

ENVIRONMENTAL SYSTEMS AND SOCIETIES

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 32	33 - 44	45 - 56	57 - 67	68 - 79	80 - 100

Standard level internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 42

General comments

The Internal Assessment moderation for November 2011 was relatively smooth. Centres were by and large very good about assembling their moderation packages in such a way as to facilitate moderation. All centres are using CPN notation and many are including a cover sheet that includes the descriptors and the level achieved by the candidate. Ideally these should come with notes or an indication of why a mark was or was not awarded. This is not only useful for the moderator but for the candidate as well. It is always odd when a moderator reads candidate work and there isn't a single comment on it. This subject report should be read in conjunction with the May report.

There were some really nice practicals this session as well as the more traditional ones. One centre, armed with CO₂ probes for their data logger, looked at CO₂ uptake by plants under different conditions. This is a really nice take on the more classic productivity practical. By boiling the water one can get rid of all CO₂ gas and therefore measure CO₂ uptake with little interference. O₂ has the disadvantage that the percentage available in the atmosphere drives dissolution into the water which is why it's so important when measuring DO that there be no air trapped in the system.

Candidate performance against each criterion

There continue to be some problems in the application of the assessment criteria, and these tend to repeat themselves each session. Although it is understood that not all candidates achieve top marks in IA, it is less easy to understand why the marks are not adjusted by their teachers prior to the work being sent for moderation.

Planning (PI)

Candidates continue to be penalized for not specifically including dependent, independent and controlled variables in aspect 1 of Planning. Rarely were the issues with this aspect associated to

the stating of a focused question, but variables continue to be a problem for candidates. These concepts need to be taught explicitly.

Although there were some problems with aspect 2 of this criterion, by far the common problem is in aspect 3 of planning which measures the candidate's ability to plan a practical that collects **sufficient** relevant data. While the data are usually relevant, often they are not sufficient. As mentioned in previous reports, five is the minimum number of treatments for most practical work. A candidate that plants three plants in each of three fertilizer treatments would not have satisfactorily completed this aspect and would thus earn a partial. In field studies, five quadrats would be the minimum required per site if these are being compared in diversity studies. However, if candidates are running transects and taking one quadrat every five meters, obviously the five quadrat rule would not apply.

Data collection and processing (DCP)

This year there were several candidates that received full marks for tables that could not be properly understood without further investigation into the practical. In theory the table should be able to stand alone. This means an adequate title and appropriate headings. As teachers the context is often clear, but this is not the case for the moderator. If a table cannot be readily understood, the candidate will lose a mark in aspect 1 of this criterion. Aspect 2 of DCP requires that candidates analyze their data. There were a number of practicals which were marked down because the data analysis was weak or missing. For example if a candidate takes the average of five readings for suspended solids at three different locations, they would be expected to calculate the average but also the standard deviation for their data. This level of analysis is required for the course. Additionally if in this same study there were parallel readings for water velocity, calculating the average and standard deviation for both parameters would be good, but it is expected that they be graphed one against the other and a line of best fit drawn for the data if it was warranted. If the candidate was to produce two line graphs of the averages of the two parameters (suspended solids and water velocity) and the data lend themselves for the drawing of a scatter plot, its absence may result in the loss of a mark. For Aspect 3 of DCP candidates often lose marks because as they haven't done any analysis they cannot present processed data. As has been previously mentioned in Subject Reports, there is no Error Carried Forward approach in these aspects. Another group of candidates lost marks even though they had analyzed data because the graphs they presented were of unprocessed data. Finally there were many cases of graphs without labels, or legends which were given full marks by teachers.

