

# ENVIRONMENTAL MANAGEMENT

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Paper 5014/11

Paper 11

## Key messages

Only short answers are expected to the four 10 mark questions in **Section A**. Beware of extending answers beyond the lines left for answering. This increased the chances of candidates rushing the last question and failing to answer in the same detail as in earlier questions.

Read the questions carefully; read each question more than once; underline key question words, such as the command words, words which tell candidates what to do.

Take careful note of the number of marks for the question. For 3, 4 and 5 mark questions it is not just matter of filling all the lines; it is highly likely that a variety of points need to be made, or details about an example given, rather than just repeating one idea.

Avoid over-using vague terms such as 'pollution'. Always specify the type of environmental pollution by at least adding air, water or land before it as well as something about its nature and origin e.g. when referring to pollution from a damaged oil rig, do not just write 'pollution', but preferably write something more detailed e.g. 'water pollution by oil from a damaged rig'.

## General comments

There was no evidence of lack of time for candidates of all abilities. The standard of answers was similar in **Sections A** and **B**.

Only minor variations in the quality of responses between the four short questions which formed **Section A** were seen. Some candidates extended their answers below the lines available for answering. Candidates are often repeating points already made, without further worthwhile elaboration or any use of examples. Such candidates, in a few cases, spent too much time answering **Section A** resulting in a noticeable decline in amount written in the various parts of **6(d)** over the last three pages in **Section B**.

In **Section B**, questions which were generally well answered by candidates included **5(a)(i)** and **(ii)** (using the Demographic Transition Model), **5b)(iv)** (drawing the line graph), **6(a)(i)** and **(ii)** (using the information about access to clean water in some world regions) and **6(b)(i)** and **(ii)** (about water-related diseases).

In contrast, the questions which proved to be more difficult than average for the majority of candidates included **5e)(i)** and **(ii)** (unsustainable world population growth), and **6(a)(iii)** (reasons for different rates in improvement in access to clean water between developing world regions).

Questions which suffered from limited candidate coverage in relation to number of marks available included **5(b)(i)**, **5(d)(iv)** and **6(d)(i)**.

Many questions required the use of resource information supplied. The better the candidate *used* the sources, the more likely the success of the answer. Question instructions most frequently ignored were describing from the graph as well as the data in **5(b)(v)** and explaining in the context of 'After the construction of the dam ..' in **6(d)(iii)**.

Using the data provided and what the candidate's own line graph showed in **5(b)(iv)** were needed for answering **(b)(v)** well; only a minority *used* (rather than repeated) data from the table, as well as describing what the shape of the line in the graph showed.

Similarly, in the best answers to **6(d)(iii)** and **(iv)** it was clear that candidates had made a careful study of all comments before starting to write their answers. Answers to **6(d)(i)** could only be based upon the resource map supplied. A careful study of the map was needed, following the rivers southwards from their sources in

the Himalayas. Without having done this, some candidates focused their attention and answers on rivers and cities to the south of the Tehri Dam, neither of which had any relevance to the question.

### Comments on specific questions

#### **Section A**

##### **Question 1**

A distance between 9.0 and 10.5 km was considered an acceptable answer in part **(a)(i)**: many candidates gave a value comfortably within this range.

In answers to **(a)(ii)** the majority of candidates failed to appreciate the importance of 'all year' in the question. They answered in terms of the transport links from mine to port, rather than making use of the map information showing that the sea is ice free all year, despite the location 190 km north of the Arctic Circle.

Evidence for the environmental impact of the mine was plentiful on the map which meant that most candidates gained credit in **(a)(iii)**.

In most answers to **(a)(iv)** little knowledge of the tundra climate was shown; many answers lacked any climatic references, which made it difficult for them to be awarded credit. The significance of the cold tundra climate in restricting human activities such as mining in these high latitudes was not appreciated.

More candidates gained credit in part **(b)(i)** with greater numbers understanding that 35% was the amount of iron ore in the rock, and that the rest was waste.

Such points were often used in valid answers in **(b)(ii)** about the need to reduce bulk, earning many of these candidates credit. Fewer candidates continued, mentioning the importance of this reduced mass for reducing transport costs.

Increased market demand was the most common answer given to part **(c)** gaining partial credit. Relatively few candidates referred to higher prices or improved technology to gain full credit.

##### **Question 2**

Some candidates realised that they needed to use of their water cycle knowledge to answer **(a)(i)**. Runoff for **X** was given more often than infiltration for **Y**.

**(a)(ii)** was often well answered with many candidates gaining full or partial credit, and with 'taken up by plant roots' the most common individual answer.

Those candidates who correctly included denitrification as one of the ways in part **(a)(ii)** were the ones most likely to know that the process produced nitrogen when answering **(a)(iii)**.

Part **(b)** was the best answered part of the question; the effects of algae in shading, and depletion of oxygen by decomposition, with the low oxygen concentration killing fish earning credit for many candidates.

Few candidates appreciated that that vegetation could trap some of the spray in **(c)(i)**.

In **(c)(ii)** fewer candidates gave the correct answer of 'strong winds' than the incorrect references to rainfall.

There was more choice of answer in **(c)(iii)**; Some candidates took note of 'a variety of different types of vegetation' in the question and stressed the importance of increasing habitats, or providing alternative food sources, earning credit.

##### **Question 3**

Most of the attempts to plot the temperature values and link them with a line in part **(a)** were correct, earning credit. A few candidates drew a bar graph, despite the instruction in the question to use a line graph. Also temperature, as an example of continuous data, should only be shown in a line graph.

In part **(b)(i)** candidates either knew that sulfur dioxide and oxides of nitrogen were the gases which caused acid rain, gaining credit, or they did not.

