

ENVIRONMENTAL MANAGEMENT

Paper 8291/01

Paper 1

General comments

This November's session showed a similar pattern of marks to that of last May. A slight increase in the number of candidates elicited a range of marks from 12 to 64 with a mean in the lower 40's. Unlike the May session the overall pattern was less polarised with the majority of Centres achieving a broad spread of marks.

Whilst candidate's performances varied according to their ability there were some notable positives in this examination:

- in **Question 3** particularly, excellent use was made of case studies
- for most Centres there was a marked improvement in the answering of 'atmosphere' questions
- all candidates are to be commended on the quality of their written English and the presentation of their answers.

Comments on specific questions

Section A

Question 1

The focus of this question was renewable and non-renewable resources, with particular reference to land and energy. In general candidates responded well to the data and marks ranged from 8 to 18 out of the 20 available.

- (a) Oddly this part posed more difficulties than the remainder of the question. Many ignored the need to refer to land as a resource and instead elaborated upon almost the whole range of resources. There were a small number of land related answers with soil fertility being the focus of the answer.
- (b) A straightforward question involving the extraction of detail from a bar graph of population for six cities. Many candidates achieved full marks.
- (c) This involved the impact of the growth of Sao Paulo upon land with its built-up area and the area immediately surrounding it. The first part proved to more difficult than the second. Urban growth on the scale of Sao Paulo would have a variety of effects, frequently detrimental to the environment:
- the inner zone would experience the effects of traffic, population and building congestion with its concomitant contributions to atmospheric, land and water pollution.
 - the area between the built up area and the edge of the metropolitan area would experience loss of rural or non-urban land, increases in pollution and the effects of constructing an urban infra-structure.
- (d) It was pleasing that the data provided in Figure 3 encouraged many candidates to assess the sustainable use of energy in such a positive way. Most candidates made effective evaluations of Brazil's use of non-renewable and renewable energy. Some sought to argue that Brazil's policies were sustainable whilst others argued the opposite; in both instances there was some accurate justification.

Question 2

It is a well known feature of environmental science and environmental management examinations that candidates find weather studies difficult. However on this occasion many answers were more secure than in previous sessions.

- (a) (i) Like **Question 1**, this earliest part of the question proved to be the most difficult. Only a couple of candidates describe how the length of day and night is a product of latitude and the curvature of the Earth. Most answers confused differences in rates of insolation with day and night and some even sought to justify place B (equator) as having longer daytime than place A; actually place A would receive 24 hours of daylight as the sun would not disappear from the horizon.
- (ii) This question required candidates to describe the greater concentration of energy in the equatorial area in contrast with less energy per unit area in the arctic. Distance only becomes a relevant factor in terms of increased reflection, deflection and absorption in higher latitudes. Too many answers incorrectly dwelt on the distance of the Earth from the sun.
- (b) (i) There was quite a wide variation in quality. About 50% of the answers correctly stated the energy budget is the difference between incoming and outgoing radiation. Some had very little understanding of the term energy budget and some sought to explain it in 'financial' terms e.g. the cost of energy.
- (ii) A correct interpretation of **part (i)** invariably led to adequate answers to **part (ii)**. Whilst most answers related higher rates of insolation at point Y and lower rates at X very few accurately accounted for the differences in energy loss.
- (iii) This part proved to be quite an effective discriminator between candidates. The question needed reference to the horizontal transfer of energy between latitudes. This is mainly achieved by winds/air masses and ocean currents. Those candidates who achieved full marks for this question stated both factors and for each gave examples.
- (c) Most candidates coped quite well with what is quite a complex depiction of the likely impact of enhanced global warming. Marks of between 4 and 6 were achieved by making clear references to locations on the map and relation with both temperature and precipitation changes. Some very good answers drew out the link between increased evaporation with increases in precipitation.

