number of marks allocated for each question.

(d)(i) Many correct tables were given. A common error was to either omit the number of cells needed for the repeats or the column heading of 'number of bottles'.

(ii) Some good suggestions were seen; 'type of plastic' and 'source of plastic' were common correct answers.

(iii) This was often answered correctly. The most common error was toothbrushes.

(iv) Many candidates correctly suggested one suitable improvement. Fewer candidates successfully suggested three.

(v) Many responses contained good explanations of advantages and disadvantages. A common error was to answer in terms of general tourism rather than sustainable tourism. Some responses confused advantages and disadvantages or only gave advantages. Others did not give sufficient detail to explanations.

(v) Some good explanations were seen. A common error was to misread the question and answer in terms of general tourism. Some responses confused advantages and disadvantages or only gave advantages. Some candidates would have benefitted from giving greater detail to their explanations.