Their effects on forests in **(b)(ii)** were well known. Many candidates did not give the coverage and elaboration needed for full credit. Partial credit was given for answers that were about trees losing their leaves and eventually dying. Such answers typically lacked any references to the soil and the effect on trees of its increased acidity.

In part **(c)** some candidates gained full credit, realising that the pollutants often originate in another country and are carried by winds, which means that affected countries are unable to control the source of the pollution, gaining full credit. Other candidates gave parts of this, gaining only partial credit.

#### Question 4

Values between 3.1 and 3.5 million, given by most candidates, were accepted in **(a)(i)**. Some candidates incorrectly gave values about half this number for males or females only.

In **(a)(ii)** most candidates gained credit.

For **(a)(iii)**, the graph required careful study and thus fewer candidates gained credit. The age group 20 to 24 gave the clearest evidence of migration into Rwanda and was seen most often.

Part **(b)** was consistently well answered with many candidates giving references to both economic problems caused by the loss of the most active work groups, and social problems from families being split up and gaining full credit. Some candidates developed their answers less thoroughly and gained partial credit.

Some answers to part **(c)** gained full credit, where candidates had focused fully on the question theme of the problem of housing, and gave evidence of their understanding of the role of city authorities in providing services to poor housing areas. Such answers moved on to the way that the interest of city authorities encouraged community involvement and self-help housing schemes. Most candidates did not provide the amount of content needed for full credit.

#### Section B

#### Question 5

Most candidates gave at least one of the correct stages and many understood the Demographic Transition Model well enough to give both.

In **(a)(ii)** most candidates gained credit for correctly giving similarities and differences between the stages..

Question **(a)(iii)** placed a greater demand on understanding. Many candidates correctly showed natural increase in stages 2 and 3 and natural decrease in stage 5, even if the shading was not always confined to the spaces between the lines for birth rate and death rate. .

In part **(b)(i)** *most* candidates showed a basic understanding of how the factors in the spider diagram could decrease a country's rate of population growth, gaining partial credit. Few candidates elaborated more fully upon each basic statement in order to gain full credit. For example, there were many partial credit answers along the lines that 'with better education women had greater awareness of methods of family planning', without incorporating another aspect associated with education of women, such as encouraging later marriages or becoming more career orientated which were required for full credit.

In part **(ii)** most candidates gained partial credit by answering the 'why' part of the question. Some candidate did not attempt to answer the 'how' half of the question as well.

In **(b)(iii)** the correct answer was given by most candidates.

A few candidates encountered problems plotting the data for fertility rates using a line graph in **(b)(iv)** although most gained full credit. The occasional inaccuracy in plotting led to some answers gaining partial credit. The most common reason for no credit was drawing bar graphs, which also consumed more time.

Most answers to **(b)(v)** gained only partial credit. The main reason for not gaining full credit was that candidates used data only to describe, without any obvious references to the graph as well, as demanded by

the question. The best answers suggested, for example, that the decline in fertility rate was fastest (at 3.1) in the 1990s, shown by the noticeably steeper gradient of the line on the graph.

Part **(b)(vi)** demanded more understanding. It was pleasing that many candidates linked fast decrease during the 1990s back to the earlier box information about contraception being more widely available. Full credit was given to candidates who recognised the greater population stability, associated with a fertility rate of 2.1 (stable population replacement fertility rate) after social attitudes to population numbers had changed.

Most candidate's answers to part **(c)** began with a sentence about the how national population policies in general can affect a country's population growth. This was followed by reference to a country with a population policy. China was the dominant choice. Next a country without a population policy was named as a contrasting example. For this the choice of country was wider, but it was often the candidate's home country. This was a sensible choice since it made it more likely that the candidate would be able to give meaningful elaboration. The amount of credit awarded reflected the amount and accuracy of the supporting detail. Less credit was awarded for the smaller number of general answers without any named countries, or no more than passing references to a country without any more information about it. In a few cases Japan was obviously being confused with China. There were very few answers in which there was no discernible knowledge of what was meant by a national population policy.

In part **(d)(i)**, most candidates knew how to work out natural increase and gave the correct answer of 15.1. The few candidates who did not know how to do this typically restated the birth rate from the table.

Most candidates suggested either stage 2 or stage 3 in their answers to **(d)(ii)**. There was no credit for naming the stage. Many candidates gained partial credit for a simple explanation which matched the stage chosen. Full credit was given to some candidates who showed very clearly that they had studied the birth and death rates for Iran in relation to the earlier diagram of the Demographic Transition Model. Some did this by comparing the size of the birth and death rates per 1000 with those in the graph; others did it by explaining why it could not be the other stages such as stages 1 or 4. A few candidates suggested a stage that was clearly wrong such as 4 or 5, or avoided answering the question.

In general the answers for 'environmental' in part **(d)(iii)** were better than those for 'economic'. Many candidates mentioned unemployment as an economic pressure. Some others described economic pressures for the provision of essential services. Deforestation was the most common starting point for the environmental effects. The amount of credit was determined by the amount of detail given in the descriptions.

In part **(e)(i)** and **(e)(ii)**, for those taking the unsustainable view, the most credit-worthy answers came from candidates who concentrated on the pressure of population growth upon the Earth's natural resources. Less credit was awarded to those who pursued the theme of environmental damage (perhaps following on from the previous part of the question), sometimes without any mention of natural resources. Little credit was earned by entirely demographic answers about controlling population growth because most or all of their content was irrelevant. Only a few candidates took the alternative view that world population growth could be sustainable due to further increases in technology, leading to a switch in dependence from non-renewable to renewable energy sources and to higher food output from GM crops and other new seeds. Full credit was possible for those taking this viewpoint. In either case, the amount of credit reflected the amount and precision of the supporting detail. Overall, the highest credit in part **(e)** was earned by those candidates who had the understanding, as well as the knowledge, to give answers that were focused on what the question was about.

