

November 2012 subject reports

ENVIRONMENTAL SYSTEMS AND SOCIETIES

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 14	15 - 29	30 - 40	41 - 52	53 - 62	63 - 74	75 - 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

The range and suitability of the work submitted

The November 2012 internal assessments (IAs) showed a wide variety of practical programs, both in the types of practicals, and in the quality of the programs. Some of the newer schools still struggle with this part of the course, while others seem to understand what is sought from the outset.

The stronger programs as always show a good mix of practical work, allowing students to develop skills in small, short practicals, often in lab settings, and then have students apply these skills through more complex questions.

The programs that struggle show a variety of problems but most have at least two things in common:

- the formulation of research questions that are too broad or not suitable for research in a school setting
- the use of group work for assessing students.

The issue of group work is of course, easy to correct. However the formulation of a good research question, or topic of research, is perhaps more complex. Some of the field projects are so broad that it is almost impossible for a student to address them within the scope of a school practical. For example, “what is the effect of human presence on the health of an ecosystem?” Other questions are not really suitable for a practical, such as “What recommendations can we make to an industry to reduce their impact?” This latter question has great potential for course work and could lead itself to a series of excellent small scale practicals, but as it stands, it does not lend itself to be assessed using the current IA criteria.

Most schools in this session included good comments on their students’ work, thus providing feedback to them; this is good practice. However, once again this year, several teachers made comments that were not reflected in their marking. For example, a comment regarding to a student indicating that they are confused about their dependent and independent variables, should logically be followed by, at best, a “partial” in the first criterion of planning. In another example, a comment to a student that they must use a consistent number of decimals in their data collection could result in the loss of a mark.

Candidate performance against each criterion

Planning

Aside from the problems regarding the suitability and breadth of research questions, some schools continue to have other problems with this criterion.

For Aspect one, the questions must be tightly focused. For example, “what is the effect of light intensity on photosynthetic rate of algae?” is too broad, the same question, but with the species indicated is far better.

Aspect two requires the use of suitable controls. In this regard when students are designing a sampling practical, what criteria are considered in selecting the sampling site is to be selected, and how randomness of samples will be assured, are both crucial for a complete to be awarded.

Finally, as has been mentioned previously, in most cases, five samples are regarded as the minimum for Aspect three of the planning criterion. Also, the method calls for the collection of sufficient, **relevant** data. A method that provides no realistic method for collecting data is not considered relevant. For example in a study on the effect of turbidity on mayfly larvae in a river; there must be some realistic method for collecting mayfly larvae. If the method indicated cannot actually result in the collection of mayfly larvae, this aspect should receive a “not at all” because no data will be generated. Although planning can be assessed as a “thought experiment”, the student must indicate a real method for collecting relevant data.

Data Collecting and Processing (DCP)

The introduction of technology in data processing has led to some problems in assessment. Namely, students are required to provide a sample calculation or evidence as to how the data are processed. For example, this can be done by providing a print out the results as well as the formulae view used in a spreadsheet to generate the results for a Chi squared test; either of

these alone is insufficient. The inappropriate graphing of raw, unprocessed data continues to be a problem, and teachers are reminded that this, in the absence of any other processing, may result in no marks awarded for either Aspect two or Aspect 3 of DCP. Teachers must spot check calculations to ensure that these have been carried out correctly to confirm the validity of the results.

There were also several instances of students applying statistical tools incorrectly. For example when a student investigates how clear and black plastic covers affect the temperature of a potted plant, averaging the results of both treatments makes no sense and should result in the loss of a mark in Aspect 2 of this criterion.

Discussion, Evaluation and Conclusion (DEC)

It is quite difficult to agree upon what is required for a “complete” in aspect one of DEC. Some teachers are down marking students for a small detail, and others are giving full marks for very simplistic work. Teacher annotations providing the rationale for the awarding of marks would greatly assist the moderator.

Students need to comment critically on how the quality and reliability of their data may have influenced their results. Ideally their research should be placed in context and references made to appropriate literature (however this latter point is not always a requirement. It can be very difficult - especially with school library resources – to find literature on what is being studied). Certainly there should be an attempt to relate their findings to their expectations.

