ENVIRONMENTAL MANAGEMENT

Paper 0680/11
Paper 11

Key messages

Candidates should:

- read the question carefully to ensure they answer the question as set
- ensure their answers are focused and clear.

General comments

Most candidates appeared to have sufficient time to finish the paper and very few questions were left blank.

Weaker candidates frequently tried to compensate for a lack of knowledge by repeating the same point in their answers and failed to provide answers which had sufficient depth.

Question 1

(a) (i) Most candidates were able to calculate this correctly.

(ii) A very large proportion of the answers to this question were vague and just talked about earthquake proofing buildings, without giving any details of what this might entail.

(iii) Most candidates suggested that the reason for the high level of earthquakes here was the proximity to a plate boundary. However, there was some confusion as to which plates were relevant and what type of boundary is involved. A significant number of answers mentioned the Arabian and Eurasian plates as being the significant ones. This then led them to talk about a conservative boundary. More careful attention to the location of Ludian in relation to the three plates shown was needed by these candidates.

(b) Candidates were usually able to come up with one advantage of living on a boundary, but few were able to think of two.

Question 2

(a) (i) This question was almost always well answered.

(ii) Most candidates were able come up with two good suggestions here. The most common error was to discuss farming related uses. This was possibly because candidates had not noticed that the question asked for other reasons for removal.

(iii) Only the strongest candidates gained full credit on this question. Many talked a lot about the loss of minerals, which was not relevant here.

(b) Despite the fact that it is listed on the syllabus as one of the strategies for sustainable forest use, few knew what agroforestry is. Most answers focused on either planting trees or not cutting them down. Very few answers made any mention of crops being grown in amongst the trees.

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Question 3

(a) (i) This question was quite well answered. The most common mistake was to fail to link the aphids to the thistle. Quite a few linking lines did not have arrows showing the direction of energy flow or had the arrows going the wrong way.

(ii) This question was generally not answered correctly.

(b) (i) A significant number of candidates wrote generally about the problems of using pesticides as opposed to what was actually asked for in the question.

(ii) This question was very well answered with a description of a rise followed by a fall in numbers given. Most candidates were also able to quote a time when a key event happened or the number of aphids present at a key time.

(iii) This question was not well answered, with the most common error being to put the total number of aphids present at this point.

Question 4

(a) (i) Most candidates recognised 42 million as the correct answer.

(ii) Many candidates were able to calculate 336 000 km^3 as the correct answer.

(iii) There were many vague answers here, but also some very strong accounts which recognised that the water is carefully targeted at each crop plant and that this avoids loss due to evaporation.

(iv) Many answers discussed the movement of water to the surface and its subsequent deposition there. However, only stronger candidates preceded this with the dissolution of salt in the water. After that, many candidates talked about evaporation leading either to movement of salt from lower down in the soil or its deposition at the surface, but not very few included both of these points.

(b) A large number of candidates only discussed the differences in water treatment between urban and rural areas and did not offer good suggestions as to why these differences exist. Stronger candidates were able to discuss differences in what can be spent on treatment, the differences in the political power in the two regions and the benefits gained by houses being close together in urban areas.

Question 5

(a) (i) Answers here were generally good.

(ii) A significant number of candidates were confident about the role of ozone in blocking UV and on the potential effects of UV on living things.

(iii) Most candidates were able to say which was troposphere and stratosphere. A similar number were able to make a comment about the effect on the troposphere. However, when it came to the stratosphere, there were many answers which talked about ozone holes rather than answering the question, which asked about composition.

(b) Those who said that they did not agree with the construction of nuclear power stations were often able to make good points about the relatively dangerous nature of such installations, the problem of waste and the issues surrounding the long lived nature of radiation damage. Those who chose to agree were often not able to give responses with such strong reasons.

Question 6

(a) This question was generally quite well answered. Rocks were commonly mentioned as was the process of weathering, and there was some good detail given of this process.

(b) (i) The majority of candidates were able to make the correct choice and to give reasons derived for the information provided. Those who chose other ranges had not noticed that the question asked for the best range, not one that would be acceptable.

(ii) Candidates who recognised that the data given in the stem were still relevant were able to talk convincingly about the relative absence of important minerals or the presence of toxic aluminium.

(c) Most candidates were able to give two points for this question.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/12 |
| Paper 12 |

Key Messages

Candidates should:

- read the question carefully to ensure they answer the question as set
- ensure their answers are focused and clear.

General comments

Most candidates appeared to have sufficient time to finish the paper and very few questions were left blank.

Weaker candidates frequently tried to compensate for a lack of knowledge by repeating the same point in their answers and failed to provide answers which had sufficient depth.

Question 1

(a) Most candidates were able to draw a food web. Some webs were drawn with lines rather than arrows. Others had arrows drawn the wrong way.

(b)(i) Very few candidates answered this question incorrectly.

   (ii) There were some very strong answers describing the relationship between the energy stored in a lugworm and the mass of microplastic in food, supported with data from the graph. There were a few less secure answers that incorrectly described a positive relationship.

(c) Candidates who described the process of eutrophication often gained full credit. However, some felt that the algal bloom uses up oxygen. There were some good answers about sewage causing diseases such as cholera and typhoid and the loss of the amenity value of the lake in terms of visual pollution and unpleasant smells.

Question 2

(a)(i) Most candidates were able to identify all three land uses on the photograph.