Overall in **Question 5** what discriminated most between answer quality and candidate performance was the amount of supporting detail in the questions worth 4 marks or more, notably **(b)(i)**, **(c)**, **(d)(iii)** and **(e)**.

### Question 6

In answers to part **(a)(i)** many candidates gained full credit. Among candidates who made one or more mistakes, careless reading of the question rather than an inability to read and understand the graph appeared to be the greater problem. For example, Middle East was the most common incorrect answer to number 3, most likely because the candidate had not homed in on the key question words 'greatest' and 'increase'.

Most candidates gained credit for correctly stating one of the two differences between the Middle East and the four other regions for the mark in **(ii)**.

In part **(iii)** the question actually set was about differences in rates of improvement between developing world regions. Many answers gained little credit as they were incorrectly about differences between developed and developing countries. A few candidates gave answers correctly focused on differences in wealth and levels of economic development between industrialising South east Asia and oil rich countries in the Middle East, compared with the economic stagnation and political instability in Sub-Saharan Africa.

Both cholera and typhoid needed to be separated out from the other diseases for credit in **(b)(i)** to be awarded, as was successfully done by many candidates. This left bilharzia (water-based using the syllabus description) and malaria (water-bred) to be described in **(b)(ii)**. Most candidates gained full credit here. Partial credit was gained by a few candidates in the second part (following a partly correct answer in the first part) for accurate description of either bilharzia or malaria.

The answers to part **(b)(iii)** that gained most credit came from candidates who acted on the question requirement to identify people and groups of people. By including references to poor people, people in rural areas, young and old people such candidates were able to offer a range of different reasons for the high risks from water-related diseases. Partial credit was gained by more general answers about developing countries and their lack of access to clean water, which had been referred to at the start of **Question 2**. Without references to people, candidates found it difficult to earn much credit.

What was most likely to be included in the flow diagram about family poverty in **(b)(iv)** was 'too weak to work' followed by 'less food grown' or 'less income' (or similar), gaining full credit. All other reasonable possibilities were accepted, provided that they followed and continued the sequence to lead into family poverty. A significant number of candidates used 'unable to afford medical treatment' or similar in the first box, followed by 'unable to work' in the second box, again gaining full credit. A minority of candidates who put 'people die' in the first box, struggled to keep the flow going in the second box to lead into 'family poverty'; thus gaining partial credit. Some such candidates referred in the second box referred to the problems for their survivors and gained full credit. Most candidates gained full credit.

Most candidates used the information given in the report to answer part **(c)(i)** and gained most or all of the credit available.

The best answers to **(c)(ii)** were given by those who used a logical order to describe, basically beginning with the solar panel driving the motor and working towards the storage and distribution. Candidates who did not adopt this approach tended to give incomplete answers and gain only partial credit.

In **(c)(iii)** some candidates gained most or all of the credit by referring to both sustainable (usually renewable energy source and water store topped up by tropical rains) and unsustainable (possible mechanical breakdown and water overuse) aspects of the solution. Some candidates tried to base their responses purely around the word 'sustainable' without deeper consideration, gaining only partial credit. For example, solar power was stated as sustainable without any further explanation as to what made it sustainable, such as being a renewable energy source given that sunlight is natural and is always going to be available.

The answers to **(d)(i)** that gained most credit were based on what was shown in the map and what could be interpreted from it, using knowledge from the syllabus about large dams. Such answers, for example, suggested that the Himalayas, shown with peaks above 7000 metres high, would be a very large water source from high rainfall or ice and snow melt. These answers also noted that, being so close to land above 2000 metres it was also likely that river valleys would be deep and steep. Finally, such answers suggested that the confluence of two rivers just above the dam position reinforces either of the preceding ideas. Many candidates gained partial credit for partial answers containing some of these ideas. Some candidates gained full credit for more complete answers.

Full credit was achieved by many candidates in **(d)(ii)**.

When answering part **(iii)**, the candidates who gained most credit appreciated the question context of 'after the construction of the dam'. Such answers included references to both economic and social disadvantages, gaining only partial credit if one or other was omitted. The candidates who gained most credit normally added explanatory comments to the statements made by villagers. Some other candidates assumed that the question was about displacement of local people to allow dam construction and thus earned little or no credit.

In **(d)(iv)** most credit was awarded to candidates who used information from the comment by the government official and integrated this with understanding gained from having studied examples of large dams elsewhere. Partial credit was gained by candidates who, having realised that the government official's comment was the starting point, were then unable to take the explanation further.

Part **(d)(v)** generated a wide range of answers, most supporting the view. Some candidates moved the discussion away from water supply issues in Delhi and concentrated either on urban problems in Delhi that had been made worse, or on the risks from reduced food output in rural areas, gaining full credit. Many candidates gained little or no credit for discussions about water supply in Delhi. A few candidates gained credit for opposing the view by arguing that urban areas were better placed for economic growth than rural areas. Such candidates pointed out that essential services could be provided more cheaply and easily than in remote rural areas.

Many candidates showed in **(d)(vi)** that they understood how a reduction in the volume of river water led to higher concentrations of pollutants, gained much of the credit. Some of these candidates gained full credit for further detail, either by looking for other possible sources of pollutants such from an extension of farming after irrigation, or by examining the consequences of reduced water flow in more detail. Little credit was gained by candidates who relied heavily upon the source information so that any elaboration was limited.

Overall the standard of answers given to **Question 6** was comparable with that for **Question 5** and **Section A**. Again, the longer questions proved more demanding for less well prepared candidates.



