ENVIRONMENTAL MANAGEMENT

Paper 5014/11

Paper 11

General comments

Despite the many variations in performance between candidates, the general pattern on this year's paper was for the total mark for **Questions 1-4** to be slightly higher than the average mark for **Questions 5** and **6**. Often the total for ***Section A*** was similar to the better of the two marks from ***Section B***. There seemed to be less pressure on time to complete this paper than in some previous years; however, it was noticeable that the quality of answers from weaker than average candidates tailed off from part **(e)** of **Question 6** onwards. Also, fewer answers were continued beyond the lines left for answering than in previous examinations. The questions which were generally well answered included **4(a)(ii)**, **(iii)** and **(iv)** about food webs, **5(a)(iv)** about geothermal power, **5(b)(i)** and **(ii)** about strategies for preparing against earthquake risks, **6(a)(ii)** about the importance of various gases in the atmosphere for life on Earth, and the flow diagram in **6(d)**. Conversely the ones which proved to be more difficult were **1(a)(ii)**, **2(c)**, **3(b)(i)** and **(ii)**, **5(c)(iii)** and **(iv)**, and **6(a)(iii)**.

Weaknesses seen in this session's examination answers suggested two ways in which candidate performance in future examinations could be improved. The first is to read more carefully the question set before starting to write the answer. If necessary, underline key words in the question to try to reduce the chances of drifting away from the actual question set during answering. It soon became clear to Examiners that many candidates were missing 'largest number' in the question for **5(c)(ii)** and were not homing in on 'the pattern of strong earthquakes during the years' in **5(c)(iii)**. Instead, in both questions many answers were based on earthquake strength, making use only of values from the Richter scale in the table. Likewise in **Question 6(f)(i)** candidates were merely required to explain the two viewpoints of persons **B** and **C**, and to reserve their comments on them and their own opinions on global warming for the next part **(f)(ii)**. It did not appear to be common practice for candidates to look ahead to the next question before answering earlier questions on the same topic.

The second is to make better use of the resource information provided in those questions. Despite the strong question wording 'Use evidence from the photograph' in **1(a)(i)**, most candidates made little further use of the photograph. This meant that the majority of answers fell well short of the amount of description needed for a full four mark answer. The focus of **Question 6(b)(ii)** was the different trends before and after 1960. A majority of candidates who obeyed the question and quoted values stated only total values for 1960 and 2000. While these showed that the amount of carbon emissions had greatly increased, they did not address the question theme of trends before and after 1960. To do this, candidates needed to use the values better, for example by comparing the increase of 200 billion tonnes of carbon in just 40 years from 1960 to 2000 with the smaller increase of 140 billion tonnes in the longer period of 100 years between 1860 and 1960.

In ***Section A***, **Question 4** was consistently the highest scoring of the four questions, followed by **Questions 2**, **1** and **3** in that order of average performance. Candidate performances between the different parts of **Question 4** were more even than in the other three questions, which reflected good candidate knowledge and understanding of food webs. Least well known and understood were the albedo effect and insolation, examined in **Question 3(b)**, which caused it to rank lowly for marks earned. The most difficult part of **Question 1** proved to be part **(a)(ii)**, with few candidates able to identify problems such as large quantities of waste and its disposal, or the costs of concentrating the ore to reduce the otherwise prohibitively high costs of transportation. In **Question 2**, least well known were the names of two heavy metals; however, since both were needed for one mark only, more serious mark losses resulted from the limited scope and depth of most answers to parts **(b)(ii)** and **(c)**, which carried a majority of the total marks.

In ***Section B***, unattempted questions were few and far between. Candidate knowledge of plate tectonics was shown to be strong throughout, which meant that parts **(a)** and **(b)** of **Question 5** were consistently well answered. Less well answered were questions based on the table of strong earthquakes along plate boundary **Q** in **5(c)**, with the exception of parts **(i)** and **(v)**. Candidates frequently gave answers to parts **(ii)**, **(iii)**, **(iv)** and **(vi)**, which did not match what the question asked for or which drew wrong conclusions from the

table evidence. Most of the answers to **5(d)** were better focused on the questions set, even if candidates did not always give the amount of detail needed to claim full marks. Candidates picked up marks regularly enough as they worked their way through the different parts of **Question 6**, but without always achieving the same consistency as in **Question 5**. Some did not know how to draw a divided bar in **(a)(i)**; others found it straightforward. Some did not recognise that **(a)(iii)** was about the carbon and nitrogen cycles. Some explained how the greenhouse effect operates in **(b)(iii)** while others gave irrelevant answers about the effects of global warming or made mistaken comments about the hole in the ozone layer. Answers to the various parts of **6(c)**, **(d)** and **(e)** were typically worth some marks; usually they were in line with question needs. What was often lacking was sufficient breadth of question coverage to claim all the marks. **Question (f)(i)** was the part that was most likely not to be answered in the manner intended.

Comments on individual questions

Section A

Question 1

While opencast mining was almost universally recognised and named in **(a)(i)**, most candidates did not describe the method in sufficient detail for a four mark answer. Most appeared to rely upon their own knowledge of opencast mining instead of using the good evidence from the photograph, as the question directed them to do. The closest many candidates came to earning their first mark in **(a)(ii**) was for references to increasing the size of the open pit, although rarely was there any further mention of problems caused by the need to do this. In part **(b)** the most common use stated for the large hole was to fill it in with waste (presumably mining waste), but reasons for this were often lacking. Somewhat surprisingly only the occasional candidate seemed to search for other uses such as landfill, water storage and recreation.

Question 2

For many candidates, reading values from the graph in **(a)(i)** was a straightforward task, but even here occasional candidates misread 1965 for 1975 or gave the answer 400 for 2005 when the value on the graph was clearly centred between 400 and 410. Most also claimed the mark for the ten-year period 1985 to 1995 in **(a)(ii)**. After this, less able candidates in particular found marks more difficult to obtain. Having to name two heavy metals in **(b)(i)** proved to be a challenge too far for most candidates. After correctly naming one, most commonly copper or lead, the second one named was often a refined product, such as steel or aluminium. Therefore it was not surprising that more marks were earned for plastics than heavy metals in answers to part **(b)(ii)**. There were many one mark answers to part **(c)**. Most typically the mark was for people dumping waste in water. What was lacking was further development such as reasons for this or the role of water movement. Typically the remaining two marks were left unclaimed.