   (ii) Most candidates were able to state the two reasons other than farming and industry for clearing natural vegetation. Some candidates did not note the reference to 'other' in the question and wrote about clearing natural vegetation for mining and agriculture.

   (iii) There were some excellent answers about how clearing natural vegetation, especially trees, causes soil erosion, with many candidates referring the loss of roots that held the soil in place, the loss of leaves that intercepted rainfall and the increased surface runoff that washed the soil into lakes and rivers. Answers which focused on nutrient leaching could not be credited.

(b) Only the stronger candidates wrote convincingly about community forestry. There were few references to the role of local people in the management of forests and forest resources.

Question 3

(a) (i)   Most candidates were able to calculate the percentage of people affected by the eruption of the Nabro volcano correctly.

(ii)   There were some strong answers from candidates who addressed the question as set and realised that it was about strategies to reduce the number of deaths *after* a volcanic eruption. However, other answers discussed strategies related to the warning signs before an eruption and methods of prediction.

(iii)   There were many accurate and detailed answers identifying the plate movement as constructive or divergent which explained how magma would rise to the surface to fill the gap between the moving plates.

(b)   Most candidates could state two ways that volcanoes are hazardous and may cause deaths. Lava, volcanic bombs and ash were mentioned most often but lahars, gases and pyroclastic flows also featured in answers.

Question 4

(a) (i)   Most candidates answered correctly that argon and carbon dioxide had the same percentage in the troposphere and stratosphere.

(ii)   Most candidates named ozone as a gas that protects living organisms from harmful solar radiation and identified the harmful radiation as ultra-violet rays. Some explanations, however, incorrectly referred to ozone reflecting instead of absorbing the ultra-violet radiation.

(iii)   There were some very detailed answers to this question, but they often focused solely on how burning fossil fuels increases the carbon dioxide in the atmosphere. Some candidates wrote about how burning fossil fuels reduced oxygen. There were fewer mentions of water vapour, sulfur dioxide and nitrogen oxides. Many answers went beyond what was required here and discussed the consequences of the changes, which was not the focus on the question.

(b)   There were similar numbers of candidates for and against the use of biomass as a source of energy. Those in favour usually mentioned it being renewable as a reason. Few referred to the fact that biomass is carbon neutral. Those against often stated that biomass gives off carbon dioxide. Other reasons given were often concerned with biomass being expensive and smelly and that there were better sources of renewable energy such as solar and wind. There was very little mention in answers of the controversy over using the land that which could otherwise be used for food production.

Question 5

(a) (i)   Many candidates calculated the percentages of clay, silt and sand correctly. Some candidates wrote down their calculation in centimetres instead of working out the percentage as the question asked for.

(ii)   Most candidates correctly circled soil type C.

(iii)   Many candidates referred to decomposition or decomposers in their answers. Some answers appeared to confuse decomposition with sedimentation by describing how dead plants and animals form rocks such as coal.

(b)   Some candidates appeared to be writing about fertilisers instead of pesticides with details about leaching into water bodies and eutrophication. Others wrote about the possible effects of pesticides on people and plants. There were some good answers about the killing of non-target species such as birds and the possible impact on crops if beneficial pollinators like bees were killed.

Question 6

(a) (i)   A large number of candidates calculated correctly that 42 000 000 km^3 of the Earth's water is fresh.

(ii)   Most candidates stated correctly that 80% of water was used for irrigation.

(iii) Most candidates wrote about salinization and showed a good understanding of the process. There were answers about waterlogging and leaching but the explanations of these problems were less secure.

(b) The most successful answers about water quality differing between countries considered both relative wealth and water treatment. Candidates writing about water quantity often wrote about access to oceans, biomes or countries that were water rich or water poor.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/13 |
| Paper 13 |

Key Messages

Candidates should:

- read the question carefully to ensure they answer the question as set
- ensure their answers are focused and clear.

General comments

Most candidates appeared to have sufficient time to finish the paper and very few questions were left blank.

Weaker candidates frequently tried to compensate for a lack of knowledge by repeating the same point in their answers and failed to provide answers which had sufficient depth.

Question 1

(a) (i) A majority of candidates identified the three areas correctly.

(ii) There were some good suggestions in answer to this question, the most common making reference to its designation as a nature reserve.

(iii) This question was not well answered. A significant number of candidates suggested there was a mineral deposit of some sort there but were unable to point out that it must be close to the surface with reference to an open cast mine.

(iv) Most candidates could only suggest one measure, such as plant trees or replace overburden.

(b) It would appear that many candidates either did not notice the word "harvesting" in the question or did not understand what it means. Therefore, most answers discussed planting trees to replace those which had been cut, which is not relevant in the context of harvesting.

Question 2

(a) (i) Many candidates were able to give the correct answer here.

(ii) Most candidates were able to give the correct answer.

(iii) This question proved challenging for almost all candidates.

(iv) There were many good suggestions here with the isolated nature of the event being by the far the most commonly suggested.

(v) Many candidates were able to gain partial credit here. The most common error was to say simply that Iceland is on a plate boundary, rather than making reference to a boundary.

(b) Relatively few candidates were confident in suggesting the well-known benefits of living in this location. However, of the few who did, they were often able to make three or even four suggestions.

Question 3

(a) This question was well answered by most candidates. The most common errors were either to omit arrowheads or put them on the wrong end of the line.

(b)(i) Most candidates knew what to do here and most did it correctly. A few did not round their answers correctly.

(ii) This was a demanding question but the best candidates were able to make good suggestions. A larger number, however, were not sure how to proceed.