Section B

As with the May session candidates are quite enthusiastically taking up the opportunity of developing their personal interests in aspects of environmental management. The three question topics of this November session were successful in testing a combination of environmental knowledge as well as the understanding of managing environmental issues.

In this session, **Question 3** to be the most popular with Questions 4 and 5 equally balanced. In the majority of answers candidates attempted to make good use of exemplar material and present both parts of their chosen question in a logical and relevant form.

Question 3

Plate tectonics has always proven to be a popular topic but not always well answered. It seems that candidates heeded the advice of using case studies and had a much clearer understanding of plate tectonics.

- (a) Using maps showing the location of continents in Triassic times and the present day proved to be a useful prompt. Most were able to select and least two pieces of evidence that lent support to plate movement. The most popular selections were the jigsaw fit, palaeontological evidence and cross continental similarities in fauna and flora. Although most candidates identified the evidence there was some variation in the quality of their elaboration.

- (b) This question fell into two parts. The first a description and explanation of a volcanic event, and the second an assessment of the recovery of the affected area. The most popular choices were the eruption of Pinatubo and the Kobe earthquake. It was important to come up with an answer that was specific to the tectonic event and marks were occasionally lost because of general accounts that could apply to any tectonic event.

The second part of this question was less well answered. The question was concerned with post event recovery which includes rescue, aid, evacuation and medical assistance etc. Preventative measures such as pre-event seismicity, building construction and evacuation planning needed to be in the context of recovery. Top quality answers were achieved where the candidate made either a positive or negative evaluation of the recovery measures

Question 4

This was not a very popular question and proved to be one that candidates found difficult; the major weakness being an inability to confine the answer to atmospheric pollution in urban areas. Many answers either ignored the requirement for atmospheric pollution or reviewed global pollution rather than urban areas. Only a small number used illustrative examples.

- (a) Whilst most candidates were able to list three forms of urban pollution not all answers were followed up with descriptions of sources and effects. Noise, carbon monoxide and industrial pollutants such as SO₂ and NO_x formed the more popular choices but as stated were not always followed up. The small number of very weak answers did not consider atmospheric pollution and suffered from irrelevance. The mark scheme contains a detailed content for this question.
- (b) There were some very good answers to this question. Here, one or more urban areas were selected, for which, a number of ways in which urban pollution is being fought were described. These answers assessed such strategies as: reducing industrial and power station emissions; urban traffic policies and controlling urban domestic waste.

Unfortunately a significant number of answers were very general and described the role of international agreements in dealing with pollution. These answers achieved some credit when urban areas were brought into the discussion but in the main such an approach was self-penalising.

Question 5

Although not the most popular question, it did elicit some very good answers. Answers were generally well balanced with effective inputs into both parts.

- (a) Most answers focused upon the troposphere, stratosphere and mesosphere. As Fig. 5.1 provided information on altitude and temperature a good quality answer could be derived from correctly locating the three layers. There were some excellent descriptions of the characteristics of each layer and many candidates went well beyond the content of Fig. 5.1. Such answers elaborated upon the weather and temperature conditions within the troposphere, the importance of ozone in the stratosphere in some instances electromagnetic radiation in the mesosphere.
- (b) Although it was intended to give candidates a wide choice, answers tended to focus upon global warming and ozone depletion. It was also possible to select from increased acidity, urban heat islands; photochemical smog and climatic change: all of which represent modifications of atmospheric processes. Unlike previous sessions there was little confusion between global warming and ozone depletion and candidates drew upon a wide range of evidence in connection with current and future trends.

Explaining the importance of international agreements aimed at managing atmospheric issues was less well done. Although there were some excellent references to Rio, Kyoto and Montreal some answers were very general and did not make reference to examples of supportive and non-supportive nations

Conclusion

There is much to commend from this November's paper. Notably many candidates made effective use of their time on the case studies and the atmosphere questions were approached with greater confidence. Candidates used their time well and there was a good balance between **Section A** and **Section B**. There were no run-on errors. The quality of written English continues to improve and it is pleasing that the **Section B** questions seem to be popular.