Question 3

Most candidates recognised the great shrinkage in the extent of sea ice between 1979 and 2007 that was shown on the maps. This meant that few encountered problems answering part **(a)(i)**. The letter **T** needed to be placed on land, and not in Greenland, and only about half the candidates marked **T** in an acceptable location in **(a)(ii)**. Part **(b)** proved to be the most difficult part in ***Section A***. The high reflectivity of white snow and ice surfaces on light rays from the Sun was little appreciated by candidates when answering **(b)(i)**. The key to answering **(b)(ii)** was the low angle of the Sun's rays, leading to more absorption as they pass through more atmosphere, and spreading the effects over a wider surface area than in the tropics. Among this cohort of examination candidates, this was little known. Part **(c)** led candidates into a more familiar topic, global warming. Most chose to agree with the statement; some were able to relate this to warmer oceans and ice melting. A few, unfortunately, deviated badly into filling the remaining lines with references to the hole in the ozone layer and its alleged consequences for global warming.

Question 4

Only part **(a)(i)** was poorly answered; decline and extinction were more common answers than increase, the answer which the question had tried to lead them towards. The correct answer of grizzly bear was the most frequent response in **(a)(ii)**. The correct answer of four was also the most common answer in **(a)(iii)**. The four terms related to food webs that were listed in the question for **(a)(iv)** were well known and understood; they were explained in many different individual ways, but some of the most successful answers used examples for predator and competition from the diagram. Explaining food chains seemed to be more difficult for candidates; not all managed to include the idea of nutrients passing from one organism to another.

Answers to part **(b)** tended to have breadth rather than depth. Stating three different effects, such as habitat loss, loss of sources of food and animals migrating to other areas, was the normal style of answering. Some answers would have benefited from greater precision of expression, such as loss of food for herbivores, or more mobile animals being the ones to migrate.

Overall in ***Section A*****,** marks for **Questions 1, 2** and **3** were below the mark obtained for **Question 4**. Only stronger candidates seemed able to perform more consistently across the questions. Scripts from weaker candidates almost inevitably included one or two parts in each of **Questions 1, 2** and **3** which failed to score any marks, often a reflection of inadequate knowledge and understanding.

Section B

Question 5

Most candidates claimed the starter marks for parts **(a)(i)** and **(ii)**. Only a few who either gave just one compass direction in **(a)(i)**, such as towards the west, or believed that **P** was a destructive boundary in **(a)(ii)**, forfeited marks. The two basic points claimed by a majority of candidates in part **(a)(iii)** were magma from the Earth's interior, reaching the surface where the plates split apart. Part **(a)(iv)** was consistently well answered; most of the references were to geothermal power, but some candidates also referred to hot water being carried away in pipes for use in heating systems within buildings. Although there were very few zero mark answers to **(a)(v)**, equally there were few answers where the explanation was sufficiently full to raise answers from the typical mark of two or three into four. Sometimes this was because candidates, having accurately explained what was happening at destructive margins, drifted into fold mountain formation or volcanic activity rather than continuing with the earthquake theme of the question. A few included a diagram; when labelled, these enhanced the worth of candidates' answers.

Part **(b)** covered a topic that was familiar to most candidates. The two questions discriminated well according to candidate ability. More able candidates gave answers to part **(i)** which included more precise details about building construction than simply saying 'using good building materials'. This meant that they achieved a better balance in marks earned between the two parts. Part **(ii)** was the one which less able candidates found the easier part; they were able to make mark earning points such as previous education and practice drills, and making medical and other preparations.

Candidates had few problems understanding question needs to part **(c)(i)**. Those who were most certain to claim the second mark were the ones who suggested definite reasons for the estimate, such as numbers buried under rubble, or chaos and confusion following a big disaster. Indonesia and Iran were the countries needed in part **(ii)**. The most common incorrect answer was Indonesia and India; candidates seemed to be looking for the two countries with the strongest earthquakes, instead of the 'number' of strong earthquakes as asked for in the question. Part **(c)(iii)** was one of the least well answered questions on the paper. Instead of answering for 'the pattern of strong earthquakes during the nine years shown', many candidates looked instead for the pattern according to earthquake strength, for example between those above and below 7.0 on the Richter scale. Quite simple answers were expected, such as the non-regular pattern, with some years with none (2000, 2002 and 2007) and one year with three (2005). The wording of part **(iv)** meant that it was intended to be a more challenging question, because candidates were required to make a summary judgement. The most common answer from those who found this difficult was that 'Most earthquakes occur between October and May', which had no significance. Some perceptive answers were seen, often along the following lines. While there is no reliable way of knowing when and where an earthquake will actually occur, the table showed places and countries along plate boundary **Q** where the risk seemed to be greater, although it existed everywhere. Part **(v)** was much better answered, particularly by those who used a systematic approach to answering. They dealt first with 'evidence for' and giving examples, and then with 'evidence against' followed by more examples. Two and three mark answers tended to come from candidates who cut corners on giving examples as supporting evidence from the table. There were wide variations in answer quality to part **(vi)**. A candidate who came to the view that evidence for 'the stronger the earthquake, the greater the number of deaths' was weak, found it more difficult to claim both marks than the one who recognised that those earthquakes above 7.5 did, on most occasions, lead to greater loss of life than those below 6.5. What candidates of both views did recognise was the importance of other factors, often human ones. Good understanding led to some very effective answers. The least successful answers to part **(vi)** came from candidates who merely repeated the style of answering already used in part **(v)** and listed examples for or against their stated view.