# ENVIRONMENTAL MANAGEMENT

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Paper 5014/12

Paper 12

## Key messages

Plan carefully your use of examination time. Spend no more than 45 minutes answering the four short questions in **Section A**; in **Section B**, spend no more than 45 minutes answering **Question 5**, so that 45 minutes remain to answer **Question 6**.

Only short, precise answers are needed to questions in **Section A**. Try to make the number of different points or reasons to the number of marks for the question. Do not extend answers beyond the number of lines left for answering to reduce the chances of running out of time before finishing all parts of **Question 6**.

Longer answers, supported by elaboration and / or examples may be expected to some questions in **Section B**. Always be guided by the number of marks as to the amount of detail needed.

Read each question more than once; underline key question words, especially the command words, the words which tell candidates what to do.

Make sure that all parts of the question are covered in the answer.

Do not begin by repeating the question. Sometimes this filled the first two lines of the answer. Begin the answer straight away. This makes it more likely that a full answer to the question has been given by the time all the lines for answering have been filled.

## General comments

There was no evidence of lack of time for candidates of all abilities. The standard of answers was similar in **Sections A** and **B**.

There were a few cases of candidates failing to complete all the later parts of **Question 6**. In such cases, the short questions in **Section A** and some parts of **Question 5** in **Section B** contained too much detail for the nature of the questions and number of marks available before these candidates belatedly became aware of time pressures. Careful planning of use of examination time is essential, especially by more able candidates with good understanding and plentiful knowledge.

Within **Section B**, candidates were most comfortable with all the questions in **5(c)** (pages 12 and 13), and in **6(d)–(f)** (pages 20 to 23). Parts of **5(e)** and **(f)** proved to be more challenging. Perhaps **Questions 5(e)(iii)** and **(iv)** were the two most difficult questions of all. Many candidates tried to relate their answers in **5(e)(iii)** to the world price of oil. In the next part, **5(e)(iv)**, most made too little use of the graph; they found it difficult to appreciate how the world price of oil could affect the likelihood or otherwise of alternative ways of electricity generation being used more widely. While the vast majority identified nuclear as the energy being assessed in **5(f)(i)**, many did no more than repeat everything from the table beginning with 'not renewable', 'no carbon emissions', without ever adding any further explanatory comments.

## Comments on specific questions

### Section A

#### Question 1

Sectors drawn on the map in **(a)(i)** were nearly always correct. A few candidates, who for ease and convenience showed the 25% for Europe and Eurasia as the first sector after the 12 o'clock line, then failed to reverse the order of shading from the key, gaining only partial credit.

In part **(ii)**, any value between 2.5% and 3.5% was accepted, since the question asked for 'approximate percentage'.

Within each of the factors for HEP production named in the table in **(b)** there was a wide choice of acceptable answers. This meant that answers earning full credit were quite common. In answers gaining partial credit, it tended to be geology which was known least well.

Candidates had many valid reasons to choose from, both human and environmental, for explaining why people object to plans for new HEP schemes in their area in **(c)**. Many looked for and stated three reasons having taken into account that the question was worth three marks. A few candidates unnecessarily gave many more than three.

#### Question 2

Candidates who studied the values to be plotted before deciding upon the size of their vertical scale in **(a)(i)** most often gained full credit, by making one large square represent 30 million; this allowed all three bars to stop on a bold line on the graph paper. Limited credit could be gained by candidates who either tried to draw a graph with an uneven scale, or began their scale at a value close to 90 rather than from zero.

Full credit was gained in **(a)(ii)** by candidates giving any two from: quotas; fish that were too small; non-commercial species. Most candidates attempted to give two reasons although not all gained full credit.

In **(b)(i)**, most candidates gained partial credit by linking subsistence fishing and fish as an important source of food for the fisherman and his family. However, such candidates continued with irrelevant material such as referring to selling surpluses and bringing in an income. More relevant answers which gained more credit were either about high protein value of fish or areas where alternatives to fishing, such as farming, are difficult.

Nearly all candidates could give a reason for why it is difficult to prevent illegal fishing in **(b)(ii)**. Size of the oceans and seas, high costs of enforcement and non-cooperation from fishermen were the answers seen most often.

Problems caused by overfishing were well known and understood in **(c)** in which many candidates gained credit. As in the final part of the previous question, a few candidates wasted time giving far more detail than the mark allocation demanded.

#### Question 3

In **(a)**, most candidates gained credit.

Most candidates gained credit for day 13 or 14 for the cyclone in **(b)(i)**.

Fewer candidates gained credit for recognising a period with high pressure in **(b)(ii)**, largely by stating only one day rather than a period of days. The period of high pressure extended from about day 21 to day 40; any period of five or more days within this period gained credit.

To gain credit in part **(c)(i)** required understanding in order to give the correct sequence in the flow diagram. Candidates with less complete understanding gained partial credit for getting some items correctly sequenced.

In part **(c)(ii)** a wide range of different answers gained credit. Answers including identification of the difficulties and their elaboration or exemplification gained most credit. Relevant difficulties included social, economic and environmental. Many candidates concentrated on a limited range of difficulties, such as some



relating to agriculture or to health, without looking more widely, gaining partial credit. There were fewer examples of over-extended answers.

#### Question 4

In **(a)**, many candidates gained credit, but other candidates incorrectly answered 1.8, the difference instead of 'How many times'.

In **(b)** most credit was gained by candidates who made direct links between the 'percentage of population' values for different age groups given in the table and the shape of the population pyramid for Honduras. For example: '38% under 14 caused the wide base' or 'only 4% over 64 led to the narrow top of the pyramid'. Candidates gaining full credit were most likely to note that the middle age group was the largest (58%), but that it was spread over more years. Some candidates tried to base their answers upon other data in the table, such as high growth rate and low income, earning little credit. Other candidates gave general answers about population pyramids, with little or no reference to the population data for Honduras, again earning little credit.