Discussion, evaluation and conclusion (DEC)

Aspect 1 of DEC varies enormously from centre to centre. Some candidates produced truly amazing discussions of their work, citing literature, indicating how close their data was to what might be expected or discussed why they thought their data did not support theory, and then discussed the relative reliability of their data. One of the really nice aspects of having candidates calculate standard deviations is that it allows them to enter into the field of discussing the reliability of their data. Although it is not intended that the discussion should turn into a several pages long dissertation, there does need to be a critical look at the quality of the data and how it relates to what is known. Obviously this is not always possible, for example when calculating secondary productivity of a particular insect, a reference figure may not be available. A number of candidates would improve their scores in aspect 2 of DEC simply by indicating that they should have collected more data. It is rare to find a practical that wouldn't improve with more data or by repeating the work. In general aspect 3 showed improvement, and candidates produced short concise conclusions to their work, and many received complete for drawing from their data to support their conclusion.

Recommendations and guidance for the teaching of future candidates

This session saw a number of self-help tools that teachers have invented for their candidates to ensure that their marks don't suffer from neglecting to do things (versus not knowing how to do something). One centre produced a checklist that candidates had to submit together with their practical that attempted to ensure that the candidate included various details of each criterion (for example legends on graphs, units, title, etc.) This sort of crib sheet is perfectly valid and may help weaker candidates to remember everything they need to do prior to submitting their work. Teachers are also reminded that they may comment on a first draft of practical work and this may lead to tremendous improvement.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 14	15 - 21	22 - 26	27 - 30	31 - 35	36 - 45

General comments

As in previous sessions, very few teachers completed the G2 form. The information is valuable as feedback and we encourage teachers to submit G2 forms.

Only one centre felt that the exam was too easy in terms of level of difficulty. The majority deemed the examination of a similar standard as previous years, with three centres rating it a little easier and four a little more difficult. Almost all deemed the paper suitably presented and satisfactorily clear in its wording.

The areas of the programme and examination that appeared difficult for the candidates

As in previous sessions there were problems with command terms. Some candidates did not understand that the 'explain' implied the giving of reasons, rather than a simple description. The term 'evaluate' should particularly alert candidates: some value judgement or comparison is likely to be required. The various command terms: state, list, outline, describe, identify and predict have different meanings and candidates should be trained to interpret these correctly.

Understanding and explanation of concepts below appeared difficult for the candidates:

- density-dependent factors
- bioaccumulation
- biomagnification
- ecological footprint
- knowledge of factors that determine a species' Red List conservation status.

The area of the programme and examination in which candidates appeared well prepared

More candidates appear to be answering within the boxes provided and not on separate sheets of paper.

The best candidates were able to utilise their knowledge of systems and ecosystem concepts to good effect. Those candidates who understood the notions of feedback; input, output and storage; transfer and transformation; energy-flow and biogeochemical cycling, were able to utilise their knowledge at several points. It cannot be too strongly emphasised that this course is based on systems concepts.

Although they were not particularly challenging, the questions involving the use and interpretation of graphs and diagrams (especially in questions 1, 2 and 3) had a good response from many candidates.

Previous subject reports have encouraged candidates to give detailed examples. Some responded to this, and, for example in question 3(e), the best candidates gave examples of the use of the indicator species technique from the use of freshwater invertebrates in the study of pollution of streams, and lichens for the evaluation of air pollution in cities.

Some candidates, but by no means all, were able to convince examiners that they had a good working knowledge of the EIA concept, and had actually studied particular instances where the technique had been used.

The strengths and weaknesses of the candidates in the treatment of individual questions

Question 1

- a) Responses were highly varied. Often answers were too vague or did not answer the question directly. There were a number of confused accounts suggesting as acidity increased potassium availability increased and copper availability declined. Also some candidates did not understand that acid decomposition resulted in a fall on the pH scale.
- b) Most candidates achieved some marks for this question, although a common error was to give accounts of decomposition.
- c) There were a large variety of responses to this question. A number of candidates incorrectly suggested that the impact of acid deposition could be reduced by a change to fertilizer use or by managing carbon dioxide emissions.