The better answers to part **(d)(i)** made mention of the differences in both number and frequency of major eruptions. Fertile soils was the answer expected in **(d)(ii)**, or an answer in relation to farming which came down to meaning the same. This was the most popular answer. While other economic activities such as

tourism and obtaining minerals can be locally important, these cannot explain the great numbers of people who live around active volcanoes in countries like Italy and Indonesia. These were unacceptable as 'the most likely reason'. Although there were some weak answers to part **(d)(iii)**, containing little more than the information given in the spider diagram, most candidates seemed to understand well how the ways listed could indicate an imminent eruption. Most candidates were able to make one or more sensible suggestions about why perfect prediction of a volcanic eruption is impossible in **(d)(iv)**. Many of the good answers to **(d)(v)** concentrated on the logistical problems of moving and relocating so many people. It was the sign of a very good answer when the candidate additionally tried to take account of the fact that Italy is a rich developed country. This means that the authorities have more money and human resources to make advance plans, and to train people to put the evacuation plans into effect.

Question 5 was well answered throughout. Most candidates had a sound knowledge of tectonic activity, which they were able to use and to apply to the questions set. For many, **(c)** was the least well answered part. There were many clues in the table of information about earthquakes along plate boundary **Q** which might have been better used by candidates in the later parts of **(c)**, such as **(ii)**, **(iii)** and **(iv)**. Using the word 'pattern' in the question seemed to cause more problems for candidates answering **(c)(iii)** than it did for **(d)(i)**.

Question 6

Completion of the divided bar graph in part **(a)(i)** was either a comfortable three marks or a challenge (perhaps for about one third of candidates). While a few candidates, among those who knew what was expected of them, made mistakes while plotting the 1% or 21% or both, the rest drew accurate graphs. Of the third, most tried to draw three separate bar graphs within the graph paper background; all they could claim was the mark for completing the key, provided that the shading matched the types used on their graph. Part **(ii)** was well answered. Candidates showed a widespread appreciation of the importance of all three gases, and many took the opportunity to fill the extra lines left for answers for water vapour and carbon dioxide. The dual role of carbon dioxide, for photosynthesis and for preventing the Earth from becoming too cold for life, was regularly referred to. When answering **(iii),** some less able candidates could do no more than state percentages from the table at the top of the page. Some of the others, who did realise that the question related to natural cycles, such as carbon and nitrogen, provided few further details. Having seen what the question wanted, this was a waste. Although some of the full mark answers were entirely about the carbon cycle, more commonly some information about the nitrogen cycle was included as well in these answers.

The best place for drawing the summary line in **(b)(i)** was through the centre of the top of each bar; however, the mark was awarded provided that the line touched any part of each bar. The solution used most was drawing an increasingly steep curved line through the top left corner of each bar. Curved and straight lines away from the bars were incorrect. The easy mark in **(b)(ii)** was for the noticeably faster increase after 1960; further marks mainly depended on the candidate's selection and use of values to illustrate this trend. There was an over-concentration on quoting totals for 2000 compared with 1960 instead of, for example, the larger increase of 200 billion tonnes in only 40 years between 1960 and 2000, which better illustrated the theme of the question. A greenhouse effect answer, and how it works, was what was expected in **(b)(iii)**. If this was the focus of the candidate's answer, the three marks were soon claimed. Answers from some candidates drifted more into the effects of global warming, while the worst answers came from those candidates who continue to believe that global warming is caused by the hole in the ozone layer. Every time a global warming question is set, there seems to be a cohort of candidates with this belief.

The information given in part **(c)(i)** shows three main features about the share of world emissions between the USA and China: that together the two countries account for about half of the world's emissions; that total emission from China are slightly higher than from the USA; and that emissions per head in the USA are much higher than in China. In typical answers candidates identified two of the three. They could obtain the third mark in another way by using the values to make a statement such as emissions per head are four times greater in the USA than in China. The quality of the responses to part **(c)(ii)** closely reflected levels of candidate understanding. One mark answers tended to be narrow in scope and to rely upon simple narrow statements about what information the cartoon showed, with little added; whereas three mark answers were strong on comment about American companies exporting both their manufacturing (due to cheaper costs of production) and their carbon emissions to China.

Some candidates seemed to start to answer part **(d)** too quickly, judging by the amount of crossing out. After one or two attempts, the great majority did find the best order. A tiny number of answers showed no hint of understanding. In those answers with one mistake, the flow sequence was most likely to be lost after 'rising sea levels' as 'flooding of low lying coastal areas' was placed ahead of 'sea defences breached'.

One mark answers were the norm in **(e)(i)**, mainly because candidates paid too little attention to the need to explain why the threat in the Maldives was greater than in other countries. Most other countries, even delta countries like Bangladesh and the Netherlands, do have areas of higher land within their borders. Even without knowing or stating this, candidates could have made stronger use of the information supplied about the physical make-up of the Maldives as well as their economic dependence on tourism. Again one mark answers were more common than two mark answers in **(e)(ii)**. Here most candidates showed a basic appreciation of question need when they referred to all the world's countries having a shared responsibility. Less often was this stated in the context of the Maldives with its tiny total population. Part **(e)(iii)** provoked a wide variety of suggestions. The most convincing ones were related to the availability of habitable land now that total world population is so large, and to the likely economic possibilities and problems. This question definitely favoured more able candidates; answers from less able candidates were typically about economic costs of the move and nothing else.

The worth of many potentially good answers to **(f)(i)** was reduced by candidates expressing their own opinions, rather than concentrating on explaining the viewpoints of persons **B** and **C**, as required by the question. This was most likely to happen from candidates strongly of the opinion that humans are responsible for climate change. The good answers came from candidates who recognised that natural climatic events do vary greatly in frequency and intensity from year to year. Throughout recorded time the Indian monsoon, summer rains in savanna lands and the annual tropical cyclone season have varied from year to year, with significant consequences for people living in the regions affected. Any adverse effects hit poor countries and poverty-stricken people hardest, because they do not have the resources to reduce or offset these effects. While some candidates did little more than repeat the comments made by person **A** when answering **(f)(ii)**, stronger candidates showed that they were aware that the frequency and intensity of natural hazards seems to be increasing in some parts of the world. Examiners marked the strength of the candidate's explanation, not the opinion held.