Most candidates realised that the data for Sweden suggested an ageing population, even if this was not always explicitly stated in part **(c)**. Candidates who began by stating this were the ones most likely to give sufficient supporting explanation to gain full credit. In contrast, many other candidates concentrated their answers around the 66% in the age group between 15 and 64 years, commenting on the plentiful number of current workers suggested by this, gaining, at best, partial credit since little or nothing was said about the 'in the future' indicated by the question.

In answers gaining full credit in part **(d)**, ways were separately identified, such as from various types of aid, more fair trade or new sources of income such as tourism. Without the structure to answering given by doing this, answers tended to be made up of individual ways to help, which were typically worth only partial credit.

#### Section B

#### Question 5

Many candidates correctly gave the total world energy demand in **(a)(i)**. Other candidates' careless reading of the question led to some candidates incorrectly giving the total value for oil in 2010 for which they received no credit.

In **(a)(ii)** Many candidates gave the correct answer with very few incorrect answers.

There were some really good answers to part **(a)(iii)** from candidates who focused both on describing from the graph, and on the question theme of the importance of oil. Not only did such candidates realise that oil was the most used individual energy source at all three dates, but they also recognised that its relative importance within the total was declining as use of other sources increased. Sometimes such candidates used ratios or percentages in support as a way of relating amount of oil used to total world energy demand. Less credit was given to other candidates who concentrated on the increased use of oil and used values from the graph in support. Most candidates gave the bare minimum graph description and relied too heavily on vague statements unsupported by graph evidence, gaining only partial credit. A few candidates referred to total energy demand rather than oil, which usually resulted in no credit being awarded.

Full credit was given in **(b)(i)** for some candidates who referred to petrol and diesel as the basis for most modern forms of land and sea transport, followed by one of its many advantages for transport over other energy sources, such as its cheapness, ease of use as a liquid, or the fact that modern forms of transport have been developed to run on oil based fuels. Many candidates concentrated instead on the great increase in transport worldwide and did not cover the main material of the question gaining, at best, partial credit.

Most candidates gained credit in **(b)(ii)** by establishing that more alternatives were available that were suitable for generating electricity. Some of these answers were continued by giving advantages of using alternatives such as lower levels of air pollution gaining full credit. The importance of coal in generating electricity in many countries was widely known by candidates.

Many candidates gained full credit in **(c)(i) – (c)(iii)**. Some candidates incorrectly labelled 'hole in the ozone layer' instead of global warming in part **(i)**, gaining no credit.

In **(c)(iv)**, most candidates understood what the question wanted and gained most or all of the credit by explaining in the same order as in the question, namely local, then international, and finally global effects. Other candidates took a less organized approach and gained less credit.

In **(c)(v)** virtually all candidates, in their own words, emphasised how greatly traffic emissions can be reduced by using buses instead of cars and recognised that the government of Dubai wanted people to give up their cars and travel by public transport.

'Another way', other than public transport, was needed in part **(c)(vi)**. The most popular choice was catalytic converters on vehicle exhausts; there was a good level of knowledge about how these worked to reduce dangerous emission giving many candidates full credit. Use of cleaner fuels such as compressed natural gas (CNG) was another popular choice through which some candidates gained full credit. Some other candidates referred to traffic management schemes, such as restrictions on city car entry or car use.

A good choice of city or country in **(d)(i)**, allowed specific and detailed answers to **(d)(ii)**. Many such candidates were able to gain full credit by giving precise reasons, including both physical and human, for the notoriously high levels of air pollution in the selected city. The choice of Los Angeles, for example, led many candidates for gain all or most of the credit as candidates referred to high levels of car ownership, dry climate dominated by high pressure and regular temperature inversions, and lowland relief surrounded by mountains. The choice of China, or a major city within the candidate's own country permitted other candidates to gain most of the available credit. In such answers, the details given clearly matched the choice of city, but a common omission was lack of a reference to a physical factor favouring air pollution. Answers with limited coverage, or with a mis-match between reasons given and the choice of city or country were worth less credit.

In **(e)(i)** many candidates made it clear, either from a statement or from values quoted from the graph, that they knew that oil, coal and natural gas were the three fossil fuels. For such candidates, all relevant statements could then be credited. Many of these candidates did in fact make productive use of the graph of world energy demand, for example, giving percentage contributions to the total from fossil fuels which showed a progressive decline from 1990 to 2030. Some candidates were unable to identify the fossil fuels and gained no credit. Some answers were about all the energy sources in the table, others were about oil only. A few included references to only two of the three fossil fuels and could gain only partial credit.

In **(e)(ii)** candidates gained credit for drawing a line at 75 from top to bottom in the graph. Shorter vertical lines at 75 were also given credit. Some candidates gained no credit either by leaving the graph blank or by giving incorrect or ambiguous marks on the graph.

Question **(e)(iii)** proved, as anticipated, demanding for many candidates. Full credit was gained by candidates who understood the idea, referring to factors such as location, ease of access, costs of labour and materials, and technology and its availability. Some of the answers about wind power were, incorrectly, more about day to day variations in wind availability rather than variable long-term suitability of locations for high and regular wind speeds. Many answers based on nuclear power were about local raw material supplies, which only form a very small proportion of the total costs of nuclear power generation.