Some schools are using a table format for evaluation. Students list the problems, how these impact their work and how they can be remedied. Although it interrupts the way a practical “reads” and may lead to less cohesiveness in the response, it is a method that can be very useful, especially for students that require more structure.

Students most frequently lose a mark for Aspect three of DEC because they do not cite their data in support of their conclusion.

Recommendations and guidance for the teaching of future candidates

Teachers whose samples have been moderated down significantly may really benefit from either working through the material available on the OCC, through discussions on the OCC or either an online or face-to-face workshop.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 13	14 - 20	21 - 25	26 - 29	30 - 34	35 - 45

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

Understanding the requirements of different command terms such as state, outline, explain and suggest. As a consequence many responses lacked the necessary detail required.

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

Candidates often did well on questions that involved a direct recollection of facts and knowledge including definitions.

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

Question 1

- a) A significant number of candidates did not correctly state 'zonation'. Incorrect answers included 'biomes' and 'succession'.
- b) Many responses were too vague e.g. limiting factors such as 'altitude' or 'climate' rather than 'low temperature' or 'lack of water'.
- c) The majority of candidates correctly suggested that each zone would move further up the mountain. Some candidates only discussed melting of snow with no link made to the potential change in the pattern of vegetation.

Question 2

- a) A common mistake was to confuse definition of invasive species with that of pioneer species.
- b) The majority of candidates correctly identified an impact of invasive species.
- c) Marks were frequently lost for 'stating' two possible problems rather than 'outlining'. Another common error was also to include eutrophication.

Question 3

- a) The majority of candidates were able to provide a sufficient definition of net primary production (NPP). Although in some cases there was some confusion of NPP with gross primary production.
- b) Responses to this question varied widely. Good responses explained how limiting factors such as light, temperature and precipitation which affected NPP varied globally.
- c) Although the majority of candidates were able to suggest high biodiversity as an ecological reason, many failed to suggest a second suitable reason with a number of candidates suggesting inappropriate economical reasons or NPP.
- d) A common error was to 'state' a human activity such as deforestation rather than 'outline' how deforestation threatens a named area.

Question 4

- a) The majority of candidates correctly calculated the percentage increase.
- b) Marks were frequently lost for being too vague e.g. suggesting 'technology' as an input without a specific example such as pest resistant crops or suggesting 'food' as either an input or output without specific examples e.g. wheat or beef.
- c) Marks were commonly lost for 'stating' rather than 'outlining' i.e. providing a brief summary or explanation for two negative environmental impacts.
- d) There were a wide range of good responses to this question with candidates commonly explaining the difference between the ecological footprint of a vegetarian and meat eaters diet.

Question 5

- a) Most candidates correctly identified the likely location of the power station.
- b) A large number of candidates were unable to correctly identify a transformation process affected by low oxygen levels. Many candidates incorrectly discussed the process of eutrophication.
- c) A common error was to discuss action e.g. people choosing to recycle rather than the factors that affected this choice.
- d) Many candidates found this straight forward, although a significant proportion failed to identify the issue related to each protocol and there was particular confusion between the Montreal and Kyoto protocol.

Question 6

- a) Responses varied widely with most candidates obtaining some credit for identifying at least one pattern.
- b) There was a range of responses for this question with the majority of candidates recognising that economical resources is a main contributor to the reasons resulting in the differences between LEDCs and MEDCs.
- c) Very few candidates included the second valid reason necessary for the mark that 'global warming leads to thermal expansion of water'.
- d) The majority of candidates gave a suitable reason for difficulties of measuring sea levels accurately. A common mistake was to state 'sea surface is too large' or 'ocean is too deep'.
- e) Often candidates failed to 'explain' the effects e.g. a reason for an increase in disease within the human population as a consequence of coastal inundation. Few candidates obtained full marks for this question.