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Paper 2

General comments

The general level of performance for this paper showed a similar level of performance to that on Paper 1. There was a fairly even balance of performance between **sections A** and **B**. In **Section B, Question 5** proved to be the more popular with **Question 3** and **4** attracting a similar number. Most candidates seem to have spent their time appropriately between each section. For both sections answers were clearly presented and the quality of essays continues to improve.

There were no rubric errors.

Comments on specific questions

Section A

Question 1

This question lies firmly within the ecology and ecological management section of the syllabus. The question moved from a brief analysis of the tropical rain forest system in **parts (a)** and **(b)**, into a strategy that could be adopted to conserve an area of woodland. Candidates did not find this question as straightforward as expected and whilst there were some excellent answers there were a significant number of 'patchy' responses. For most candidates **part (a)** proved to be the most difficult.

- (a) (i)** Unfortunately very few candidates correctly inserted labelled vegetation layers; the most common choice being the upper canopy. Little direct use was made of Fig.1.1
- (ii)** The fundamental problem associated with this part was that very few candidates seemed to make use of Fig.1.1 which was a requirement of the question. Some listed marine ecosystems and referred to generalities such as terrestrial or aquatic; the latter two could be a desert or a lake. Fig.1.1 clearly showed a number of distinct ecosystems such as: river, tree, saprophytes and epiphytes.
- (iii)** This was slightly better answered as some credit could be given for valid generic description that related to Fig 1.1.
- (b)** There were some quite detailed explanations of why tropical rain forest soils are of poor quality. Most picked up leaching and a significant number quoted the biomass as the largest nutrient store as high temperatures and humidity encourage rapid decomposition of litter and take up by the vegetation.
- (c)** The model in Fig 1.4 shows how the zoning of land use around a conservation area aims to prevent intrusion or invasion by human activity.
- (i)** All that was needed here was for candidates to state that the core area of woodland is a relatively untouched ecosystem in need of conservation.
- (iii)** Most candidates achieved 3 and 4 marks by describing the land use of each zone and that the research centre assisted the conservation programme. A smaller number recognised the role of the buffer zones in preventing access to the core and graduating human activity.

Question 2

Performances in **Question 2** were similar to **Question 1** with marks ranging from 5 to 15, with the first parts proving to be more difficult than the latter.

- a (i)** Although using residence times is an unusual way of depicting water storage, it was defined in the question and candidates should have some knowledge of each storage zone. Most candidates made a fairly general statement relating the usefulness of knowing how long water might remain in a store but were uncertain as its advantages compared with stating volumes.
- (ii)** The majority of candidates correctly quoted evaporation and transpiration as the reasons for relatively rapid water loss. A small number described these factors as integral parts of the hydrological cycle; thus rapid water loss and replenishment.
- (iii)** This was less well answered as a significant number of candidates only went as far as stating that reservoirs were useful in dry climates or during periods of drought. Very few mentioned the advantages of a 10 year storage period.
- (iv)** Answers to this 4 mark section were quite varied with descriptions of soil moisture being better than those of groundwater. Good answers mentioned the deep storage of groundwater frequently within aquifers: there were even some good descriptions of confined and unconfined aquifers.
- (b)** There were some excellent answers from candidates who confined themselves to Fig.2.1. In **part (i)** such answers contained: pesticides and fertilisers, and solvents, oil or leachates. Careful use of Fig 2.1 enabled reference to a lowering of the water table and the intrusion of sea water. A number of perceptive candidates realised that less groundwater might lead to a greater concentration of pollutants.
- (c)** Again careful use of the data, this time concerning supplying water to Mexico City, frequently enabled candidates to achieve high marks: significantly **(i)** was better answered than **(ii)**. **Part (ii)** was really about the sustainable supply of water i.e. supply and demand. As Mexico City is expected to continue to grow there are serious issues relating to; aridity, clean supplies and further industrial and domestic demand.