(c) There was a rather poor knowledge of the general effects of oil pollution in the sea. A little more detail than simply animals, fish etc. get killed was needed.

Question 4

(a)(i) This was answered well by almost all candidates.

(ii) This was answered correctly by most candidates.

(b) A few candidates were able to make two or three suggestions but most either had no suggestions to make or made just one.

(c) The strongest candidates gave good answers. However, for many candidates there was confusion between fertilisers and pesticides or even fertilisers and air pollutant such as acid rain gases.

Question 5

(a)(i) The stronger candidates defined the term weather correctly. However, there was a lot of confusion between weather and climate.

(ii) Nearly all candidates knew the correct instrument for each parameter. The commonest error was to swap **F** and **E**.

(iii) There were some good attempts at this entirely skills based question.

(iv) Only a minority knew that this was cool temperate interior.

(b) A significant number were able to talk about changes in carbon dioxide levels but fewer went on to say how changes would affect climate.

Question 6

(a)(i) Only stronger candidates were able to answer this correctly.

(ii) As is often the case with questions which ask for a description of distribution, most candidates gained partial credit but gave answers which were not detailed enough for full credit.

(iii) Many answers discussed the quality of the water which was available, rather than concentrating on the actual availability of any water.

(b) Vague references to pollution or contamination were not sufficient to gain credit on this question. Whenever pollution is being discussed, candidates should be aware that they need to make reference to a specific and relevant pollutant or pollutants.

ENVIRONMENTAL MANAGEMENT

Paper 0680/21
Paper 21

Key messages

Candidates usually made good use of the resources provided in the question paper, carefully studying them to extract relevant information to answer the questions set.

Soils and cyclones seem to be challenging for some candidates.

General comments

Knowledge and understanding of El Niño and eutrophication were much improved on past years. Other syllabus areas such as the development and decline of cyclones, soils in terms of soil organisms and air and water within the soils and differential heating by the sun at different latitudes require better understanding.

Candidates' use of the resources in the paper was generally very good. Graphical skills, too, were excellent.

Comments on specific questions

Question 1

(a) (i)   Most candidates completed the graph well. A few needed to be more accurate in plotting the 45%.

    (ii)   Many candidates ignored the role of air <u>in soil</u> and wrote about photosynthesis using the carbon dioxide in the air. The role of water for hydration, for use in photosynthesis and for supplying minerals in solution from the soil was known by some candidates.

    (iii)   Strong candidates achieved maximum credit by identifying the role of soil organisms in decomposition, aeration and nitrogen fixing. Only a few mentioned worms or fungi.

(b) (i)   Most candidates correctly chose 2.5–3.0 times.

    (ii)   The size of graph paper in the question paper was chosen so the graphs could be drawn to a sensible scale using the whole of the graph paper. Quite a few candidates chose scales that meant only a small proportion of the graph paper was used, making accurate plotting more difficult for them. Many candidates gained most of the available credit. The most common reasons for gaining less than full credit were:

         –   *y*-axis lacking a label
         –   inaccurate plotting of points
         –   *y*-axis not to scale

         Some candidates drew bar graphs, but if they were plotted accurately they could still be awarded full credit.

    (iii)   A large number of candidates wrote "an increase in population"; it should be noted that the question asked for the reason for the increase in average meat consumption *per person.*

(c) (i)   This was well answered with nearly every candidate correctly stating Africa.

    (ii)   Careful study of the map shows North America and Oceania have the highest consumption. Candidates often chose one of these in combination with Europe or South America.

(iii) Most candidates identified wealth as a major factor. Some thoughtful candidates wrote about religious beliefs (vegetarian), tradition and even availability of refrigeration.

(iv) Strong candidates showed an understanding of overgrazing and how it caused soil erosion, trampling was less often explained. Most candidates gained credit for "water pollution" even if they had no credit for "soil erosion", with most referring to faeces.

(d)(i) and (ii) Both these parts were usually correct.

(iii) Most candidates understood the concern over methane emissions. A few gained credit for the concern over deforestation and its impact on climate change. Some weaker candidates needed to read the question more carefully as they wrote about other environmental aspects rather than the impact on climate.

(e)(i) A few answered 17%, candidates must study the information given in the question carefully. The majority noted that just one stream was affected in 2012.

(ii) Almost all used the resource well and gained full credit.

(f) The best answers dealt with the excess fertilisers being washed into water courses and all the subsequent impact of eutrophication. They went on to offer sensible ways of trying to replace or limit the use of fertilisers and / or preventing them reaching water courses. A few wrote about skimming algal blooms from rivers and lakes and pumping oxygen onto the water. At Level 2 most could give a good explanation of eutrophication. They then needed to look at remedial action in some detail to achieve the higher level. Weaker candidates gave very brief descriptions or wrote about the effects of pesticides. Some seemed to think that fertilisers were the same as pesticides or herbicides.

Question 2

(a)(i) A limited number of candidates used their knowledge and the diagram to explain the difference in areas heated by the two rays shown. Some also correctly identified albedo as being important and the fact that as light waves travel a longer distance through the atmosphere at the Arctic Circle there is more energy lost through reflection. Some candidates needed to explain their answers more clearly; saying that the sun is vertical or shines directly on the Equator was too vague. Some thought that distance from the sun is the cause.

(ii) This was generally well answered.

(b) All the candidates correctly interpreted the unusual graphic to gain most of the available credit.

(c)(i) and (ii) Yet again there was good interpretation of the resource by nearly all candidates.