Some of the answers to **(e)(iv)** were given without any references to the graph during the discussion of possibilities for more wind and nuclear use. These answers were given partial credit because the question asked for use of knowledge as well as the graph. Some candidates showed that they understood that from the graph, only onshore wind could be competitive with oil at a world price of \$75 per barrel. Such candidates were in a strong position to answer the question, whatever their view about how likely it was that new wind and nuclear power stations would be built and such answers gained most or all of the available credit. A view expressed as 'unlikely' led to answers dominated by economic reasoning. A view expressed as 'likely' tended to be based on other factors, such as less polluting and longer lasting.

Most candidates gained credit in **(f)(i)**.

In **(f)(ii)** candidates who stated first the assessments which meant that it could not be wind (such as being weather dependent) and oil (such as emissions of carbon dioxide) gained credit. The candidates who then added to the information already given to explain why it was nuclear power (such as not fully sustainable because uranium is needed or not safe because of radiation) gained more credit up to the maximum available. Candidates, who re-stated without explanation or elaboration, the terms given in the Energy assessment table, gained little or no credit.

## Question 6

Most candidates gained credit in **(a)(i)** with an answer of 1990-2010. Those who did not gain credit typically stated only one of the dates (1990 or 2010) rather than the 20 year period asked for.

There were many clear, precise answers to **(a)(ii)** supported by the use of key percentages gaining much credit. Some candidates made it clear that the higher percentage of urban population that had existed in developed countries in 1950 had been replaced by a much higher percentage concentration in developing countries in 2010, gaining full credit. Other candidates lost credit by never actually mentioning the term 'urban' when referring to the population. Reasons for the changes gained no credit as they were irrelevant because the question asks for a description rather than an explanation.

Plotting the world population totals correctly for the three dates in part **(iii)** earned credit for almost all candidates. Most candidates gained credit for plotting the urban populations although some made errors and so did not gain full credit.

Partial credit for answers 'urban growth' were more common than full credit answers 'increased percentage of the population living in urban areas' in part **(a)(iv)**, even though candidates had just plotted these percentages on the graph. Once again there were quite a number of answers in which 'urban' was never mentioned, reducing the potential credit.

Candidates had plenty of choice of content for answering part **(b)**. Those candidates who included natural increase and migration, developing and developed in their answers had little trouble gaining full credit. Many candidates were familiar with reasons for high birth rates and rural to urban migration in developing countries. Some candidates made no reference to one of either natural increase or to rural to urban migration which limited credit. A few candidates misread the question and referred to push and pull factors for migration from developing to developed countries which limited credit. Others who correctly addressed both question themes referred only to what was happening in developing countries, ignoring differences with developed countries again limiting credit available.

For the mark in **(c)(i)** the letter **S** needed to be placed in one of the obviously empty spaces, on either side of the river, or on the slopes beyond the factories.

For a full explanation in **(c)(ii)** candidates needed to mention at least one advantage and one disadvantage. Some candidates referred to one without the other, limiting credit. Most of credit-worthy answers were explanations of the advantages and disadvantages of living near the river or near the factories. Stating 'near the factories' as an advantage needed to be qualified by its significance, for example in terms of nearness for finding a job, or low transport costs to reach work in order to gain credit.

In, **(d)(i)** and **(d)(ii)**, candidates were expected to select appropriate answers from the newspaper report, adding some additional comment towards the description of 'stable low-income neighbourhood' in **(ii)**. Most candidates gained all or most of the credit.

In **(d)(iii)** many candidates had few problems identifying and isolating two reasons for the big change, such as the Workers Party, supportive NGOs and local businesses, and police clearing out drug dealers. Some candidates gained little credit for continuing with the same answers as part **(ii)**.

In part **(e)(i)**, answers based on deforestation and high levels of pollution were most common. Differences in credit mainly reflected amount of elaboration, and degree of precision about the types of pollution and their effects. Many candidates concentrated on identifying three different types of environmental damage, with nothing more than a basic statement about each one, gaining only partial credit. Some candidates gave more context to their examples as well as content, gained more credit. References to pollution were only effective when the type of pollution was specified. Some candidates narrowly named only air, water and land pollution, mostly then giving answers that were short on real detail, thus limiting the amount of credit available.

Pleasingly, many candidates gained full credit in part **(e)(ii)** for expressing the idea that when a population increases, its carbon dioxide emissions can be expected to increase as well, the opposite of what has happened in Freiburg – however that understanding is expressed. Some candidates did no more than state what the graph showed, for both population and carbon dioxide and these were given partial credit.

There were plentiful choices on the map for candidates to describe in **(f)(i)**. When describing such material, candidates need to go beyond stating the terms seen on the map and in the question, such as eco-friendly,

renewable and sustainable, in order to gain credit. Most candidates had sufficient understanding to gain at least partial credit for each of their chosen characteristics. Full credit was given to candidates who described more fully, as demanded in the question.

A wide range of options for dealing with urban wastes were named and explained in **(f)(ii)**. Some candidates worked from the trigger on the sketch and referred to waste water treatment first. Others began with recycling. Many of those who referred to landfill went out of their way to describe how the operations could be made more sanitary. The range and amount of content were the main determinants for the amount of credit given. Some answers stopped short of what was needed for full credit. A few candidates referred to methods of waste disposal forgetting that they were supposed to reduce environmental impacts, limiting the credit available. Answers from such candidates were typically landfill based. Taking the rubbish well away from the eco-city to be dumped is not an environmentally friendly solution and could earn no credit.

# ENVIRONMENTAL MANAGEMENT

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Paper 5014/21

Paper 21

## Key Messages

Make effective use of the source materials – these provide the context for the questions in this paper. Make sure that in each question you are using the information given.

Ensure that you understand how to apply the range of mathematical and graphic techniques evident in past examples of examination papers for this syllabus.

