ENVIRONMENTAL MANAGEMENT

> **Paper 5014/01**
> **Paper 1**

General comments

Despite the great range in overall performance between candidates, it was possible to detect a general pattern of candidate performance within the paper. Of the three parts, each worth 40 marks (**Section A**, **Question 5** and **Question 6**), typically the highest mark was for **Question 5**, followed almost equally either by **Question 6** or **Section A**. **Question 5** covered topic areas that appeared to be familiar to almost all candidates, whereas **Question 6** included parts which placed a higher demand on more specialised knowledge, such as about the formation and distribution of minerals.

In **Section A**, there were fewer high scoring (9 and 10 mark) answers than in previous examinations, but also fewer very low scoring answers (worth only 1 or 2 marks). In other words, there was usually one part that was known to each candidate, but equally there was one part which challenged the most able in its demands. There was evidence of answer quality tailing off in parts **(f)** and **(g)** of **Question 6** among weaker candidates. It was clear that many of the able candidates were becoming stretched for time on reaching these two final parts: however, clear cut examples of candidates, who genuinely did not have sufficient time to complete the examination within the time allowed, were few and far between. Looking back through their earlier answers, most had begun by writing excessively long answers to questions worth two or three marks in the first half of the paper. Future candidates need to be made aware that they must keep an eye on the clock and allocate their time accordingly for this examination.

If there was a pattern to the marks in **Section A**, **Question 3** yielded the highest mark and **Question 4** the lowest, but there was considerable variation from Centre to Centre. Quality of performance in **Question 1** seemed to be heavily dependent on degree of candidate familiarity with salination. The equivalent in **Question 2** was knowledge and understanding of El Nino. Within **Question 3** the first and final parts, **(a)(i)** and **(b)(v)** were the main mark scorers. The weakest answers in **Question 4** were most frequently given by candidates who made little use of the photograph and believed that tourists came to see the refinery, which negated one of the main themes of the question. In **Section B**, the knowledge gaps exposed most often were for desalination in **5(c)** and mineral formation in **6(a)(iii)**.

Three main areas for improvement in examination technique, useful for alerting future candidates, were highlighted in this examination. One was the need to read ahead to the next part of the question before beginning to answer the current question, to reduce the chances of repeating part or all of the answer in the following question (where it really belonged in the first place). Many answers to **Questions 2(a)(i)** and **(ii)** were illustrations of this. After one descriptive statement like 'decrease in size of the Aral Sea' in **(a)(i)** the candidate continued 'because people are using more water', and then carried on from there, only to find that they needed to repeat the same answer when they turned over the page and read the question for **(a)(ii)**. Most simply repeated the same answer, without any thought of going back and amending the answers already written in **(a)(i)**.

Another was the need to refer first in comparison questions to the item that came first in the question. For example in **6(d)(iii)** the focus needed to be on HEP rather than oil, whereas in the next part the focus needed to be switched more towards oil. The third was giving list-like answers to longer four and five mark questions, such as **5(g)(ii)** and **6(g)** in this paper. Listed answers such as 'too poor', 'lack of education', 'developing countries' and 'against their traditions' in **5(g)(ii)** failed on most occasions to deliver answers that were worth more than one of the four marks.

In addition on this paper, given its length and the large number of separate short structured questions, candidates can never afford the luxury of repeating the question before beginning the answer. The message highlighted in last year's report remains valid – that the lines left for answering are for guidance only, and cannot take into account the many variations in size of handwriting and precision of expression between individual candidates. Remember that candidates tend to equate filling all the lines with giving a full answer

to the question, irrespective of any relationship between number of points made and number of marks available.