Question 2

- a) The majority of candidates answered this question correctly.
- b) There was much confusion over the concept of 'density-dependent limiting factors' and few candidates related this to malaria.
- c)
 - i) Most candidates gave the correct answer.
 - ii) Some marks were achieved by most candidates for this question. However, some candidates only described the graphs rather than provide an evaluation. A number of candidates also misinterpreted Figure 2.
 - iii) There was some confusion over an 'ecocentrist' viewpoint.

iv) There were some good responses to this question. In a few cases concepts of bioaccumulation and biomagnification were not understood.

Question 3

- a) Almost all were able to use the graph to determine the cereal yield in the UK.
- b) This part-question, too, was well done. Most were able to list inputs necessary for high cereal yields. Most answers were unoriginal – water, sunlight, fertilizers, pesticides, machinery
- c) Most candidates achieved 1 out of 2 marks for this question for outlining the overall trend; few candidates suggested that the relationship between bird population and cereal yield was not strong.
- d) A wide range of causes of the decline in farmland birds was suggested: pesticides, bird-scaring (scarecrows), hunting, destruction of hedgerows/ tree-lines, eutrophication of wetlands and farm-ponds by fertilizers.
- e) There were some very good answers to this question and able candidates also provided appropriate examples of indicator species.
- f) Some variable responses were given to this question. This was surprising; given that questions on factors that determine Red List status have appeared in previous recent papers.

Question 4

- a) Most candidates provided a good response to this question.
- b) Surprisingly few candidates were able to say that the process indicated was a transformation process, **and** to explain why. Transfer was nominated almost as frequently, and the reasoning often confused.
- c) Almost, but not quite all, were able to identify 'steppe' as the biome with the largest store of soil nutrients.
- d) The idea that one could utilise ecological knowledge to predict the future proved uncomfortable for some candidates. Some were perceptive enough to suggest that a long-term increase in precipitation might move some of the characteristics of the steppe ecosystem closer to those of deciduous forest. A few candidates confused the terms biome and biomass.

Question 5

- a) Many candidates considered 'the **water** used for the generation of hydroelectricity' a renewable resource, whereas it is replenishable. The confusion is no doubt due to the fact that in the media **hydroelectricity** (i.e. the power) is frequently described as a 'renewable source of energy'.
- b) This question achieved a large number of good responses. Over half of the candidates were able to identify 'one form of natural income.....'. Water for towns' supply or irrigation was the most frequent answer, but fishing and various types of tourism appeared.
- c) Responses to this question were highly variable. Candidates often provided incomplete answers that did not justify how the dam could contribute to the ecological footprint. Answers were divided between those who argued that it would increase a nation's footprint (by using up land, by the energy and materials put into construction) and those

who said it would reduce it by reducing the demand for fossil fuels: both alternatives were accepted.

- d) Most candidates discussed the 'assessment of impacts' and some also included the value of a baseline study. Few candidates considered proposals for mitigation or monitoring during and after implementation of the project.

Recommendations and guidance for the teaching of future candidates

- Ensure key concepts and definitions are fully understood. Continue to give candidates the opportunity to practice interpreting different figures. Candidates need to be encouraged to read the questions very carefully. The command term indicates the way it is to be answered.
- Where possible, teaching should be structured around the systems approach and framework.
- Detailed, named examples should be included where possible, but excessively wordy answers and repetition must be avoided.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 10	11 - 21	22 - 27	28 - 35	36 - 43	44 - 51	52 - 65

The areas of the programme and examination that appeared difficult for the candidates

The number of G2 forms received was slightly better than the previous year but still disappointing. The paper was considered to be of a similar standard compared to last year, with four centres indicating that the paper was a little easier. The level of difficulty was mostly appropriate, with one centre indicating too difficult and one other as too easy. The syllabus coverage, clarity of wording and the presentation of the paper was rated as satisfactory or good.

The resource booklet and Section A questions elicited few comments on the G2 forms. One criticism was that the section A questions could have involved more biology based questions. Syllabus coverage, complexity and the balance between group 3 and group 4 style questions are considered when writing a paper. The resource booklet is a concern for teachers with candidates having English as a second language.