(iii) The correct answer of 6–7 degrees south was given by the majority. Others needed to be more accurate as they stated 5 or 10 degrees south.

(iv) This proved challenging. Candidates needed to be aware that cyclones formed over warm water and that this provided their energy. Therefore the lack of water on land and the fact that sea temperatures decrease away from the Tropics would explain why the cyclone weakened.

(v) In general this was another challenging question. Better answers showed knowledge of the origins of cyclones and that the low pressure causes sea level to rise. Aided by the strong winds this leads to storm surges – the inundation of low-lying coastal areas by the sea. Weaker answers discussed the low-lying nature of the land would increase the flood risk from heavy rain and a few noted that such areas are often densely populated.

(vi) This was much better answered. Many candidates knew enough about the precautions against cyclone damage to achieve full credit.

(d)(i) Most candidates were clear about the roles of wind and water currents. Some candidates did not understand that the ocean currents are separate bodies, i.e. the warm current will not heat the cold current. However the use of the resource and the understanding of El Niño were good.

(ii) The majority of candidates correctly stated that the advantage was for agriculture.

(e) (i) Candidates understood the food web.

(ii) Candidates needed to make clear that death through starvation lead to a reduction in numbers, or that sharks were at the next level in the web to seals and penguins. Many candidates stated that all the fish, etc. would die, which is incorrect. There is a reduction in zooplankton, so there will still be some food for fish and whales as well as other creatures at higher trophic levels.

(f) The phrasing of this question should have led candidates to compare the impacts of the three climatic hazards. The best answers did that, with some noting that cyclones may cause more damage in monetary terms as buildings, etc. are destroyed, but that droughts frequently lead to the greatest number of deaths and migrations. These better answers also looked at environmental impacts. Many referred to the length of time that these events may last, and the cost involved to countries of various levels of development. Where weaker candidates did refer to the effects, these were often listed and repetitive, rather than comparative. As with all these types of questions, there is no single correct answer, rather candidates are rewarded for the quality of the explanation and conclusions.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/22 |
| Paper 22 |

Key messages

Candidates need to make full use of the resources provided when answering questions.

Where descriptions are required it is essential that candidates provide details rather than vague statements.

Some candidates' explanations are really descriptions – such answers need to give reasons to gain maximum credit.

General comments

In general candidates performed slightly better on **Question 1** than on **Question 2**. Performance overall on parts of **Questions 2(a)** and **2(d)** was weaker. Both illustrate the key point above about using the information in the resources provided. As stated in the comments on specific questions, the diagram for **Question 2(a)** showed that at **X** there was no subduction as both plates were continental. This was overlooked by the majority of candidates. In **Question 2(d)(ii)** candidates wrote about the changes in numbers of plant species, with many identifying the sharp increase from 1989 onwards. However, in the next part they often overlooked their answer to part **(ii)**, did not take note of the graph and wrote about birds decreasing the number of plant species.

The final part of each question is still an area that requires some improvement. For example in **Question 1(f)** many candidates wrote solely about cyclones and did not consider other climatic hazards. Unfortunately quite a number who did try to compare based their comparisons on earthquakes. In **Question 2(f)**, answers were better as the question required advantages and disadvantages which most candidates covered. However, many answers were lists with little explanation, especially as to how volcanoes can be dangerous.

On a positive note, candidate knowledge of the negative impact of fertilisers (eutrophication) and of El Niño events was very good.

Comments on specific questions

Question 1

(a)   All parts were well answered.

(b) (i)   Nearly all candidates correctly identified that availability of water to soil made fertile by alluvial deposits explained the location of the intensive farming, fewer were able to explain why extensive cattle farming was carried out away from the river

(ii)   This question was well answered as candidates noted the drought and described its likely impacts. A few wrote about crops instead of cattle.

(iii)   The best answers included the heavy rain, the preceding drought years and their likely impact on the vegetation and soil to produce thorough explanations. Weak answers noted the heavy rain but without noticing the preceding drought and did not explain why that year had particularly bad soil erosion.

(iv)   The impacts when excess fertilisers are washed into water bodies were well covered by many candidates with the basics of eutrophication well understood. Some seemed to have no knowledge

of eutrophication. Other candidates confused fertilisers with pesticides and so wrote answers that were awarded only partial credit.

(v) Many candidates were able to give a variety of ideas, usually involving controlled irrigation, such as trickle drip, organic fertilisers, crop rotation, mixed cropping and various methods to prevent soil erosion.

(c) (i) Answers had to refer a period of little or no **rain**. A shortage of water was insufficient, as this applies to hot deserts nearly all the time.

(ii) Most candidates correctly identified Europe.

(iii) The better answers noted that the areas were close to or between the Tropics and then gave specifics such as southern Asia, eastern South America, for example. A few even noted that droughts were more common on the eastern side of continents. Weak answers consisted of a list of continents without more specific detail; to gain greater credit a general description of the distribution was needed.

(iv) Desertification and global warming were regularly stated as human causes of droughts by the stronger candidates. Some candidates wrote about ozone destruction (usually incorrectly blaming it on carbon dioxide).

(d) Few candidates achieved full credit. They needed to explain as the command words were "Suggest why …". Many incorrectly believed that increased temperatures from global warming would cause vegetation to burst into flames. Drought, leading to vegetation drying out, contributes to increased bush fires. From bush fires candidates needed to explain why these could lead to mass extinctions. Few candidates noted that increased temperatures affect habitats, so that, for example, animals adapted to polar conditions would die out. Some excellent answers covered melting ice sheets, the subsequent rise in sea level and the extinction of life on low-lying islands and impacts on corals and attendant species.