## General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country, Borneo. Many candidates understood and made good use of the source material. Written responses were sufficiently clearly expressed to give the examiners confidence 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 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 gave credible consequences of improving educational standards, gaining credit.
- (ii) The advantages of preventing illegal logging proved to be rather harder for candidates to identify clearly. Credit-worthy responses such as the loss of revenue to the government when illegal logging takes place were only suggested by some candidates.
- (b) (i) The majority of candidates chose plan B. To gain maximum credit this needed to be supported by reasons based on the source information rather than simply suggesting that this plan was more accurate or reliable.
- (ii) Most candidates made credit-worthy suggestions and gained appropriate credit.
- (iii) Most candidates correctly suggested that alang-alang absorbed a great deal of water so the seeds of other plants could not germinate.
- (c) (i) Most candidates made the point that yields would be greater with high density planting, earning partial credit. Some of these candidates were able to go on and make a second credit-worthy suggestion.
- (ii) The candidates readily identified at least one reason why processing palm oil into biofuel could be sustainable activity although very few candidates discussed the idea of biofuel being carbon neutral. Suggesting a reason why the activity might not be sustainable proved to be more demanding with loss of soil fertility being the most frequently seen answer that gained credit.

- (iii) and (iv) The term biodiversity was well understood by most candidates as were the advantages of maintaining biodiversity, so many candidates gained full credit.
- (d) The graph was usually correctly plotted and labelled gaining full credit. The most common error was to place years on the y axis, limiting the candidate to partial credit.
- (ii) The harvest estimates from the graph were nearly always correct so almost all candidates gained credit.
- (iii) Candidates needed to express the idea that the cost of increased fertiliser needs to be less than the increase in price of palm oil. Many candidates made this point and gained credit but there were some answers that implied that the cost of fertiliser would always be worthwhile which did not gain credit.
- (iv) The table was nearly always correctly completed so most candidates gained full credit.
- (v) The calculation of percentage increase in average weight proved demanding, but some candidates gained credit. The difference in average weight must be expressed as a percentage of the original weight.
- (vi) Most candidates identified a good advantages of heavier bunches of fruit, gaining credit.
- (e) The benefits of agro-forestry were explained well from the point of view of the farmer, so that candidates gained credit. However from the point of the environment the answers given were frequently too vague to gain credit. There was a tendency to quote some source information without any further qualification which does not gain credit. Some candidates gained full credit on this question, but the majority gained only partial credit.

## Question 2

- (a) (i) Most candidates suggested some reasons for increased flooding events. However, full credit was only awarded to a minority of candidates. These candidates correctly described a sequence of events leading to flooding.
- (ii) The destruction of infrastructure, or the long time needed to repair it, was appreciated by some candidates, earning credit. Other candidates suggested soil erosion, also earning credit.
- (iii) Some candidates appreciated that opencast mining creates coal dust which leads to breathing problems and lung infections, earning the credit. There were many suggestions that there would be an increase in malaria, this of course does not give rise to lung infections and did not gain credit.
- (iv) The comparisons were usually clearly given as stated in the mark scheme, thus earning credit.
- (b) (i) Most candidates gave at least one way in which the surveys should be carried out in the same way to allow a fair comparison between 2009 and 2012, thus earning partial credit.
- (ii) Knowledge of the role of mosquitoes in spreading malaria was seen in nearly all answers, allowing candidates to earn credit.

## Question 3

- (a) (i) The calculation of the cost per tonne was usually correctly completed so most candidates gained credit.
- (ii) Most candidates gained credit by selecting the appropriate information from the graph and showing that it was profitable to mine in December 2005.
- (iii) Nearly all the candidates gained credit as they identified by inspection of the graph when the mine was most profitable.



- (b) (i)** Many candidates described environmental damage in general terms and gained little or no credit. The question clearly asks for examples shown in the sketch. Some candidates did carefully look at the sketch, as asked, and identify specific changes, earning full credit.
- (ii)** Most candidates gave an opinion as to whether the environmental damage was long lasting or not, but it was not for the opinion that the credit was given. Some candidates did back up their answers with specific information from the sketches, earning partial credit for one piece of evidence, and needing to give two pieces of evidence to earn full credit. The source information was underused by most candidates.
- (iii)** Nearly all the candidates suggested simple survey methods without any real detail, earning partial credit if they gave one practical detail. The examiners were looking for any sensible method that related to the sketches. Some candidates did give two valid details and earned full credit, between them covering all the points in the mark scheme.
- (c) (i)** There were many good attempts to justify the proposed mine, earning much of the credit available. The examiners were pleased to see evidence of thoughtful evaluation of each mine. The best answers gained full credit.
- (ii)** Most candidates gave good reasons for protecting the national park, gaining partial or full credit. Some candidates gave correct general answers which were given credit. Other candidates made similar points, but made them specific to the situation in Kalimantan and were also given credit.

# ENVIRONMENTAL MANAGEMENT

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Paper 5014/22

Paper 22

## Key Messages

The source materials provide the context for the questions in this paper. Ensure that you are effectively using the information given in every question.

Make sure that you know how to use the range of graphical and mathematical techniques seen in past examination papers set for this syllabus.

## General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country, Australia. 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 some candidates.