Comments on the G2 forms indicated that the Section B essay questions were "well selected from a variety of topics", and there was "good use of technical terms as used in the syllabus". However, one comment was "an over emphasis on pollution in both papers." Also the concept of carrying capacity was tested twice in the paper in 1(d) and 3(b). The way the questions were worded was sufficiently different but the answers could be very similar. There was a concern about the use of succession as it has been tested in Section B in previous sessions.

Section A (Question 1), which requires the use of the resource booklet, proved problematic to the weaker candidates. Many gave simplistic, non-analytical answers and seemed to answer some of the question parts using quotes from the resource booklet.

In Section B Questions 2 and 5 were the least popular and the essays that were answered weakly. The main issue seems to have been lack of knowledge in the topics covered rather than incorrect interpretation of the command terms. The most difficult concepts were: systems; GAIA and pollution; sustainability, natural capital and income; succession linked to equilibrium; plate tectonics and speciation; global food supply issues.

As noted last year the use of specific named examples also proved to be an issue. Candidates gave very general examples that were not appropriate. Germany has good energy usage and China has poor energy usage or definitions of an NGO but no example – all of these are not detailed enough for the question asked.

Continuous prose can be problematic as in some cases it was very difficult to see where one part of the question ended and the next started.

The areas of the programme and examination in which candidates appeared well prepared

Candidates showed a solid understanding of the basic content of the course, similar to last year. Time management, this year, seems to be less of a problem for the candidates. The candidates found the resource booklet and Question 1 relatively straightforward. There was a clear preference for Questions 3 and 4 in Section B. Question 3 was generally answered very well and question 4(c) was also usually good.

When clear examples were used they were detailed and supported the answer.

In terms of content, candidates showed good understanding of human population demographics, energy resources and approaches to pollution management.

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A

Question 1

- a) (i) The majority of candidates gave two appropriate responses such as low oxygen concentration and salinity.
- (ii) Most candidates correctly stated that removal of mangrove trees resulted in a reduction in diversity.
- (iii) Most candidates were able to interpret the information from the graphs that the body size of the Blue Striped Grunt was reduced by removal of mangrove trees. Some candidates gave very long answers here for only one mark.
- (iv) Most candidates gained at least one or two marks for this question with popular answers including loss of habitat/shelter, fish nursery grounds, food availability and increased susceptibility to predators.

- b) (i) A wide range of responses were given. More candidates were able to successfully name inputs than outputs of semi-intensive shrimp farming. A common mistake for outputs was repetition of the same point i.e. increase in shrimp yield and density.
- (ii) The candidates found linking the activity of shrimp farming and/or likely pollution directly to water quality rather difficult.
- (iii) Most candidates gained a mark here but few gave a clear definition for non-point source pollution. They could describe the effects of the pollution on the water as clearly being non-point pretty well.
- (iv) A broad range of good answers were given. A common mistake was to include sustainable fishing for crabs and snails.
- c) A majority of candidates answered this question very well. Most gained two marks for indicating the trend of the agricultural and aquacultural exports. Their final mark was usually awarded for stating that the income for agricultural products is still much higher than for aquacultural products.
- d) Few candidates achieved full marks for this question. Many simply repeated the question but failed to substantiate their viewpoint. E.g. max capacity has been reached as there is no more land available or capacity can be further expanded via technologies such as GMOs.
- Some answers were very confused and only mentioned fishing.
- e) (i) The candidates often just repeated the ecological services listed in Figure 7 including erosion. The term 'natural income' appeared to be misunderstood by a significant number of candidates. When the candidates understood the question they usually gained full marks.
- (ii) The majority of candidates were able to provide an appropriate answer. A common mistake was to include an aspect of economic value.
- (iii) Few candidates achieved full marks for this question. Many candidates incorrectly understood natural income to be the same as natural capital. Also linking these clearly to sustainability proved very difficult for the majority of candidates. A number of answers just reworded the question in three sentences.