Comments on individual questions

Section A

Question 1

Most gave the correct answer, soil P, in part **(a)(i)**, but this did not stop quite a number of candidates offering instead one of the letters A-C for the soil horizons. Many fewer correctly shaded in the zone below the water level in profile Q in part **(a)(ii)**, while a clear majority gave the wrong answer of soil P in **(a)(iii)**, attracted by the label 'sandy' on the profile. Answers to part **(b)** were either high scoring from candidates with knowledge and understanding of salination, or worthless from candidates who tried to apply causes other than excessive use of irrigation water in hot climates. References to deforestation and soil erosion were common in answers of the latter type. Part **(c)** was better answered. Although a few candidates limited the worth of their answers by using only one reason, often related to soil acidity, most referred to several reasons, most commonly based upon them being 'hungry soils', short of water, from which useful nutrients were soon washed downwards out of the reach of plant roots.

Question 2

Most answers to part **(a)(i)** lacked finer descriptive detail beyond the most obvious descriptive points of becoming smaller with more shallow water and an increase in areas of land in between. Thus one and two mark answers were much more common than three mark answers. Others spent more time suggesting reasons than describing, and then found that they needed to repeat most of the answer in **(a)(ii)**. Many good suggestions were made in answers to **(a)(ii)**, from able candidates, which covered a range of possibilities including greater direct human use, diversion of water from river sources into the Aral Sea, increased deposition of sediments and climate change. In part **(b)**, El Nino was described as everything from a Protocol to the result of global warming by the minority of candidates who had no idea what it was. Others with imperfect knowledge and understanding began to make incorrect statements about El Nino at some point in their answers. Many of these were the opposites of the truth, such as El Nino causing droughts in Peru. A few with generally good knowledge became stuck at three marks because they described more than they explained when answering **(b)(ii)**. Despite these criticisms, it was pleasing to find that candidate understanding of El Nino continued to increase, especially useful now that it enjoys a higher profile than previously in the wider news media.

Question 3

Although a few candidates confused barometer with anemometer in part **(a)(i)**, this was the most commonly claimed mark in the question. Answers to **(a)(ii)** suffered from candidates attempting only to reword the description instead of simply stating that the change was caused by the weight of air. Candidate performance in parts **(b)(i)–(iii)** varied greatly between Centres; often there was no clear pattern from candidates within a Centre which suggested great variations in levels of individual candidate understanding. Shading sometimes spilled out beyond the area in the Centre of the diagram below 952 mbs; some shaded in below 956 but above 952 mbs to give a result looking like a 'do-nut' in **(b)(i)**. In **(b)(ii)**, either one line or three lines between 980 and 992 mbs were more common incorrect answers than no lines drawn in at all. All candidates struggled to explain strong winds in **(b)(iii)** unless they referred to the closeness of the isobars or to the steep (or large) difference in pressure between Centre and edges. The two main reasons for failure to claim both marks in part **(b)(iv)** were just stating 'because of the winds and rain' without any adjectives to describe them, or only referring to one from the list of choices including 'strong winds', 'heavy rains' and 'coastal storm surges'. Warnings, precautions and evacuations formed the basis for most answers to **(b)(v)**. Answers most likely to claim all three marks were those which rung true for cyclone such as moving inland and retreating to already built shelters. Least successful were answers which were more about preparations taken well in advance, or about the methods of improved weather forecasting themselves.

Question 4

Most weak answers to this question were rooted in inadequate observation of the photograph. The least well answered part was **(a)(i)**; in the majority of answers nothing was stated that was based on direct observation. Mention of the clearly visible chimneys was often almost incidental in the context of air pollution, the theme which dominated many an answer. Some answers to part **(a)(ii)** suffered from being too list-like with an overuse of the word 'pollution'. Much better were answers in which candidates attempted longer explanation and stated more clearly reasons why people might have objected. Two of the most common answers to **(b)** were 'natural beauty' (merely repeating what was stated in the first question) and 'to see the oil refinery'. Whereas the photograph evidence, if used by the candidate, pointed towards boating and fishing. There was a wide range of acceptable answers for part **(c)**. If answers remained at one or two marks, the most likely reason was over-reliance upon one line of explanation. Other candidates, who targeted a range of points and made sensible comment about the advantages of a coastal location, were the ones most likely to claim all four marks. The minority who returned to the theme of the oil refinery as a tourist attraction struggled to gain any marks when this dominated their entire answer.