It is difficult to find an explanation why the total mark for **Question 6** was usually, but not always, one or two marks below that for **Question 5**, since the topics examined seemed to be familiar enough to most candidates, and Examiners saw good answers to every one of the individual questions. Perhaps it was more a problem of varied candidate performance between questions, which led to slightly lower mark accumulations overall without a consistent pattern as to where different candidates gained and lost marks.

ENVIRONMENTAL MANAGEMENT

Paper 5014/12

Paper 12

General comments

In ***Section A***, there was little difference in mark outcomes between the four questions. Among more able candidates, full marks were obtained more frequently for **Question 4** than for any of the others; marks for **Questions 3** and **4** were typically higher by one or two than for **Questions 1** and **2**. Among less able candidates, the mark pattern was slightly different; **Question 2** most regularly yielded the highest mark and **Question 4** the lowest. **Question 4** appeared to have two hurdles for weaker candidates: one was needing to concentrate only on description from the photograph in **4(a)(i)** and the other was having to write an answer about pastoral and not crop farming in part **(b)**. In many cases, the total mark out of 40 for answering ***Section A*** was similar to the candidate's average mark for the two longer questions in ***Section B***. Occasionally there was a big difference in standard between the answers to ***Sections A*** and ***B***, but there was no consistent pattern as to which one of the two was the better answered. It all came down to individual candidate preference and performance.

Within ***Section B***, the general distribution of marks between **Questions 5** and **6** on this year's paper was slightly different from the pattern seen in previous examinations. This year the total mark for **Question 6** for the majority of candidates was a little higher than that for **Question 5**. The apparent preference this year for **Question 6** over **Question 5** represented a rare example of a question on the Atmosphere section of the syllabus being more popular than one drawn from the Biosphere.

Most candidates had been well prepared for the examination. Questions covered topic areas with which the majority of candidates showed a high degree of familiarity, particularly those related to the characteristics of desert vegetation in **4(a)(i)** and **(ii)**, the usefulness of trees and forests in **5(a)** and **(b)**, siting the rain gauge in **6(a**, and tropical cyclones in **6(b)**. There was a minority who showed such limited understanding of the main topics that they struggled throughout, able only to cover some of the basic points without any hint of elaboration.

Time for completing the paper was an issue only for a handful of candidates. For these individuals, it was a serious issue. Answers to the short questions in ***Section A*** regularly carried on into the empty spaces beyond the lines left for answering. In contrast, answers to **Question 6** in ***Section B*** became progressively shorter and more like notes until some questions, at least those in part **(d)**, were left unanswered. It seemed to be more of an issue of exam time management for individuals rather than inadequate availability of time for the length of paper, because other candidates completed all the questions, and some from time to time even continued their answers on the blank pages 26 and 27. On this paper, all well prepared and knowledgeable candidates can expect to be busy for the full 2 hours 15 minutes allowed; therefore they should enter the exam room with a plan for managing their time efficiently. They can be recommended to spend no longer than 45 minutes answering ***Section A***. They can always go back and add to earlier answers if they find that they have finished ***Section B*** with some time to spare.

Many candidates could have improved the reward for their knowledge and understanding in three different ways in this examination, all of them related to examination technique. The first was by reading ahead to the next related part or parts of the question, before beginning to answer the first part. For example, many candidates wrote longer than necessary answers to **Question 6(a)(iv)**, because they also gave the answer needed in the next part, **6(a)(v)**, by stating the negative points of sites A, B and C. Doing this led one able candidate to write 'Oh explained previously' in the margin before having to repeat the answer in **(a)(v)**.

Secondly, some candidates were unable to distinguish whether the question set demanded only description from the information given, or whether further explanation was what was needed. This was particularly noticeable in many of the answers given to parts **(i)** and **(iii)** of **Question 6(d)**. Some answers to part **6(d)(i)** were full of reasons, related to differences in level of development and population between Niger and Europe. When part **(d)(iii)** was reached, the problem then for the candidate was whether or not to repeat these reasons, which meant giving the same answer as in part **(d)(i)**. The question instruction required

candidates to describe 'why' as well as 'how'. Some did repeat or write similar answers to gain marks for their answers to **(d)(iii)**, but others went back to describing how the effects were different between Niger and Europe, the answer that had been needed in **(d)(i)**. By reversing the answers needed, candidates lost all marks for both parts. Quite often this poor ending was atypical of earlier candidate performance. The principle behind many of the questions set on this paper, including the one followed here, is to require candidates to describe first what a resource shows, before expecting explanation.

Thirdly, some answers would have benefited from a fuller and more obvious use of the source information given. There might have been an issue in **Question 5(d)** because so much information about the BR 163 road was given. Certainly many answers to all three parts of **(d)** would have come closer to gaining maximum marks if candidates had made fuller use of the information provided to include more variety of points in their answers. The focus in **Question 6(c)(iii)** (the climate graph) was much narrower. In order to gain all four marks, it was essential for candidates to incorporate relevant supporting values from the graph in their answers. Candidates can be guided into what to look for when asked in examination questions to describe the main characteristics of the climate of a place. The significant characteristics that candidates should be guided into looking for include general temperature levels (hot, warm, cool, cold), highest and lowest temperatures and their months, annual range of temperature, and precipitation distribution during the year (whether seasonal, all year or virtually none) along with significant months (such as the month with highest rainfall). As usual with photograph based questions, some candidates in **4(a)(i)** did not make any use of the photograph. The reference to hot desert regions in the question triggered off a considerable number of answers about characteristics of desert vegetation beyond those that could be observed in the area shown on the photograph.