(e) Candidates used the information in the diagram to generally answer the question well. A few thought that the heavy rains caused the other changes.

(f) To achieve Level 3 candidates needed to investigate at least two climatic hazards. Candidates could, at best, achieve the top of Level 2 by stating they agreed with the statement and writing about the damage cyclones can do. Some candidates did compare with other hazards, but often chose earthquakes which are not climatic hazards. A number of candidates stated that a cyclone destroys everything in its path; this is overstating the hazard. Few mentioned the damaging storm surges that occur as the low pressure allows sea level to rise and the strong winds drive massive waves onshore.

The best answers wrote about floods and / or droughts as well, comparing and explaining relative impacts, such as cyclones may cause damage that costs most to repair, but that droughts affect wider areas for longer and probably kill more people.

Question 2

(a) (i) This question was answered correctly by nearly all the candidates.

(ii) This proved a challenging question. Candidates needed to look carefully at the diagram of the Earth; it would have helped them answer this and the next question. At X the two continental plates are moving towards each other, stating that would have gained partial credit. Some candidates thought the plates were moving apart and volcanic eruptions created the mountains. Stronger candidates identified the movement and went on to describe crumpling or folding to create the mountains.

(iii) Careful use of the resource was needed. The diagram showed that there was no subduction and therefore no melting of a plate to create magma. Few stated this and many contradicted the previous answer.

(b) (i) and **(ii)** The majority of candidates noted divergence and could then draw the arrows correctly. Some labelled the fault at the mid-oceanic ridge.

(c) (i) Most correctly stated Surtsey was south or south-west of Iceland.

(ii) It is important to read the information given in the question carefully. The stem to part **(c)** stated that the island was volcanic, however, quite a few candidates chose sedimentary or metamorphic.

(d) (i) Nearly all the candidates correctly gave an answer of 21 or 22.

(ii) In questions of this type it is necessary to note look carefully at the graph and identify rates of change, dates and figures. The best answers identified various stages of growth and periods of no growth and linked those to dates and actual figures read from the graph. Candidates needed to follow this pattern rather than stating simply "they have increased". Candidates earned credit by identifying the starting point of zero and an end point of 56/67.

(iii) Candidates needed to use the graph to see that from 1989 the period of no growth ended and rapid growth in plant species began. Many wrote about the birds eating the plants so the number of species decreased. Candidates need to be clear about the meaning of the term species. Some thought that if the birds spread the seeds across the Surtsey, new species would appear; this is not the case, it will lead to an increase in the number of plants rather than number of species. Some got credit for noting the increase but only the best answers stated that the birds transported seeds there in their feathers or droppings. The main reason was, in fact, that the birds' droppings provided the nutrients for new species to grow, whether the seeds were brought in by the birds or the wind.

(iv) Candidates need to ensure that they know the meaning of the term "vegetational succession". The best answers described the change from bare rock / soil through to climax vegetation as each plant altered and enriched the soil. Some gave examples as a way of describing which was perfectly acceptable.

(e) (i) Quite a number of candidates thought the energy that was converted to electricity was provided by the water rather than by the heat of the Earth. Many gained some credit for stating that steam turned the turbine. Some mentioned the heating of the water by the rocks, but few mentioned the cold water being pumped into the rock. The diagram showed hot water rising to the surface. However, many candidates stated that steam rose to the surface. The drop in pressure at the surface allows the hot water to change to pressurised steam / water vapour.

(ii) Some of the candidates identified the hot rocks that underlie the volcanic island of Iceland. Many others thought it was the presence of water that made it suitable for geothermal energy, even though the water is re-used.

(iii) Candidates often find the concept of sustainability challenging. It is to do with the heat energy from the interior of the Earth being to all intents and purposes renewable, so this energy source is available for future generations no matter how much is used now. Some stated it is a renewable energy source without stating what the source is. Weaker candidates wrote about the water and quite a few wrote about it being non-polluting, which is true but does not make it sustainable.

(iv) Environmentalists are concerned with the effects of extracting and burning fossil fuels other than with the fact that they are rapidly depleting. So the best answers included the release of carbon dioxide, a greenhouse gas leading to global warming. Many also covered the release of sulfur and nitrogen oxides that cause acid rain. Some candidates incorrectly thought that carbon dioxide destroys the ozone layer.

(f) As for **Question 1(f)**, candidates needed to concentrate on two aspects, the positive and the negative sides of living near an active volcano. Weaker candidates needed to write about both sides, frequently candidates just decided that advantages or disadvantages were greater and wrote a one-sided response. Some listed points with no explanation. Better answers covered both sides and reached a conclusion. The best answers discussed the type and the frequency of eruptions. Those volcanoes that just emit a small amount of lava on rare occasions are probably safe to live with; those that are explosive and unpredictable are best avoided.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/23 |
| Paper 23 |

Key messages

Candidates need to use the resources provided more thoroughly.

In the final part of each question, it is important to write detailed responses and, where necessary, look at both sides of an argument.

General comments

Candidates must ensure that they answer questions even when no answer line is provided, such as the graph drawing requirement in **Question 1(c)(i)**.