Section B

Question 5

To claim both marks in **(a)(i)** the two bars needed to be accurately plotted, and the candidate had to make an obvious attempt to follow the shading pattern already used. Only a few candidates failed to do both of these. Those candidates who compared but without stating any percentages in **(a)(ii)** were limited to two marks; those who just stated percentages without any comment were also limited to two marks provided that comparative percentages were stated, and to one mark if non-comparative percentages were listed. Candidates who answered along the lines that 'water supply and sanitation were low in Europe' were given no marks. Two and three mark answers were the most common. The basic answer in part **(a)(iii)** was that water supply is easier and cheaper to supply than is sanitation. Once this was clearly stated or hinted at in answers, it only needed a minimum of elaboration to reach two marks. Marks, whether zero, one or two, tended to go in line with candidate ability.

The easy mark was in **(b)(i)**. A few candidates, however, made life difficult for themselves by answering **(b)(ii)** with poor choices – sometimes lists of more than one that were totally different (such as well and river), sometimes desalination (most likely taken from the next question), or even worse oceans. Again the quality of explanation given closely reflected ability. The wording of the question allowed candidates to explain everything from totally safe to totally unsafe, as well as all levels of safety in between. The weakest answers to **(c)** came from candidates who believed that all that was needed was to allow the sea water to evaporate in the hot sun. A lot of candidates considered the coastal locations of these countries to be the major factor. However, those with a real understanding of desalination gave the effective answers based upon the expense of this process and how it is only carried out where the need is great (as in these desert countries) and the financial resources exist (due to oil revenues).

For most candidates part **(d)(i)** offered an easy chance to claim three marks; inaccurate plots of the percentages were rare. A few insisted on drawing bars, perhaps as the only graphical technique they know. More surprisingly this was the part of **Question 5** most likely to be unanswered by candidates. The reasons for this are difficult to identify, although there are always a few candidates in each examination session who seem to be more uncomfortable with practical graph questions than with the written answers. Many answers to the next two parts, **(d)(ii)**and **(d)(iii)**, were inadequate because candidates merely named one month for 'season' (normally January) and for 'time of year' (almost always May). Ranges of months as narrow as two to three months or as wide as six or seven months were accepted, as also were summer in **(d)(ii)** and end of summer in **(d)(iii)**. In other words, the mark scheme was quite flexible provided that candidates looked beyond one month. While almost all candidates showed themselves to be aware of the relationship between the wet season and high incidence of malaria, a good number struggled to relate and explain the increase in cases towards the end of, and immediately after, the wet season in part **(iv)**. Only more able candidates were able to apply what they knew to this particular example in a sufficiently precise way to claim all three marks.

In part **(e)(i)** some candidates ignored the command word 'Describe' and filled all the lines trying to explain why malaria is a more serious problem in Africa than in the rest of the world. From the information given, some items were more useful to candidates for answering this question than others. Most useful were the comparative figures for deaths per 100,000 people between Africa and the rest of the world. Candidates, who made full use of the significant differences in numbers per 100,000 and in the changing trends shown between 1900 and 2000, produced most of the two mark and all of the three answers. Weaker candidates

tended to use only the comparative values for 1900 and filled the lines by merely repeating what was given, with a minimum of comment. For them, one mark was the typical outcome. The question seemed to be a missed opportunity for some. Full mark answers were much more common to part **(ii)**, with references to reducing the capacity to work and the cost of medicines or preventative measures, dominating in the many two mark answers.