Comments on individual questions

Section A

Question 1

The style of question in **(a)(i)** was such that candidates could write letters in the spaces provided irrespective of whether they knew the answers or not. The frequency of entirely incorrect answers from the less able candidates suggested a dominance of guesswork. Perhaps the two which caused most problems were C (used for sedimentary or folded rocks instead of igneous) and F (used for the example of folded rock instead of metamorphic). For answering **(a)(ii)** wise candidates made some use of the diagram of rock types in **(a)(i)** as a basis for illustrating mining difficulties caused by folding and faulting. Otherwise two-mark answers were more common than four-mark answers from candidates successfully showing difficulties associated with mining depth, especially if they tried to indicate depth below the surface. Unfortunately a few either ignored the theme of geological factors, or did not know what was meant, and concentrated on showing mining problems such as tunnel collapse instead. There were several possible routes to answering part **(b)** which led to many successful answers. The most frequent references were to precious metals, size of the deposits, high export value and employment.

Question 2

In **(a)(i)** candidates had the choice of Kurile and Californian currents, as the only two currents flowing in the direction from the poles towards the Equator. Understanding the needs of **(a)(ii)** was rarely a problem for candidates. Whether a candidate claimed both marks or only one of them depended on how complete their answers were. The weakest answers came from candidates who took an over-narrow view, believing that the minor currents flowing from the Kuro Siwo alone would carry the plastic pieces to Hawaii. The majority of answers to **(a)(iii)** adequately conveyed how all the currents flowed towards the centre of the North Pacific surrounding the area without an exit. Part **(b)** was dominated by two-mark answers, typically for stating non-biodegradable and being eaten by marine organisms. Some other characteristics that had been expected to be widely known, such as plastic floating and being light so that it is easily blown by the wind and carried by the currents, were only occasionally referred to. Likewise part **(c)** was dominated by two-mark answers, either for mentioning two ways instead of three, or for failing to elaborate more fully about any of the individual ways. **Question 2** seemed to be a question for which four and five marks were much easier to reach than those worth eight marks and more.

Question 3

From those who knew all about the sunshine recorder there were many three-mark answers to part **(a)(i)**. The best answers to **(a)(ii)** were for day to day variations in cloud cover and / or type of weather. If the candidate took a longer, more yearly, view the answer had to be about the Earth's revolution around the sun, not its rotation. There were quite a few incorrect 'November' and '2.0' answers to **(b)(i)** for candidates who sought to give the month that was most different instead of one that was most similar. Again, 'November' was the most common incorrect answer to **(b)(ii)** instead of 'winter season'. Recognising the sunshine peak in July was the clearest indication of candidate understanding in **(b)(iii)**; most candidates claimed this mark. Higher sunshine hours in every month in Calgary was the starting point for most answers to **(b)(iv)**. For the remaining marks, candidates needed to support their answer either with good references to supporting values, or by some broadening of answer scope. Some did this by referring to the limited solar potential in both places in winter. The weakest answers came from those who either talked in general about the advantages of solar power as an alternative energy source, or believed that the presence of sunshine hours in every month made both places highly suitable for solar power.

Question 4

If candidates concentrated on description alone from the photograph in **(a)(i)** there was plenty for them to describe for both nature and distribution, and they readily mentioned at least three of the points in the mark scheme. It was those candidates who responded more to the mention of 'hot desert area' in the question than to the command word to *describe*, and tried to use knowledge instead of observation, who did less well and sometimes failed to claim even one mark. Part **(a)(ii)** was one of the best answered questions on the entire paper with desert vegetation characteristics, such as large rooting systems, thorns and spines instead of leaves, succulent stems and widely spaced plants, being directly related to survival in the hot and dry climate. How much progress was made in part **(b)** depended upon whether the candidate focused on livestock farming or crop cultivation. The split tended to be according to candidate ability. Some less able candidates began their answers as if for pastoral, but then switched to the poverty of desert soils and the need for irrigation water in a crop growing context.

Section B

Question 5

Part **(a)** was well answered. Most candidates recognised that the process of photosynthesis was the key to answering **(a)(i)**. Elaboration upon it led to the award of all three marks, which happened frequently. Parts **(a)(ii)** and **(a)(iii)** were answered equally well and consistently, even by candidates who struggled with some of the later parts of **Question 5**. Slightly less well answered was **(b)(i)**. A majority of candidates claimed at least one mark, often for 'provides a habitat for birds and animals', although this was expressed in an enormous number of different ways. Claiming the second mark proved to be more difficult, either because of the repetition of the same point in a different way, or through taking too narrow a view, often solely in relation to plant life within tropical rainforests. Again in part **(ii)** full-mark answers were the norm, often from one simple statement about the roots absorbing both water and nutrients from the soil. One-mark answers were characteristic of candidates who gave similar answers for both bullet points: essentially related to roots preventing soil erosion.

Part **(c)** was perhaps the least well answered part of **Question 5**. Even candidates who began well by focusing their answers on the theme of location in **(c)(i)** tended to stop answering once they had stated one different feature of the location of early and recent clearances; they had not taken into account that this was a three mark question. One-mark answers were typically more vague, referring to locations in Brazil in terms of 'north', 'south' and 'centre'. Part **(c)(ii)** was intended to be a more testing question. Candidates were asked only to 'suggest reasons'. While the attractions of riverside locations for early rainforest clearance and settlement were widely acknowledged, only more able candidates recognised how the location of recent clearances reflected expansion from the economic core in the south east of the country.

Although parts **(d)(i), (ii) and (iii)** seemed to pose few problems for candidate understanding of what was needed, most answers fell short of the amount of content needed for all marks to be claimed. In part **(d)(i),** references to the ease of export for beef and soya beans gave a sound basis to many answers. Something else was needed for the third mark, which is where the source information could have been more fully used. For example, infrequent use was made of the enormous distances shown on the roadside sign. Also the problems during the wet season that would be avoided by paving the road, given below it, were little referred to. The wording of part (**ii)** allowed the candidate to take the view that economic reasons are 'not very strong'. To be effective, explanation for this view needed to focus on short-term economic gain and long-term

environmental loss. In reality, many of the answers trying to support a 'not very strong economic' viewpoint were too environmental. It was much easier to explain strong economic reasons, simply because so much evidence in the source information was supporting this view. Two-mark answers were the most common outcome in part **(d)(iii)**, typically from references to the economic value of logging and to the amount of illegal logging that already exists and is likely to increase after improved access from paving the road. Only candidates who searched more carefully for relevant information from the source achieved greater breadth in answering, which in turn increased opportunities for including meaningful comment. The weakest answers were those which were entirely devoted to description of environmental problems resulting from forest clearances, this was not a relevant response. It was a common type of answer from less able candidates.