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

Overall the pattern of this paper is 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 calculated 20%, earning the credit available.
- (ii) Most candidates gave credible suggestions concerning the advantages of a large coalfield to the state of Queensland and Australia, gaining full credit.
- (b) (i) This question required the candidate to inspect the data given carefully and to give the one correct answer. Most candidates did this, but a surprisingly large number of careless mistakes and errors occurred, so that candidates lost credit.
- (ii) Again, this was correctly done by most candidates, but the expected answer was not stated as frequently as expected, both by candidates giving the incorrect month, but also, more puzzlingly, some candidates who gave answers which appeared unrelated to the question asked.
- (iii) The table presented gave four sets of weather data, only one set representing the weather leading to the worst flooding for 100 years. Some candidates clearly inspected the data and made a correct selection, earning credit. In other cases the first row was selected apparently without regard to the data given.
- (iv) The consequences of flooding on mining were well described by most candidates, earning credit. There were a few inappropriate descriptions of soil erosion which did not gain credit.
- (c) (i) Some candidates have clearly had practice in designing and carrying out such questionnaires and therefore made good suggestions and earned credit so that all the marking points were given by at least some candidates.. However, most candidates did not make sensible suggestions as to how to carry out a survey using a questionnaire. For example, it is usual to ask a sample of people

(which was credited) and not to ask all of the people locally (which is likely to be a very large number, and was not credited).

- (ii) Some candidates noted that the data in the table was in percentages and gave precise and detailed instructions how to calculate the percentages, gaining full credit. Many candidates suggested finding the average for each questionnaire answer, suggesting that they had not looked back to see what form the data should be in.
  - (iii) Most candidates gave credible answers to explain why so many people wanted the new coalfield to be developed. The need for employment being a greater concern than for the environment was the most commonly cited reason.
- (d) (i) The sequence of events leading to salinisation was correctly selected by the majority of candidates. In some cases the order of events was only partially correct, gaining only partial credit, but very few candidates failed to gain at least some credit.
- (ii) There were a wide range of suggestions to explain why the plants die in salty conditions. Some candidates correctly explained the principle of osmosis drawing water out of the roots towards the salty solution, earning credit. Many candidates gave incorrect suggestions about a failure to absorb nutrients.
- (e) (i) Nearly all the graphs were clearly plotted and the examiners were pleased to see that both axes were fully labelled by the majority of candidates so that most candidates gained full credit.
- (ii) From the candidate's own graph, the estimation of the yield of crop for the following year was usually 8.7 and nearly all answers were within the accepted range so that almost all candidates gained credit.
  - (iii) The economic need for careful use of fertilisers was clearly understood by candidates, so that most gained credit. A few candidates found it difficult to express their ideas sufficiently clearly to gain credit.
  - (iv) The events following nitrate and phosphate enrichment of water were well known by most candidates. All the points on the marks scheme were described by candidates many of whom gained most or all of the credit available. The only confusion that appeared was that, incorrectly, plants die from lack of oxygen rather than, correctly, lack of light, which lost some candidates credit. Only a few candidates recognised that bacteria are responsible for the decomposition (and therefore the deoxygenation).

## Question 2

- (a) (i) Most candidates understood the meaning of biodiversity. The number or variety of different species was required to gain credit rather than the number of different animal or plants and animals.
- (ii) Candidates were asked to describe a method for carrying out a fish survey. All the points on the mark scheme were given in some answers. A surprisingly small proportion of candidates gained credit by suggesting measurement of the mass, length and sexual maturity in a repeatable manner. More candidates just gave vague suggestions like 'count them' that could be given little or no credit.
- (iii) There were a wide range of credible suggestions as to the advantages the no fish zone to Queensland and Australia, earning many candidates credit. The object of this conservation measure was not to start exporting fish as a few candidates suggested, earning no credit.
- (iv) Many candidates realised that the details of fishing net construction were important and gained much or all of the credit, showing that they know this topic well. However a statement that large nets should be used did not make sense in context and could not gain credit. The examiners cannot assume that 'large nets' - which has a very clear incorrect meaning - actually means that the nets should have large holes. Similarly, statements about small nets without further detail could not be given credit. Most candidates got the credit for the restriction, but in some cases the reason for the restriction was not very clearly described. .

- (b) This question proved to be more demanding than expected suggesting that many candidates did not read the passage before the question, which contained the key piece of information that sea water may get too hot. Some candidates referred to burning fossil fuels leading to increased carbon dioxide levels and the greenhouse effect or global warming, earning credit. Other candidates incorrectly suggested a very wide range of possible causes for warming the oceans which was surprising given current global interest in global warming.
- (ii) Candidates were equally divided between credible answers along the lines indicated in the mark scheme gaining them credit. There were other vague answers about 'accuracy' that could not gain credit without further qualification.
- (iii) The question described an example of mutualism or symbiosis. Some candidates used these terms and gained credit. Other candidates gave clear descriptions of how each organism benefits from the association which also gained credit. However, some candidates just repeated the information given without any further detail or discussion which could not gain credit.
- (c) (i) and (ii) The changes in food chain were well understood by nearly all candidates, most gaining full credit..

### Question 3

- (a) (i) Nearly all the candidates used the information about cane toads and their prey to give sensible reasons why the cane toads failed to control the beetle, earning at least partial credit. Only some of the candidates gave a third possible reason, gaining full credit. Almost all candidates at least tried to answer the question.
- (ii) The table was completed successfully by most candidates.
- (iii) The average was correctly calculated by most candidates.
- (b) (i) The examiners were pleased to see that most candidates drew neat tables with correct headings, earning at least partial credit. To gain full credit, candidates were expected to convert and present the tallies correctly and accurately. A small number of candidates did not make use of the information provided to arrive at the correct numbers for their table.
- (ii) Some candidates used the information given to explain, in their own words, why the cane toad has become a serious pest in Queensland. There were some very thoughtful answers gaining all or most of the credit. All the points in the mark scheme were suggested in at least some answers. Many candidates, however, just repeated the source information without any further explanation. The examiners do expect to see information extracted from the source but candidates are expected to add some of their own thoughts and express these thoughts and factual material from the source, in their own words, in order to gain credit.