Answers like 'the female anopheles mosquito breeds in water' were never going to be worth a mark with 'water-bred' in the question in **(f)(i)**. A surprising number of candidates were shown to be under the false impression that the disease was spread by contaminated water supplies. However, most did claim the mark. Likewise full two mark answers dominated in part **(ii)**, after candidates identified stage 4 for Method 1 and either stage 6 or 1 for Method 2. Since none of the other stage numbers were persistent distractors, the minority of incorrect answers were more likely to have been based on a total lack of individual candidate understanding. Again the vast majority of candidates could identify 'low cost' and 'only needed in small amounts' from the details supplied in part **(iii)**. To score marks in **(iv)** candidates needed to concentrate on describing how the new methods were improvements. Some failed to do this, instead merely stating their good points. The importance of having the mosquito nets treated with insecticide was the improvement that candidates missed most often.

In **(g)(i)**, most candidates did stick to description this time instead of trying to give reasons. The worth of some answers to **(g)(ii)** was greatly reduced by the use of lists. Many of the reasons suggested were valid, but they were stated in such a short, general way as to be of little value. It was no surprise that poverty dominated the answers; well developed, this could take the answer up to three marks. The most effective answers came from candidates who explained using other reasons, especially ignorance (as opposed to just 'uneducated') and problems of distribution to reach the rural areas, where the majority of Africans live.

Question 5 examined familiar, previously visited, topic areas, for which the great majority of candidates were well prepared. Despite highlighting weaknesses in this report, this question was well answered by the majority of candidates and was quite high scoring. The key to a high total mark, as always, was consistency of performance between the different parts, which favoured candidates without gaps in their knowledge and who best obeyed question commands.

Question 6

Four mark answers to part **(a)(i)** were most common when the regions lettered F (Southern Africa) and G (Middle East or the Gulf) were chosen, irrespective of the part of the world where the candidate lived. Location knowledge for other regions was shown to be patchy, with perhaps Alaska for region A being the most regular mistake. To answer part **(ii)** well some mineral choices were better than others; oil was perhaps the best choice for stating a wide variety of uses. Uranium was a less good choice unless candidates were able to elaborate upon its two major uses, in the way that many more showed they could do after having chosen diamonds. A lot of answers to part **(iii)** suffered from inadequate knowledge of mineral formation. Some candidates approached the answer by referring to the past conditions needed for the formation of fossil fuels, but it was impossible to write a full mark answer without reference to geological conditions. Some candidates confused minerals as used here with minerals as nutrients in soils. Certainly there were many vague, general answers about how climate or soils or the movement of the plates affected mineral formation.

The answer to part **(b)(i)** was intended to be 75 years; this was far and away the most common answer, although a range between 70 and 80 years was allowed since candidates had at least shown that they understood what needed to be done. Most answers to **(b)(ii)** were too narrow; typically candidates filled all the lines making the one point that they are non-renewable resources, often without more telling points such as the millions of years for new deposits to form, and present human use occurring at a faster rate than the resources can ever be formed. Few candidates showed awareness of the widespread availability of minerals in the rocks of the Earth's surface compared with their limited occurrence in deposits of sufficient size to be economic to mine.

The two questions that made up part **(c)** were higher scoring. The majority of candidates understood the main difference shown between the two diagrams and chose to explain A in part **(ii)** on the grounds of fewer stages in the operation and less energy use for transport and in factory processes. The most common answers which failed to progress beyond two marks were those in which the candidate tried to justify the choice of B as being better for the environment, which was a big challenge in this particular example.