The mark scheme identified three unique features of tropical rainforests for answers to part **(e)**, namely greatest biodiversity, greatest mass (or highest primary productivity) and largest number of vertical layers. This tended to be the order of frequency with which they were referred to by candidates. A few candidates identified all three. More frequently, able candidates mentioned two of them, in which case some elaboration or exemplification was needed for the third mark to be claimed. Weaker candidates were more likely to describe forest characteristics without specifically identifying either great biodiversity or mass and achieved enough for a one mark answer. Some answers were dominated by references to the rainforest's unique uniformly hot and wet climate, which was not what the question really wanted.

More careful reading of the question set in **(f)(i)** would have stopped a good number of candidates from writing about the activities listed in **D**–**F** as well. While Examiners ignore irrelevant answers, candidates penalised themselves by devoting too little time to describing activities **A**–**C**. In weak answers, there was an over-reliance on repeating 'small-scale' given in activity **A** and the general meaning of the term 'sustainable'; in other words, there was inadequate development of answers which applied to particular activities. Overall two and three-mark answers were the more common, from candidates who examined each activity in turn and described how their environmental impacts were low. There were so many different but equally valid approaches to answering **(f)(ii)** that these two marks were readily claimed by most candidates. A minority of candidates (often more able ones) answered in relation to low outputs and levels of development from these traditional activities. The majority referred to outside pressures on the forests from population growth, the need for increased food output and the drive towards economic development. In the significantly better answers to part **(f)(iii)** two ways of sustainable logging were stated upfront. Most answers began by stating how logging in Brazil was not sustainable; and some of them never reached the point of describing sustainable ways. Weakest of all were answers based around the words illegal and legal. Many candidates were really trying to answer their own question 'State how the logging taking place along the sides of the BR 163 in Brazil is different from sustainable logging of hardwoods', which is not the same as the one set. The better answers to **(f)(iv)**, worth three and four marks, came from those candidates who followed the order of the question and began by giving a definition of ecotourism; best of all was when this included references to both the natural environment and local people. These candidates were then in a better position to explain how making money out of the forests was more likely to lead to both the forests and the lifestyles of local communities being saved. Two-mark answers were more common in those that were dominantly economic. Answers more about tourism in general instead of ecotourism in particular were worth little.

Considering the nature of the topic, the middle part of **Question 1** was not as consistently well answered as might have been expected. The more biological parts of the question in parts **(a)** and **(b)** were well answered in comparison with the many map and written resource-based questions in parts **(d)** and **(e)**. Questions in the four parts of **(f)** demanded the application of candidate knowledge and understanding, which the more able were always going to be able to answer better.

Question 6

A few candidates ignored part **(a)(i)** and left the diagram unlabelled, even when some of its component parts were referred to in later answers. The funnel was best known; for the other component parts there was some overuse of the labels cylinder, flask, beaker and jar, sometimes without any difference between the inner and outer containers. This meant that two-mark answers were more common than those worth three marks. In part **(ii)**, reducing the chances of the collected rainwater evaporating was a much better answer than maintaining the rain gauge's stability. For the answer to part **(iii)**, candidates could refer to occasions when the rainwater falls into an already calibrated glass jar, instead of the more usual situation in which the contents of the inner container are emptied into a separate measuring cylinder. If they did the former, they were more likely to omit to mention the need to place the cylinder on a level surface in order to take accurate readings at eye level. Those candidates who knew nothing about measurement of rainwater amount referred instead to the general siting advantages of the rain gauge. There was some repetition of answers between parts **(a)(iv)** and **(v)**, as referred to previously under the general comments. **D** was widely chosen as the best site in part **(iv)**, although for the second explanatory mark candidates needed to do more than

just state 'open area' or 'on grass', which were marked for them on the plan. In part **(v)**, **C** was perhaps the easiest of the sites for which to explain non-suitability, but most candidates had few problems explaining sites **A** and **B** as well. Those who left out site letters in their answers to **(iv)** and **(v)** lost some of the marks, quite unnecessarily.

Completing the pie graph in part **(b)(i)** posed few problems. Most candidates included their calculations for the number of degrees, although given the closeness of two of the raw percentages to one third and two thirds, doing these calculations was not absolutely necessary in order to draw the pie graph to a sufficiently high level of accuracy for claiming the marks. The world map in **(b)(ii)** was used better than the one in **Question 5(c)**, perhaps because the pattern shown was more familiar to candidates; two and three-mark answers were typical here. For the area of formation mark, candidates needed to put together both the ocean source areas and the fact that they are in or near the tropics (in other words, over warm ocean surfaces). One without the other was the main reason for losing one of the marks here. A fuller answer to any one of the three parts could have been used to claim the floating fourth mark. Some candidates charged into the answer to **(b)(iii)** with many details of how people lose their lives during and after tropical cyclones, without stating basic causes such as very strong winds, heavy rainfall leading to flooding and landslides and storm surges along the coast. The better answers came from candidates who adopted the alternative approach and gave information about the characteristics of tropical storms first, as a lead into effects on people. Although the question was a consistent mark earner, two-mark answers were more common than those worth three or four marks because of the lack of basic physical information about cyclones.