Section B

Questions 5 proved to be more popular than **3** and **4**. Although standards varied, most candidates had left sufficient time for **Section B** and there were some very long answers. As with paper 1 good use was made of case studies that were directly relevant to the question.

Question 3

- (a)** In the past candidates have coped well with the functioning of food webs and chains and it proved to be an interesting departure to use a coral reef ecosystem. It was pleasing that nearly all answers began with the role of solar energy for photosynthesis. Most went on from here to describe each trophic level. Some candidates did not however recognise the complexity of this food web and failed to outline the flow of energy through the system.
- (b)** Pressures on marine ecosystems has been a feature of past examinations and it came as a surprise that there should be such a wide variation in quality. Some excellent answers referred to: over-fishing whaling; oil spills and tanker accidents and industrial pollutants that enter the sea via rivers. Although slightly less secure, the management of human activity was often linked to its particular pressure. Weaker candidates made very general and frequently brief references to the pressures on marine ecosystems and sometimes, managing human activity was not mentioned.

Question 4

This question on population and its management was reasonably well answered with **part (a)** much better answered than **part (b)**.

- (a) The majority of candidates are well versed in the concepts of under, optimum and over population. The linkage between each of these and the supply of resources was generally well developed. Describing the role of technology and the dynamism of the relationship between population and resources was more the province of a small number of candidates.
- (b) In assessing the place of population management in achieving a sustainable future, it is necessary to review the interaction between population change and the resources.
- Population issues can range from over or under population, an ageing or youthful population to migration and gender.
 - Resources can range from food to industrial output, minerals, technology, wealth and education.

Good answers selected an LEDC and an MEDC to assess the relationship between these points. Clearly problems of over-population can be alleviated by family planning and birth control, but, if possible an increase in resource output can also lead to a sustainable future. The former is usually the policy of LEDC's and the latter MEDC's or rapidly developing nations. The more discerning candidates also related issues concerning the ageing populations, of, for example Sweden, Italy and Japan.

Weaker answers reflected an inability to balance the components of the question and were either too brief or very general.

Question 5

This proved to be the most popular **Section B** question. Answers to **part (a)** were generally of good to excellent quality but more varied in **part (b)**.

- (a) Unlike some previous sessions 'eutrophication' did not prove to be problematic. This might be because it is a familiar local environmental issue or a topic that is very well taught and learned; or probably both. Nearly all answers began with the passage of nitrates and phosphates from farms into rivers and then into lakes. This was then followed by descriptions of the growth and spread of algae leading to loss of oxygen and ecological disaster. The variation in the quality of answers was largely down to the depth and accuracy of analysis.
- (b) This was answered with slightly less confidence than **part (a)**. Quite clearly when candidates had a local heavily polluted river to write about, their essays tended to be long and frequently quite passionate; textbook derived examples seemed to be less well developed. Few difficulties were encountered in describing the types and causes of pollution which included from industrial waste, sewage, household rubbish and chemicals used in agriculture.

The second part of this question proved to be more difficult. It was necessary to identify and describe measures that have been or could be used to clean up the selected river. Good answers did this, but some described an entirely different example and the weakest answers omitted this part of the question.

Conclusion

As with paper 1 this biosphere and hydrosphere paper has proved to be an effective test of the candidates' ability, knowledge and understanding of environmental issues. As in previous sessions many candidates were able to empathise with the subject material of the question through their personal experience and studied examples.

The quality of English displayed in this paper was of a high quality and most essays were well structured. There was a fair balance between **Sections A** and **B**, showing that candidates used their time well. There were no rubric errors on this paper.