For a two mark answer to part **(d)(i)** a candidate needed to state how it fulfilled the two essential requirements for HEP generation, namely a supply of water, and a head of water to provide the force to drive the turbines. Both were needed. Candidates could use either direct evidence from the sketch (such as presence of the dam and reservoir, difference in height with the HEP station sited on the valley floor) or what was likely in high mountain areas such as the Alps (water from melting ice, high annual rainfall and great variations in height between mountain tops and valley bottoms). Non-scoring answers were rare. The best answers to part **(ii)** came from candidates who approached the answer in a logical way – starting with building the dam high in the mountains, and then leading the water by a pipe under the mountains so that it could drop with great force into the HEP station on the valley floor. Unfortunately more common were answers in which the human additions were treated as separate items, or ones in which candidates imagined the sketch showed what they knew about other HEP schemes, such as water being discharged out of the dam directly into the HEP station. The result was that one and two mark answers were much more common than those worth three marks. Some candidates made hard work of reaching the two most obvious answers of renewable and less polluting in part **(iii)**, sometimes prolonged by beginning with oil and only later switching to how HEP was different. Then in **(d)(iv)** many answers were over-focused on HEP sometimes to the exclusion of direct statements about oil. Many candidates, who in the end did reach three marks, needed to fill all the lines, and sometimes more, to do this. The mark scheme included many simple advantages of oil, which must have been known by many more candidates than actually used them, such as ease of use, variety of uses (as a fuel), ease of transport, a long history of use and its relative cheapness (at least until recently).

Divided bar graphs are a less widely used alternative to pie graphs. They are easier to draw than pie graphs, especially when a graph paper background is provided. There were many accurate constructions in part **(e)** from candidates who knew what to do. The most common mishap was to show Brazil as 42% instead of 41. A minority of candidates were determined to try to draw a bar graph within the frame, despite the percentage scale being provided; others attempted to show all the percentages beginning at 0% and not going beyond 41%. These candidates could still claim the mark available for shading in or designating the countries, provided this was done clearly.

The three questions in part **(f)** proved to be more challenging than expected. Even in what had been imagined to be the very easy part **(i)** there were many answers of Brazil instead of the named crop (sugar cane). More worryingly was the frequency of corn and USA answers. These suggested either that the information in the table was not fully understood, or that candidates were running short of time and could not study the table as carefully as was needed. Then in part **(ii)** some lost the mark by merely re-stating that it was cheaper by quoting the average costs of production (0.4 and 0.7), instead of explaining either by reference to lower fossil fuels inputs or greater output per hectare. Something similar happened in part **(iii)**. Many answers were dominated by descriptively repeating the values in the table, which for this answer needed to be used in a more explanatory manner. In the best answers the lower fossil fuel use in Brazil was linked to the greater reduction of carbon dioxide, followed by mention of the likely environmental benefits of this.

The typical answer to part **(g)** was worth two or three marks, based on selective use of the information supplied to support the candidate's expressed view. Marks higher than this were reserved for candidates who introduced a broader perspective or an overview. This was most frequently done by reference to the other alternative energy sources and how their possibilities for further use compared with biofuels. Only more able candidates showed themselves able to do this, which is why the question can be said to have discriminated well between candidates. However, there were some candidates who appeared still not to understand what biofuels were. Perhaps they missed the explanation given at the start of **(e)**; they saw biofuels as emitting all the same polluting gases as from burning oil and diesel in motor vehicles.

For many candidates the total mark for **Question 6** was below that for **Question 5**, to a large measure because of a decline in performance from part **(f)** onwards. The more able the candidate, the less that this general summary of performance applied.

ENVIRONMENTAL MANAGEMENT

General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one island in the Indian Ocean. Many candidates understood and made good use of the source material and their written responses were sufficiently clearly expressed that the Examiners could be confident that marks awarded were deserved. The mathematical and graphical questions did pose some difficulties for a minority of candidates.

Candidates had no problems completing the paper in the time available.

Overall the pattern of this paper is very similar to past papers and Centres should work through past papers to help candidates see how to make the best use of the information given for each question.

Comments on specific questions

Question 1

(a)   The graph was often plotted with a suitable scale. However both axes need to be labelled and in some cases the plots were not clearly distinguished by a key.

Part **(ii)** required candidates to study the graph (or data) and describe the trend for species diversity. Most candidates could make the point that species diversity increased with increasing distance from the road or made the point that species diversity remained constant after 20 m but unfortunately very few made both points to gain maximum marks.

Part **(iii)** asked candidates to assess whether there was any evidence that roads reduce plant biodiversity. The most frequent response was that it did but the figures that could have been quoted from the sources were rarely given in support of the answer. These figures were the only evidence candidates had to work with.