Question 7

- a) The majority of candidates were able to gain some marks for this question.
- b) The majority of students correctly stated 'carrying capacity'.
- c) A common error within this question was to 'state' rather than 'explain'. In some cases students incorrectly discussed how population size could be increased (e.g. better healthcare) rather than focusing on ways to increase carrying capacity.

Recommendations and guidance for the teaching of future candidates

- Encourage students to read the question carefully and ensure they address the specific command term.
- Encourage students to make and appreciate the inter-connections between each ESS topic.
- Practice past question papers and other questions that involve application of knowledge and understanding to different situations.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 9	10 - 18	19 - 23	24 - 31	32 - 38	39 - 46	47 - 65

General comments

The number of G2 comments received was disappointing, with only 15 schools completing the online form. All found the paper had a suitable level of difficulty. 11 schools found the exam of a similar standard to last year, one indicated it was a little easier and 3 a little more difficult. All found the clarity of wording and the presentation satisfactory or good.

Most of the comments on the G2 forms indicated syllabus coverage issues: "Some students noted the lack of ecosystems and biodiversity and conservation related questions in Section B. However, these topics were covered in Section A, and Question 2 (Section B) allowed a degree of choice which some of my students appreciated", one comment indicated that "there were too many questions focusing on pollution", another noted that "quite a leaning towards the Global Warming topic in the essay questions, or scope for students to respond with global warming understanding e.g. Question 3(c)".

One comment noted "I liked the direct and clear linking of concepts in the essay Question 2. Some students found it a bit 'scary', but commented that once they got started on the essay sections, they found it easy to format their ideas". This corresponds to what the examiners saw as they marked the essays. Once the students started answering they were able to use the example with each question part.

The overall feeling from the G2 comments was that the essay questions were open-ended and allowed the students to work with their strengths. No comments were made about Section A or the Resource Booklet. This can be viewed in a positive light and the assumption is made that the teachers and students found the resource booklet easy to access and the questions asked to be suitable.

In the essay section Question 2 was the most popular, closely followed by Question 4, then 5 and Question 3 was the least popular.

The standardizing team considered how the candidates answered questions as the final markscheme was prepared. When students approached questions in a different way from the original exam writers expected interpretation then the markscheme is reviewed. Generally both the original interpretation and the post-standardisation interpretation are included, as long as the concepts are correct.

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

Time management was not so much of an issue this session. Most candidates completed the paper answering all the parts of Section A and two essays in Section B. Some students are still trying to incorporate the three parts of the essay into a continuous prose. This can mean they focus mainly on one part only, not always the part with the most marks available. Very few candidates gave no response to parts of questions.

In Section A candidates often gave one sentence answers for two or three mark questions, usually meaning only one mark was awarded. The questions with stems providing information gave the most difficulty, these were often misinterpreted.

The concepts of natural income, renewable verses replenishable and linking energy resources to sustainable development proved to be harder for the candidates.

Students found it challenging to have to use the concepts in relation to the context of the Resource Booklet rather than to just define the term. This led to definitions being given in the boxes before the actual question was attempted.

In the essay section the students often repeated points and used weak, vague examples to support the topics. Often the example used wandered off from the question asked. Here the student was just writing all the information they knew about the example without referring back to the question. Application of concepts and examples to a specific question indicates the holistic aspects of the course are lacking.

The questions that combined parts of the syllabus proved to be problematic for the candidates. They found the linkage hard to grasp and providing examples almost impossible, only the really strong candidates managed to be successful with this.

Evaluate and discuss are the command terms that are most often misunderstood.

Assessment objective 4 stresses the need to make reasoned and balanced judgments using appropriate economic, historical, cultural, socio-political and scientific sources. Only the very best candidates were able to demonstrate this balance.

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

The candidates answered all sections and seemed to generally have enough time to complete the paper. The Resource Booklet did not seem to cause problems with accessing information. They were able to extract the required details from it when asked in specific questions.

The handwriting was generally clear this session, most students used a dark enough pen (it should be blue or black), so the scanned image was clear.

The drawing of diagrams in the essays was better than in previous sessions. The positive and negative feedback cycles were often good or very good.