Candidates performed better on **Question 2** than on **Question 1**. On **Question 1** candidates found **(c)(ii)**, **(d)(i)**, **(e)(ii)** and **(g)** challenging. Candidate knowledge of sustainability and bilharzia was apparent. On **Question 2** parts **(d)(ii)**, **(e)(iv)** and **(f)** proved most challenging. Candidates need to think before responding to some questions, for example in the last part of **Question 2**, it might have been best if candidates had spent just a couple of minutes jotting down benefits and drawbacks of tourism to the national parks, so that they could then write clear explanations on both sides and reach a conclusion. Listing the benefits and/or the problems gains limited credit as the question requires an explanation.

Comments on specific questions

Question 1

(a)   Most candidates correctly interpreted the graph to complete the paragraph. A few candidates needed to be more accurate in reading figures from the graph.

(b)(i)   The best answers described the changes in rainfall, related them to locations along the line and noted the symmetrical nature of the rainfall distribution. Some candidates ignored the line and gave a general description of rainfall distribution and so could not be awarded maximum credit.

  (ii)   Nearly all candidates identified the north and the south west of Africa.

(c)(i)   A few candidates missed this question; they needed to pay close attention to the type of response required. Those who did complete the graph did so accurately.

  (ii)   The change after 1980 was noted by the majority of candidates. A few thought that the decrease in the steepness of the line meant that consumption decreased.

  (iii)   The strongest candidates identified a variety of reasons, usually linked to domestic and industrial use as well as differences in availability of water (piped to homes in Europe, from wells or rivers in parts of Africa).

(d)(i)   Candidates needed to study the photograph carefully and then think why it shows a good location for a dam and reservoir. Few candidates mentioned the river to supply the water. The steep sided valley, ideal for dam construction, was mentioned by some candidates. Other points that were largely ignored were the almost complete lack of settlements and the mountains which are likely to have high rainfall.

(ii) The best answers identified that the reservoir would flood the habitats over a large area, disrupt food chains and prevent fish migrating and spawning. Very few saw the positive side of the new aquatic habitat and wetlands. Weaker candidates found the question challenging and offered little apart from a loss of vegetation.

(e) (i) Most candidates answered this well. The most frequent omission was the need to open the sluice gate to start the process.

(ii) Many candidates did not understand the term *sustainable*. The best answers were able to explain that to be sustainable it must be available for future generations and then relate this to the natural recycling of water. Weaker candidates thought that the fact that it was non-polluting was what made it sustainable.

(f) Bilharzia has a complicated life cycle, but most candidates knew about the larvae entering through the skin when people wade in water. Some knew about the effects on humans such as muscle pain and blood in urine or stools. Only the very best answers added detail to the life cycle or effects.

(g) Weaker candidates needed to distinguish between those water-related diseases that are transmitted by pathogens in the water (water-borne), such as cholera and typhoid and those, water-based, such as bilharzia, and those that are water-bred, such as malaria. Sanitation will only affect those which are water-borne. Many seemed to think that treating sewage would prevent mosquitoes spreading malaria. Those candidates that could distinguish, did not think of other ways of controlling water-related diseases and so tended to just agree with the statement. In this type of question candidates need to discuss alternatives such as education, drugs, prevention, etc. and then reach a considered conclusion.

Question 2

(a) This was well answered by most candidates. A few confused a food web and a food chain or were not familiar with plant succession.

(b) (i) This was another well-answered question.

(ii) Nearly all the candidates correctly calculated 1380 mm.

(iii) Candidates needed to think carefully about the question. Those that did correctly identified the negative relationship.

(iv) This proved difficult for many candidates who did not relate climate and vegetation. Candidates needed to look at the climate data provided and decide what natural vegetation occurs in that sort of climate.

(c) (i) The graph was completed accurately by most candidates. A few lacked accuracy in plotting the bars for 170 mm and 70 mm.

(ii) Nearly all candidates were able to draw the line for average rainfall correctly.

(iii) Most candidates correctly counted up to 7 years.

(d) (i) The best answers used the information from the diagram as a basis from which to develop detailed descriptions of adaptations. Weaker answers focused rather narrowly on water storage in succulents and the deep roots reaching groundwater.

(ii) This was a challenging question for many candidates. Better candidates usually identified burial by moving sand and the water table being lowered.

(iii) Some candidates used information from the diagram and wrote about extracting groundwater for irrigation. Only a few mentioned oases or rivers flowing through deserts as a source of water. Some weaker candidates ignored the major impediment to desert agriculture - the lack of water.

(e) (i) Answers such as "in the middle of Africa" gained no credit as they were too vague. Better answers identified Chobe was in northern Botswana and close to Zimbabwe / Zambia / Namibia.

(ii) The purpose of national parks was not well understood, with some weaker answers suggesting they were rather like zoos. Better answers discussed conservation of natural environments for the future and ensuring survival or protection of species.

(iii) When explaining terms it is necessary for candidates to use other words or at least add to them. Therefore, a *hunter-gatherer* is a person who hunts animals and gathers wild plants to feed themselves, rather than someone who hunts. In fact, several candidates ignored the *gather* part. *Nomadic pastoralist* was not well explained by a large number of candidates.

(e) (iv) and **(v)** Quite a lot of candidates correctly chose April or May and then explained that the dry season had arrived and so they migrated to the Chobe River for water and food. Other candidates picked a month at random, but were then often able to state that they moved for water.

(vi) This was usually well answered, with many knowing that viewing wildlife was the main reason. This was backed up by examples or explaining that such animals could not be seen in their own countries.