Part **(iv)** asked how the survey could have been carried out in a more reliable manner. The need for repetition was given by many candidates, though sometimes their answers were rather ambiguous.

Part **(v)** asked candidates to give a reason for collecting data 200 m away from the road and many candidates did clearly make the point about comparison or to act as a control.

Part **(vi)** asked candidates to describe a method for collecting data at random. A small number of good answers was seen; unfortunately many of the sampling methods described were actually systematic. It is expected that candidates have had first hand experience of sampling methods before attempting an examination paper as an alternative to coursework.

(b)   Most candidates appreciated that if the road was longer the builders would earn more money.

Part **(ii)** often only yielded one mark for a general remark that there would be fewer plants at A and C. Only a small number of candidates clearly made the contrast between plants being damaged on both sides of the road as opposed to just one side.

Part **(iii)** was hoping to elicit candidate responses giving details of the ways in which the seashore could become polluted. Unfortunately most candidates only suggested the road would be destroyed by flooding.

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Question 2

(a)   A small number of candidates did not attempt the calculation but the majority gained at least the first mark.

In part **(ii)** most candidates successfully explained why overgrazing would be difficult to identify in the dry season.

Part **(iii)** asked candidates to complete a questionnaire. The layout was good in most cases and the questions were often appropriately constructed. The Examiners were looking for two questions which focused attention on the changes that might have taken place in recent years; maximum marks were only gained by a small number of candidates.

(b)   Many candidates understood the question but only gave general purpose answers about using the questionnaire rather than giving answers related to the specific context of goat keeping.

In part **(ii)** most candidates realised that a comparison between villages was possible.

(c)   Candidates were required to study the plan of the grazing area and consider a sensible number of quadrats for sampling the area. Whilst many did select a sensible number of quadrats the scale of the area was not always taken into account and rather large quadrats were drawn.

Part **(ii)** asked for specific ideas as to what should be measured in the quadrats. Only a minority suggested measuring the height of the plants or using a suitable table. The majority went no further than suggesting recording the number of species present.

Part **(iii)** asked candidates to describe the sequence of events leading to desertification. There were some very clear and orderly answers but too many were spoilt by statements that were too vague to be given credit.

Question 3

(a)   It was clear that most candidates had some understanding that the description of fishing activity was an example of a sustainable way of life. There were some excellent answers but some promising answers did not quite display sufficient understanding because the candidates had not added their own thoughts to the source material. All the marking points were given by at least some candidates.

(b)   This was quite a complicated question and many candidates did gain between two and four marks by working through the consequences of removing too many sea cucumbers and sharks. The general point that a species may not be able to reproduce as fast as it is being fished out was made by a significant number of candidates but not the majority as expected by the Examiners.

(c)   Many clear explanations were given that gained three or four marks. Only candidates that had difficulty working in English sometimes failed to provide enough detail to gain credit.

(d)   An understanding of how a government could control fishing was required to answer the question. There were many good answers involving a specific fishing season, exclusion zones and licences. Only a very small number of candidates just wanted to apply quotas again.

Question 4

(a)   Most candidates realised that a development-free zone would allow both tourism and traditional agriculture to take place. Unfortunately a few candidates were determined to carry out development because they had not read the question carefully.

Part **(ii)** required an answer to the question 'what is an ecotourist?' Many candidates did suggest these were people with a specific interest in seeing wildlife or wildlife habitat. Candidates that suggested they were environmentally-friendly tourists did not gain credit.   Part **(ii)** required candidates to study the climate data provided and then explain that the climate would be more suitable for tourists between November and March. A reference to the change of temperature was the most important point. Candidates that only referred to a wet and dry season did not gain credit.

(b)   Many sensible developments and restrictions were given by candidates and many answers gained six to eight marks. There was a good understanding of the developments that would be appropriate in the particular context of this island as well as restrictions. Only a very small number of candidates gave answers that were not related to the information given in the source.