The essays were generally open-ended and so allowed the students to choose areas of the syllabus they were comfortable with as examples.

The concepts of eutrophication, footprints, climate change and conservation were seen to be grasped by the candidates.

Generally the command terms were understood and the depth of the answers was appropriate.

The use of examples was more prevalent this session, even when the question did not specially ask for an example. There is still a need to for more detail to be given in the examples used.

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

Section A

Question 1

- a) (i) The vast majority of candidates gave the correct answer of meandering.
- (ii) Again the majority found this question straightforward to answer. A few gave only biotic factors rather than abiotic.
- b) (i) The majority of students gave Sulina Channel as the correct answer and indicated navigation as the reason, also correctly. A minority gave all 3 channels and others gave one of the other channels.
- (ii) Generally well answered by most candidates. The effects were easier to articulate with abiotic factors rather than biotic. The biotic effects mentioned were often vague and so did not gain a mark. Some candidates only gave abiotic effects and so could only gain two marks
- c) (i) Many candidates did not show the working and so could only gain one mark from the correct answer. Other candidates gave confused workings and an incorrect answer. A significant minority gave 70.7% as the answer.
- (ii) The candidates found the term “maintenance” difficult to grasp. Many students linked this question to human maintenance of the dredged channels and so suggested less sediment meant less maintenance needed, as less dredging required. This was not an acceptable answer. The resource booklet does indicate how less sediment flow would reduce the height/expanse of the delta.

- d) The majority of candidates could identify the relationship giving the breeding is higher/lower when the river discharge is highest/lowest. However they usually failed to make a second statement about correlation or directly related to gain the second mark.
- e) The majority of candidates could identify the relationship giving the breeding is higher/lower when the river discharge is highest/lowest. However they usually failed to make a second statement about correlation or directly related to gain the second mark.
- f) This appeared to be a straightforward question, however a significant number of candidates gave correct answers but in the wrong place. Fishing was indicated as a replenishable capital and hydropower as renewable. The teaching of these concepts needs review
- g) Many candidates defined natural income and sustainable development rather than discuss the relationship between the two concepts. Others just listed all the natural income and made no link to sustainable development. Very few candidates gained four marks here. This was a good discriminator question for level 6 and 7 candidates.
- h) Most candidates gained marks here. They did generally focus on management issues and legal aspects. Very few gained all three marks.

Section B

Question 2

- a) A significant minority of candidates misread the question and gave climate change/global warming/CO₂ increase as the global problem. Some may have not considered climate change and global warming/CO₂ increase as the same problem. As a result they could not gain marks for this part of the question. However error carried forward (ecf) was used for part b and c of this question where appropriate. Others gave too broad an example; pollution, too vague; resource use or only regional; acid rain/urban air pollution. This who did give a focused global problem usually gained high marks. The second part of the question on why it is a global problem was often vaguely answered.
- b) The international and national level policies were usually given with a reasonable evaluation. Unless a detailed local example was known the candidates were too vague at the local level. The evaluation was often basic and linked to economic aspects of costs. The stronger answers mentioned social/lifestyle changes and inertia. Candidates found it easier to mention negative rather than positive factors.
- c) The candidates struggled with this part of the question. They wasted time defining ecocentric and technocentric and the general advantages and disadvantages. This

could gain some marks. The detail in the answer depended upon their choice of global problem. Ozone depletion and biodiversity loss gave the candidates scope to mention both approaches and to make a statement about which, in their opinion was more effective.

Question 3

- a) This was the least popular question. However those who attempted it usually gained marks in this section. Candidates were more comfortable with human causes of eutrophication, a few confused pesticides with fertilisers. The majority gave very clear answers for the processes involved. This indicates that the topic has been covered well in the schools.
- b) This part proved very challenging to the students. They tended to define positive and negative feedback and then often gave very vague links to eutrophication. The positive feedback illustration seemed to be easier for the candidates to explain. The main problem was not linking the steps involved and not clearly stating how the change links back to affect the original mechanism.
- c) Most candidates gave global warming/climate change as the system and they could at least describe the positive feedback and then explain some solutions. However the majority only looked at one positive feedback and so seldom gained full marks. The question is split into sub-parts and nearly all the candidates managed to answer all the sub-parts. This is encouraging to see that they are reading, internalizing and then answering the question.