Question 2

- a) The stronger candidates were able to gain the marks for the GAIA concept but all struggled to link GAIA to pollution. Generally the candidates wrote too much for the four marks this question was worth.
- b) This question gave a variety of results for the candidates. Some knew the 3-step pollution model extremely well and used an appropriate pollutant, often carbon dioxide. A number of pollutants were given indicating the candidates had a broad knowledge of this topic. A few candidates gave very weak answers indicating that they did not understand the model concept.
- c) This part of the question proved to be problematic for many candidates. They found mentioning a factor linked to culture particularly difficult. The examples used to illustrate the factor were also weak. A significant number of candidates struggled to discuss a wide range of relevant issues. Most candidates focused on a few aspects only. This question requires careful reading and a plan of how to answer in order to ensure all the parts were

mentioned. Each aspect of the question requires at least a factor mentioned, with a clear example, for full marks.

Question 3

- a) This question was very well answered by many candidates. A common mistake was to only focus on biodiversity and then to give a long winded answer about this. The best answers gave a brief comment on at least four reasons, thus doing precisely what the command term required.
- b) The majority of candidates could define carrying capacity in enough detail for one mark, though very few gained two marks here. Many gained high marks however; other candidates often lacked sufficient detail in the answer or only covered a limited number of relevant aspects.
- c) Most candidates wrote a long answer here, though sometimes this did not always address the question. A wide range of very good responses were given to this question. One aspect commonly overlooked were policies that reduce the death rate. Nearly all answers discussed the one child policy in China. The development policies proved more challenging than the cultural influences for most candidates.

Question 4

- a) This question was generally poorly answered. Few candidates stated that ecosystems are open systems with named inputs and outputs. Often they mentioned ecosystems and then wrote about the components needed, thus gaining a mark or two for inputs.
- b) Most candidates adequately answered this question for energy flow. However many answers were repetitive with limited points made. Decomposers were generally not mentioned at all.
- c) Many candidates answered this question very well, though often as a list. In a few cases, candidates did not select two contrasting energy sources or name two different societies. The examples used were often superficial at best. The economic factors were generally vague.

Question 5

- a) Although there were some very good answers to this question, some candidates would have benefited by including specific examples. The concept of speciation was generally understood but a clear link to plate tectonics was missing.
- b) Candidates managed to detail succession well but this was not always linked to equilibrium. The depth of the answers was limited and so some candidates failed to discuss a sufficient number of points to achieve high marks.
- c) This part of the question was generally answered well. The majority of candidates had enough knowledge of the intergovernmental and non-governmental organisations to give contrasts easily. Few candidates gave comparisons, though the stronger candidates did. A small minority had no idea of examples to use for this question.

Recommendations and guidance for the teaching of future candidates

- Please complete the G2 form after the examination as this helps with the development of the examinations for future sessions.

- The resource booklet and the Section A questions are design to follow a format. The case study can be set anywhere in the world and basic information on location and characteristics are given in the booklet. The answers will be able to be taken from the resource booklet and then the content learnt during the course will be applied to this case study situation. Candidates should be exposed to the resource booklet and questions format from the samples posted on the OCC. This will allow them to become familiar with the timing and the style of this section of paper 2.
- Candidates should be shown how to interpret the question carefully, paying attention to bold words indicating the numbers of answers to gain a mark or where the answer should be taken form, for example the resource booklet.
- Candidates should be encouraged to give precise answers rather than vague ones. The use of clear examples could also be used to illustrate this.
- Candidates should be familiar with the command terms and be aware that a question may contain more than one command term. To gain full marks both command terms must be addressed in the answer.
- Remind candidates that the final part question for each essay is likely to require more evaluative/discursive/higher-order thinking, so simple descriptions will not score highly.
- Candidates need to read the command terms carefully and make a simple plan before starting to write.
- Candidates should use their own case studies to answer the essay questions rather than taking ideas from the case study. They should have greater knowledge of the ecosystems they have studied.