(f) As usual in this type of question, there is no single correct answer. Credit was awarded on the quality of the discussion. Good answers discussed the benefits in terms of employment and income for locals, taxes raised for the government and that the money earned could pay for rangers and other protection methods in the national parks. They went on to discuss the problems – the infrastructure requirements being environmentally damaging, scaring of animals, etc. Surprisingly the fact that most visitors flew long distances to get there and the consequent large carbon footprint was not mentioned. Then they made a decision based on their arguments. Weaker answers usually decided to agree or disagree and then just looked at that particular aspect.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/03 |
| Coursework |

General comments

Some interesting environmental topics were carried out this year and it is encouraging to see how concerned candidates are about their own local environment. The candidates demonstrated their enthusiasm for coursework and how well worth the effort was in allowing them to explore issues close to their homes.

Comments on specific questions

Domain A

Some very good marks were achieved in Domain A, demonstrating some excellent teaching of the basic processes in the environmental management specification.

Domain B

Candidates in general displayed some very competent investigative skills and had worked hard implementing a wide range of techniques including some excellent presentations of the data. However safety was not always considered as thoroughly as it could have been.

Domain C

The main focus of Domain C should be a thorough review of possible choices available for sustainable development. All interested parties should be canvassed as to their opinions and a thorough assessment needs to be carried out of the factors behind their value positions.

A management plan can then be devised with a consideration of constraints and advantages. It would benefit candidates to look ahead when they begin their investigation and consider in advance the options, which are available to achieve sustainability.

ENVIRONMENTAL MANAGEMENT

> **Paper 0680/41**
> **Alternative to Coursework**

Key messages

- Candidates should be reminded to read the source material and the question carefully to ensure they answer the question as set.
- Where relevant they should use data from either graphs or tables to help describe trends or patterns.
- Answers should be precise and should avoid statements which are vague. Candidates should always make suggestions using precise terminology such as "concentration", "volume", "mass".
- Both axes of any graph should be fully labelled with units.

General comments

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

Candidates appeared to have had no problems completing the paper in the time available.

Comments on specific questions

Question 1

(a)   Candidates nearly always entered correctly calculated data into the table.

(b) (i)   Most candidates completed the diagram with sampling quadrats in the correct positions. Candidates needed to study the positions of the seven quadrats already completed to make sure they used the given coordinates correctly.

(ii)   Most candidates stated the range correctly.

(iii)   Many candidates gave correct answers to this question.

(iv)   The majority of candidates multiplied their answer to **(iii)** by 922 to give the estimated total dry mass.

(v)   Stronger candidates were able to identify that the roots of the plants were not sampled and this accounted for the missing biomass.

(iv)   Most candidates correctly suggested that repeating the sampling method would provide more data to improve reliability.

(c) (i)   Nearly all the candidates recognised that the biomass had increased over the three years. Fewer candidates gained full credit by suggesting that the biomass increased by about 200 g each year.

(ii)   Many candidates found this question challenging with only the stronger candidates suggesting a valid conservation plan.

(d) (i) Stronger candidates gave sensible methods and often gained full credit. However, many candidates found this a demanding question and repeated variations of the sampling method given in the question.

(ii) Most candidates provided a table with space to complete data for 10 quadrats as well as suitable headings.

(e) (i) Most candidates clearly understood that the plants would grow faster as the organic matter was a natural fertilizer.

(ii) Many candidates identified at least one risk of adding organic matter. The risk of disease and eutrophication were the two most common responses.

(f) (i) Most candidates identified the use of air conditioning in a hot climate and therefore the need for more fuel to generate electricity to run the air conditioning units.

(ii) Nearly all candidates correctly identified photosynthesis as the process that captures carbon dioxide.

(iii) Most candidates made one good suggestion regarding the possible advantages of carbon capture. Stronger candidates provided a second and third good suggestion.

Question 2

(a) (i) Most candidates explained at least one reason why the red palm weevil is now a severe pest.

(b) (i) Most candidates could not suggest two factors that needed to be kept the same.

(ii) Many candidates understood the concept of a control and explained the need to compare the performance of the pesticides against water.

(iii) Most candidates completed the tables correctly.

(iv) There were many ways candidates could express differences shown by the results. Stronger candidates were able to give clear comparisons that were valid from the table of data and gained credit.

(v) This proved to be challenging for many candidates.

(c) (i) Most graphs were completed correctly. There were some plotting errors and incomplete axis labels usually on the *x* axis.

(d) (i) Most candidates selected a time for spraying as required by the question. In many cases the candidate went on to justify their choice. However weaker candidates were unable to justify their choice.

(ii) Nearly all candidates suggested a sensible safety measure.

(iii) Many candidates suggested introducing a natural predator or referred to biological control as an alternative method to using pesticides. Some candidates recommended cutting down all the palm trees.

e) (i) Nearly all candidates made at least one good suggestion as to why the government wanted to set up research laboratories. Most candidates gave two or three suggestions worthy of credit.

(ii) All the points on the mark scheme were seen regularly and most candidates gained at least partial credit.

ENVIRONMENTAL MANAGEMENT

| Paper 0680/42 |
| Alternative to Coursework |

Key messages

- Candidates should be reminded to read the source material and the question carefully to ensure they answer the question as set.
- Where relevant they should use data from either graphs or tables to help describe trends or patterns.
- Answers should be precise and should avoid statements which are vague. Candidates should always make suggestions using precise terminology such as "concentration", "volume", "mass".
- Both axes of any graph should be fully labelled with units.