There was an easy location mark in **(c)(i)** for stating between the Tropic of Cancer and the Equator. The other marks in **(c)(i)** and **(ii)** followed from recognising that Niger was a landlocked country (however stated). The third mark was usually awarded to candidates who explained the disadvantages resulting from not having direct access to aid supplies from the sea. Candidates who fared best when answering **(c)(iii)** were those who had been well prepared, so that they knew what to look for when asked to describe the climatic characteristics from a climate graph. Maximum marks were easily reached by candidates willing to support general statements, such as 'wet summer' by reference to months of the year, and 'hot all year' by quoting lowest temperature value and month, or the range of temperature values between highest and lowest (with º C added as the unit, of course). Without precise references to values and/or months, few answers were able to reach more than half marks. Despite it being a basic syllabus requirement, candidates never find it easy to name a climate type from a climate graph, although in the case of part **(c)(iv)** they had the map of location as well to help. The most popular choice was Desert, while the correct answer of Savanna came as a poor second. The amount of precipitation in the summer season was too high for desert to be correct. Those who made good use of the climate graph were the ones most likely to gain both marks for their answers to **(c)(v)**. High temperatures received many mentions; they were of greatest value to the answer when combined with references to high rates of evaporation. Those who totally ignored the climate graph, or believed that 554 mm indicated desert conditions, were the ones most likely to miss out on any marks. While the term 'drought' was understood by all in part **(vi)**, some candidates tried to answer this question too narrowly by referring only to the dry winter months and to what was happening within the average year. Those candidates who viewed the question in terms of variations in amount of rainfall between one year and the next gave the best and most successful answers, and there were many.

Answers to the three parts of **(d)** tended to be polarised between good and bad. When the answer to **(d)(i)** had been focused on reasons instead of the effects themselves, most candidates were reluctant to restate them in **(d)(iii)**, where they were needed. Candidates who listed effects separately for Niger and Europe in **(d)(i)** could reach a maximum of two marks. Most of those following the best approach to answering commented on the greater severity in Niger as well. The stark differences with respect to livestock were used very effectively by some. Answering the first part in the correct manner seemed to help candidates to identify income per head and population increase, (with wide variations in the ways of expressing them), as the two main factors responsible for the differences. Some stated both birth rate and fertility rate, without any reference to income and development, which was not as good an answer. For those taking note of the command words, the final part of **(d)(iii)** discriminated well between those who used population and income with only a limited amount of elaboration and those who were able to convey the greater picture. In Niger it was a matter of life and death from persistent poverty and rapid population increase, not allowing surpluses to be accumulated in the good years for use in times of drought. In contrast, in Europe there was little more than economic inconvenience as farmers were forced to use their stores of winter fodder to keep animals alive.

The total mark for **Question 6** was typically, even if not always, a few marks above that for **Question 5**. Until the final part **(d)**, all the other parts were answered well across the ability range. Less able candidates picked up marks quite consistently, even if some of their answers lacked the depth and incisive focus to claim all the marks available for those questions worth more than two marks.

ENVIRONMENTAL MANAGEMENT

Paper 5014/21

Paper 21

General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country, South Africa. 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 posed 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) (i) Many candidates identified at least one reason why the local people wanted to carry out the development themselves. However most candidates did not go on to offer a second reason.

(ii) Many candidates gave three ways in which the two enclosures should be the same and scored maximum marks. Some candidates gave ambiguous answers that could not be given credit as they did not clearly show the idea of comparing similar enclosures.

(iii) The idea that the two enclosures should be separated to prevent disease passing from one to the other was rarely given. Most candidates wanted to prevent interbreeding which was not an appropriate answer on this occasion.

(iv) The mathematics required to answer this question was no more demanding than in previous papers. Most candidates either did not attempt the question or selected inappropriate numbers to start their calculation.

(v) Many candidates correctly selected three pieces of evidence from the source material to show why one breed of chicken was selected by the villagers.

(b) There were a large number of very clear drawings and sensible scales provided with most of the drawings. The changes required were drawn in by most candidates.

(ii) Protein and other significant dietary components were stated by many candidates. However there were answers that were a repeat of the question with no additional information that could be given credit.

(iii) Many candidates appreciated the difference between costs and profit. Sharing the profits equally was sometimes suggested even though the data showed that different hours had been worked.

(iv) A large number of correct answers were presented. On some occasions the working was not very clear which prevented credit being given.

(c) (i) Candidates seemed to have very limited knowledge of biogas production so many candidates failed to gain credit here even though some marking points were not demanding.

(ii) Many candidates realised that a biogas stove would be cheap to run but a second advantage also needed to be given. Some candidates wrongly suggested that the stove would not generate pollution.

(iii) Nearly all candidates gave a creditworthy suggestion for a source of money to invest.

(iv) This question gave candidates the opportunity to demonstrate their understanding of the term sustainability. Very few candidates gained two marks and explanations were often unclear. The concept of sustainability is central to this examination so future candidates should expect to have to answer this type of question.

Question 2

(a) Most candidates positioned their X in a sensible place. Whilst most candidates went on to give three reasons these often did not give any more information than 'near the village' without saying why this was an advantage. As candidates had not been told that asbestos is a health hazard they could gain a mark for saying, being far from the mine because of the risk of contamination or being near the mine as a supply of stone to build with.

(b) (i) The measurement of humidity does not seem to be well known; anemometers or barometers were often wrongly suggested. A description of a hygrometer would have gained credit.

(ii) Many candidates did not pay sufficient attention to the information given in the table. There was a tendency to discuss water supply which was not referred to in the table. Photosynthesis was a process that was not stated. Overall the effects of high light values, high temperatures and high humidity on plant growth were not as clearly described as had been anticipated by the Examiners.

(c) (i) The calculation proved to be easy for most **c**andidates.

(ii) Many candidates gave the correct order, B A C. However the justifications were often not sufficient to gain credit. The shading, for instance, was vital to stop the seedlings dying after being planted. The donkey would have been necessary when the production increased though many candidates suggested it was still a luxury that was not really needed.

(iii) Most candidates objected to the purchase of a donkey on financial grounds. Further detail to gain the second mark was often not provided.

(d) (i) The graph presented few problems for most candidates. The commonest causes of loss of marks were failing to write in the units on each axis label and presenting the axes the wrong way around. The axes were mainly clearly expressed, answers gaining maximum marks.