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School Based Assessment

General comments

This November's entry has seen the submission of research projects of a high average standard. Although most candidates are writing well structured reports, more than has been the norm, exceeded the 2000 words. With Centres from Argentina, Zimbabwe, Nepal and India, the variety of topics almost covered the whole of the syllabus. The quality of written English was of a high standard and most projects contained a balanced combination of text and illustrative material.

The vast majority of candidates investigated local scale issues with some impressive collection and presentation of field data. It is still worthwhile issuing the warning that the overuse of the Internet or textbooks can lead to plagiarism and copying.

Although most Centres conducted their assessment accurately and with diligence there have been some administrative inconsistencies. It is important that the final moderated mark is included on the MS1 form and that an assessment form is completed for each candidate; both of these forms plus the summary form should be submitted with the projects. It is also important that candidates are not awarded credit for criteria that are not present in their report. This particularly applies to assessment criteria, C2 (e) statistical tools and C3(c) the evaluation. It is important that the assessment criteria on pages 10 to 12 of the syllabus are consulted at all stages.

Comments on assessment criteria

The assessment criteria fall into three categories that broadly conform to standard scientific method. Skill C1 targets the initial planning stage of a research project in which the clear establishment of a hypothesis or question is supported by an introductory statement and a clear outline of the methods to be used. Skill C2 involves the presentation of results and their analysis. In drawing together explanations there is a little overlap between skill areas C2 and C3. However the emphasis for C3 should be concluding statements with reference to the data completed, finishing with an evaluation of the conduct of the research; some candidates are still confusing a conclusion with an evaluation.

Skill C1

This formed the better of the three skill areas with nearly all reports beginning with a clear hypothesis or question either within the title or in an introductory paragraph. The majority of hypotheses were quite specific and established an issue or question that could be investigated and tested. The weakest reports invariably lacked this specificity.

Once again some candidates were less clear about specifying the methodology used to undertake the research; often implicit rather than stated. It is helpful for candidates to clearly specify and justify their methodology in order to tighten the latter sections of the report. It follows that the quality of the research benefits from a clear statement of intent.

Skill C2

Of the five criteria nearly all candidates achieved high standards in (c) and (d), with the result that most sampled reports made for interesting and enjoyable reading. The best reports were succinctly written, directly related to the research and data, and organised into distinct sections by chapter headings.

Where primary research or field work had been undertaken, assessment criteria (a) and (b) were frequently achieved the 2 marks available. There were very few very weak projects with the majority containing photographs and well constructed graphs; the analyses of these data were frequently of a high quality. However, to reiterate an issue with Internet data, it is difficult to satisfy criteria (a) and (b) when the data and graphs are copied and pasted. It is worthwhile assembling data that can be effectively used within the conclusion where trends and patterns derived from the results is required

Skill C3

Candidates showed much greater confidence in writing their concluding sections. This is quite a difficult skill area for it must draw together various strands within the report through reference to data included in the report. It is still worth reminding candidates not to worry if their findings disprove their initial hypothesis as the whole point of the conclusion is to make and justify such assessments.

Criteria (b) had better coverage as an expression of knowledge of environmental and management principles were frequently contained within the results analysis as well as the conclusion. Weaker reports tended to be unclear about the environmental trends contained within the data.

Very few candidates constructed an evaluation of their work. For some, an evaluation was confused with a conclusion. Candidates should write a brief assessment of their areas of success and the limitations of the work. Limitations should be supported with some mentioning of possible improvements and areas of success justified.

Conclusion

This section of the examination is an important feature of a candidate's study of environmental management. This session candidates selected research topics that were practical in terms scale, data and balance. These local scale research topics generally utilised locally obtained data and were much better than the very general global topics that sometimes appear.

The trend of there being large entries from single Centres has continued. Inevitably a number of candidates will opt for the same research area. Whilst it can be productive for these candidates to assist each other in their field research, they must produce a final report that is constructed independently of other candidates.

Once again, I must thank Centres for submitting an interesting, well written and in most cases accurately assessed sample of research reports.