General comments

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

Candidates appeared to have had no problems completing the paper in the time available.

Comments on specific questions

Question 1

(a) (i) Candidates suggested some advantages of developing small businesses. All the points on the mark scheme were seen.

(ii) Candidates needed to look carefully at the map to be able to identify the benefits of the location of Oman. A scale was provided to allow candidates to estimate distances but very few candidates made use of the scale.

(iii) Most candidates had some appreciation of the term "environmental impact assessment". However often candidates found it difficult to express their ideas.

(iv) Candidates who had taken note of the information given about Oman gave good answers for the supply of water and the generation of electricity. Unfortunately some candidates simply gave descriptions of HEP which was not practical in this location.

(v) The calculations required to provide the answers were usually carried out successfully for sodium carbonate. There were fewer correct answers for caustic soda.

(b) Most candidates made at least one good suggestion as to how to manage waste chemicals. Answers referring to treatment to make the chemicals less toxic and carefully constructed landfill gained full credit.

(c) Most candidates provided sensible advantages of enlarging the port.

Question 2

(a)   Good answers took careful account of the data provided and included good reasons why it was not possible to grow vegetables in fields. Comments such as "there is no rainfall in some months" were too vague to be given credit.

(b) (i)   The strongest candidates were able to explain clearly how evaporating water could cool plants in a greenhouse. Many candidates suggested, wrongly, that when the water condensed on the leaves it had a cooling effect.

(ii)   Candidates could gain full credit by either suggesting reasons why this system could be sustainable or might not be sustainable. This was a demanding questions but stronger candidates usually gained credit.

(ii)   Most candidates clearly identified either one or two health benefits of eating vegetables.

Question 3

(a) (i)   Most candidates correctly identified the effect of increasing salinity on mass and length. However many candidates did not identify that there was no significant change in diameter.

(ii)   Only a minority of candidates clearly explained why the scientist divided the field into three plots. There were a large number of factors that could have been suggested as staying the same. This would allow a comparison to be made. Weaker answers suggested that it was convenient for the scientist to have plots next to each other.

(iii)   Most candidates correctly identified August and then gave a suitable reason for their choice.

(iv)   Nearly all candidates completed the table correctly.

(v)   Nearly all candidates completed the calculation correctly.

(b) (i)   Most graphs were completed correctly. There were some plotting errors and incomplete axis labels.

(ii)   Most candidates correctly selected **A** and **D** and then gave a sensible reason for their choice.

(c) (i)   Many candidates understood the need for a control and could explain its purpose.

(ii)   Candidates nearly always presented a table format. A significant number of candidates did not include a column for water only, so they could only be awarded a maximum of 2 marks.

(iii)   Most candidates gave very clear and orderly accounts of how to set up a dish of seeds for this experiment. However, some candidates failed to specify 10 seeds in the dish.

(d) (ii)   Stronger candidates gave good answers gaining full credit. Other candidates described the process of nitrogen fixation which did not answer the question.

(ii)   Candidates familiar with the role of seedbanks gained credit. Unfortunately some candidates confused this with an ordinary grain store against famine.

(iii)   Candidates who had some recall of different methods of plant breeding usually gained full credit.

ENVIRONMENTAL MANAGEMENT

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Paper 0680/43

Alternative to Coursework

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Key messages

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- Answers should be precise and should avoid statements which are vague. Candidates should always make suggestions using precise terminology such as "concentration", "volume", "mass".
- Both axes of any graph should be fully labelled with units.

General comments

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

Candidates appeared to have had no problems completing the paper in the time available.

Comments on specific questions

Question 1

(a)   Candidates nearly always entered correctly calculated data into the table.

(b)(i)   Most candidates completed the diagram with sampling quadrats in the correct positions. Candidates needed to study the positions of the seven quadrats already completed to make sure they used the given coordinates correctly.

(ii)   Most candidates stated the range correctly.

(iii)   Many candidates gave correct answers to this question.

(iv)   The majority of candidates multiplied their answer to **(iii)** by 922 to give the estimated total dry mass.

(v)   Stronger candidates were able to identify that the roots of the plants were not sampled and this accounted for the missing biomass.

(iv)   Most candidates correctly suggested that repeating the sampling method would provide more data to improve reliability.

(c)(i)   Nearly all the candidates recognised that the biomass had increased over the three years. Fewer candidates gained full credit by suggesting that the biomass increased by about 200   g each year.

(ii)   Many candidates found this question challenging with only the stronger candidates suggesting a valid conservation plan.

(d)(i) Stronger candidates gave sensible methods and often gained full credit. However, many candidates found this a demanding question and repeated variations of the sampling method given in the question.

(ii) Most candidates provided a table with space to complete data for 10 quadrats as well as suitable headings.

(e)(i) Most candidates clearly understood that the plants would grow faster as the organic matter was a natural fertilizer.

(ii) Many candidates identified at least one risk of adding organic matter. The risk of disease and eutrophication were the two most common responses.

(f)(i) Most candidates identified the use of air conditioning in a hot climate and therefore the need for more fuel to generate electricity to run the air conditioning units.

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(c)(i) Most graphs were completed correctly. There were some plotting errors and incomplete axis labels usually on the *x* axis.

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e)(i) Nearly all candidates made at least one good suggestion as to why the government wanted to set up research laboratories. Most candidates gave two or three suggestions worthy of credit.

(ii) All the points on the mark scheme were seen regularly and most candidates gained at least partial credit.