Question 4

- a) Generally well answered by candidates. A significant minority mentioned deforestation, which was not credited as less CO₂ is absorbed and the question asks for “addition” of CO₂. Candidates found giving two human processes difficult to do, they tended to only mention combustion of fossil fuels in a variety of circumstances.
- b) The candidates did well in this section of the question. The main area of concern was not making a comparison between the two groups. Contrasting the groups proved to be straightforward for most candidates. Though some only mentioned industrialization/transport issues giving limited scope for marks being awarded. Many candidates repeated points in separate paragraphs as they stated all the MEDC trends and then all the LEDC trends. The two groups must be directly compared and contrasted to gain the marks.
- c) Strong candidates answered this section really well. The weaker candidates often wrote plenty but failed to actually answer the question asked. They would go off on a tangent describing global warming. The best answers mentioned sceptics and global dimming. A final conclusion summing up the viewpoints was the part most often missed out.

Question 5

- a) This question asks for a lot of information and is only worth six marks. At least two of the influences, culture/technology/economics needed to be mentioned for full marks to be awarded. Most candidates gave a reasonable resource, usually fossil fuels or timber or uranium. The weakest aspect in the answers was outlining how the value of the resource changed over time/space. As an outline question the candidates needed to mention how the influences changed the resource use.
- b) The command term outline created some misinterpretation of the question, as did the use of the term "range". Candidates had to do more than just list or state energy resources. They needed to identify and outline the range: renewability verses non-renewability or availability/usefulness etc. then examples of energy resources and a brief comment about where they lie within the range. Examples from both sides of the range mentioned were also required. Most candidates managed to gain some marks here.
- c) Nearly all the candidates could define sustainability successfully. Most could also link renewable energy resources to being sustainable and non-renewable as not sustainable. Only the strongest candidates made concluding statements that brought in a more holistic view of population, demand and technological developments.

Recommendations and guidance for the teaching of future candidates

The following is a summary of the advice for teaching future candidates:

- Review the meanings of command terms so students know what is required in each question.
- Encourage students to make annotated diagrams large and clear if they are using them.
- Make sure students pay attention to the "point value" for each question to gauge how many different and distinct statements they need to address to earn full marks.
- Encourage candidates to give clear, diverse and discreet marking points, rather than a single vague, limited, and repetitive discourse.
- Encourage students to break up their answers into the relevant sub sections to make it easier for the examiner to identify which part of the question they are answering.
- Ensure sufficient time is dedicated to the teaching of core ecological principles and concepts. In particular explicitly explore 'meta-ecology' issues (like energy flow) and relate them to concrete examples (like reducing water input to the Iraq marshes means fewer reeds, which is fewer producers and less autotrophic energy fixation dictating that higher tropic levels will also be reduced as a consequence).
- Reinforce the importance of learning key definitions and terminology eg. biodiversity,

sustainability. While rote learning of key definitions may have its place, a firm grasp of the underlying concepts behind the terminology and the ability to communicate this understanding is essential. Poor definitions at the start of a question can lead to the 'snowball effect' whereby the rest of the answer suffers from a weak foundation.

- Clarify how expression of ideas marks are allocated and perhaps use them in your own marking so students get used to developing their answers, including examples and structuring their ideas.
- An interdisciplinary approach in teaching should help students to approach essay questions holistically.
- Spend additional time addressing common misconceptions eg. difference between carbon footprint and ecological footprint and between ozone depletion and climate change.
- Candidates should be encouraged to write within the space provided on the exam paper.
- Please encourage students to print specific examples as these are often hard to interpret when the handwriting is bad.
- Detailed examples are needed for all areas of the syllabus. Local ecosystems should be used and then the inter-relationships can be explicitly noted.