(ii) A wide range of factors were given credit and many candidates gained two marks.

(iii) A disease of plants that would have altered production was required to gain credit. A wide range of diseases were suggested, but some of them were human rather than plant diseases.

(iv) Most candidates correctly suggested that the cost of pesticides was going to be a problem but very few candidates could come up with a second reason. There were many suggestions that the pesticide would kill the plants or cause eutrophication; this did not gain credit.

Question 3

(a) (i) Careful reading of the graph ensured that most candidates gained the mark. There were some answers where the lowest price had been misread from the graph and a few answers given in years.

(ii) The question asked candidates to select the years when more miners would be employed. At least two years were required within the range 2005-2008. Many candidates achieved this but a significant minority only stated a single year and could not be given credit.

(b) This type of question has been asked in past papers and candidates have managed to suggest a variety of advantages and disadvantages to family life when money is available. In this examination the suggestion that the family would have more money was not qualified by suggesting what the money could be used for. The ways in which the family could be worse off were usually confined to diseases associated with mining rather than being related to family life.

(c) (i) Some candidates stated the fence would have to be placed at 0 metres without looking carefully at the source material. Others recognised that the plants indicated recovery further from the source of the cyanide; more needed to suggest that the soil here was not now affected by cyanide or that it would be safe to graze.

(ii) Only a small number of candidates wanted to extend the distance of this survey or repeat it. Many candidates suggested other things the students might have done.

ENVIRONMENTAL MANAGEMENT

Paper 5014/22

Paper 22

General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country, Ethiopia. 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 posed 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) (i) Most candidates correctly suggested the adults moved to find work or to earn money.

(ii) Most candidates suggested the meat shortage would be due to animals dying or being sold off.

(iii) Most candidates realised that selling of farming tools was a bad idea as they would have to buy them back at greater expense after the drought or could not take up farming again without the tools.

(b) (i) The advantages of a living hedge were not evident to most candidates. The most common suggestion was that the hedge could keep animals in one place and therefore prevent overgrazing. This was not a creditworthy answer. Very few candidates considered alternative fencing as using more resources or costing money to buy.

(ii) There were a good number of sensible suggestions for the advantages of using animal dung as a fuel. However many suggested a disadvantage was that burning dung gave off methane which is not correct. Only a small number of candidates suggested that the dung would not be fertilising the ground if it had already been burnt.

(iii) The Examiners were pleased to see that the role of bees in pollinating plants was well known by many candidates. To gain the second mark it was not sufficient just to say the honey was sold; they had to go on and suggest a use for the money. Honey is also a food in its own right and it was not clear in some case if candidates appreciated this. Suggestions about bees protecting other stock animals were not correct.

(iv) Most candidates appreciated that a toilet would help stop the spread of disease but only a small number of candidates made a suitable suggestion for the second mark. Polluting drinking water and fewer days off work were the best answers.

(c) Most candidates attempted the calculation and many gained the correct answer. The common error was not multiplying 40 by 10 as the price required was for 10 kg.

(d) (i) Most candidates drew a workable plan for irrigation. To gain the second mark the pump had to be part of their design and the Examiners were pleased to see the pump was incorporated more often than not.

(ii) There were some excellent descriptions of the process of salinisation and most candidates gained two or three marks here.

(iii) The role of the mosquito in spreading malaria was well known by nearly all candidates.

(iv) Candidates generally recognised that preventing mosquitoes from breeding could only be done by reducing the amount of standing water. Changing the method to trickle drip irrigation gained credit.

(v) Methods of prevention of malaria were well known and all the different methods were regularly suggested.

(e) (i) The role of protein in the diet was well known by most candidates. Only a small number suggested protein was eaten to gain energy.

(ii) Most tables presented were able to record two years' yield for three fields. If an error was made it was usually to record for only one year. There were very few split tables.

Question 2

(a) (i) Many candidates described a nomadic way of life; some confused this with shifting cultivation or slash and burn cultivation.

(ii) Most candidates correctly suggested that the nomadic way of life prevented overgrazing or gave the soil time to recover its fertility.

(b) (i) The consequences of development for the nomadic people seemed to be less obvious to many candidates. They often said they would lose their land or grazing land but usually did not go on to suggest a consequence such as having to keep fewer animals or not having enough animals to survive.

(ii) The Greenhouse Effect leading to global warming were often correctly cited. Some candidates correctly commented upon the high use of fuel to make cement.

(iii) A good number of candidates recognised that the carbon dioxide released by the cement factory could be absorbed by the sugar cane plants, but very few went on to name the process of photosynthesis. This is a key process in biology that has great relevance to environmental management.

(iv) Burning sugar cane waste for small scale use or the waste being placed in a power station to generate electricity were ideas gaining credit. A simple statement that it could provide electricity was not given credit as more details were required. Most candidates realised ethanol was a fuel and some thoughtful candidates gave a reason why feeding sugar cane waste to cattle would help production.

(c) (i) The calculation proved to be easy for most **c**andidates.

(ii) Many candidates gave the correct answer yes and the more thoughtful candidates expressed the idea that the extra yield was worth more than the extra cost of irrigation, either in words or by processing the data supplied. Most candidates attempted to qualify their answer.

(d) (i) The graph presented few problems for most candidates. The commonest causes of loss of marks were not labelling each axis, and presenting the axes the wrong way around.

(ii) Nearly all candidates commented on the high fertility of the soil as an explanation for increased yield between years 1 and 2. The biological process of growing a complete root system was rarely suggested.

(iii) Nearly all candidates gave a suggested yield for year 6 within the correct range.

(iv) Some candidates made vague statements without specifying a year when they would start adding fertiliser. After year 2 or at year 3 were answers gaining credit, as inspection of either the data or the graph showed a marked decline in yield at this time.

(e) (i) Most candidates gave two or three clear and sensible precautions for using a pesticide.

(ii) The commercial advantages were well expressed by nearly all candidates. Only a minority of candidates appreciated that less pesticide or fertiliser would need to be used so less risk of pollution or poisoning the workers would result.