

ENVIRONMENTAL SYSTEMS AND SOCIETIES

Overall grade boundaries

Grade:	E	D	C	B	A
Mark range:	0 - 7	8 - 15	16 - 22	23 - 28	29 - 36

The range and suitability of the work submitted

The guidelines state that the extended essay must refer to both ecosystems and human societies, and most extended essays did this. A wide range of essays varied in standard from excellent to very poor. Overall, the suitability of topics is continuing to improve from year to year - with a greater number of experimentally based essays and better-focused literature based essays. However, a weakness of many essays was the breadth of the research question which could never be properly addressed in the length of the essay.

The best essays tended to have two things in common; the student had a genuine curiosity or interest in the selected topic and the investigation contained experimental or field work. Although these are not absolute requirements for the essay, environmental systems and societies is an experimental science and lends itself to hands-on work. While literature-based essays are suitable for the task, those that rely exclusively on web-based sources run the risk of failing to adequately meet particular criteria.

A wide range of topics was covered. Popular areas included:

- energy – especially renewable energy (such as biomass) and nuclear power including the impacts of Fukushima, Japan on public perception and acceptance of nuclear energy.
- organic farming vs. conventional/intense farming method
- footprint and recycling, generally investigations carried out at school level.
- biodiversity of local ecosystems or evaluation of specific protected areas
- water pollution, generally using direct methods to monitor pollution but some candidates studied bio-indicators.

The selection of a topic that was far too general, such as "Global warming and deforestation" may indeed represent major current environmental issues, but topics such as these are far too open-ended for an essay at this level.

On the other hand, there are still some candidates that submit essays that do not fulfil the minimum requirements for the extended essays. Unfortunately, many of those reflect a lack of knowledge by the supervisor of the IB requirements, for example missing mandatory sections such as the abstract or sending a long lab report as the extended essay. Every year an increasing number of candidates treat the extended essay as an extended piece of internal

assessment practical work. Supervisors should explain to candidates the requirements for an extended essay and caution them against simply writing yet another laboratory report.

Another problem has been essays that were originally selected to be submitted in other subjects, such as biology, chemistry, history, etc., and ended up registering for environmental systems and societies. It is not clear if these represent clerical errors by the IB coordinator or a wrong judgment by the supervisor, assuming that almost everything will fit in a transdisciplinary subject such as ESS.

The time spent with the candidate ranged from 0 to 30 hours which confirms that many teachers do not read the IB guidelines for the extended essays as the recommendation is to spend between 3 and 5 hours with the student. Comments made by the supervisor on the circumstances surrounding the research and level of personal involvement of the candidates can be of considerable assistance to the examiners. Many supervisors used observations from the *viva voce* to illustrate their comments on the cover sheet. Unfortunately, many supervisors provided no comments on the report on the cover sheet. The absence of comments does not diminish the extended essay, but a report giving an indication of personal involvement and determination is very helpful in setting the context.

Both candidates and supervisors should remember that although the use of animals in environmental systems investigations is welcomed, they should pay attention to the ethical issues involved in these experiments. The following is an excerpt from the *IB Animal experimentation policy*:

"Experiments involving animals should be based on observing and measuring aspects of natural animal behaviour. Any experimentation should not result in any pain or undue stress on any animal (vertebrate or invertebrate) or compromise its health in any way. Therefore experiments that administer drugs or medicines or manipulate the environment or diet beyond that easily tolerated by the animal are unacceptable. Experiments resulting in the death of any animal are unacceptable."

Candidate performance against each criterion

Criterion A: research question

Candidates need guidance in the selection of the research question to avoid inappropriate, poorly focused or even trivial questions. Many students selected a topic that was far too general and too broad to be covered in 4000 words. Supervisors should strongly discourage topics that are too vague such as "Global warming". Once the research question has been formulated candidates should be trained to ask whether it is actually sharply focused or whether it could be narrowed down even further. Some candidates from the same school selected very similar research questions.

Criterion B: introduction

In the majority of the essays, the relevance of the topic and the approach to the research question were explained in the introduction. Strong essays also included personal reasons for selecting the topic and why it was worthy of investigation. All introductions should contain material that is clearly referenced to show that the student has done meaningful background

research. In a few cases, the introduction became excessively long and the student provided lots of information about the topic, which was not always relevant to the research question. The detailed development of relevant theory belongs to a separate chapter of the essay.

Criterion C: investigation

The way in which this criterion is applied will depend on the style of the essay, either literature based or experimentally-based. Students who planned and did their own practical work still needed to consider the work of others in their chosen field and discuss their options. The highest scoring essays reflected a well-planned investigation based on the consultation of an appropriate range of sources. Unfortunately, a large majority of the essays were done using secondary data, mainly (or only) from the Internet. The Internet is definitively an excellent source of information and for some candidates the main one. However, students should learn to distinguish between scientifically reliable sites, peer-reviewed publications, common press, and personal opinion sites, among others. Supervisors should encourage candidates to be selective in their choice of secondary sources.

Some candidates only cited newspaper or magazine online articles and included no further citations of scientific papers or even textbooks. These sources were seldom evaluated and very few essays attempted to discuss the reliability of the data presented. Most of the candidates could cite according to a standard model. In addition there must be clear evidence that the investigation has been planned by the candidate.

Criterion D: knowledge and understanding of the topic studied

In this criterion candidates are expected to show that they understand the topic they are investigating and to put the investigation into a proper academic context. The level reached varied widely. Many candidates demonstrated good knowledge and understanding of the research topic and explained how their own investigation fitted into the existing academic framework. However, in several cases the candidate showed conceptual misunderstandings. The most common ones were on the topic of global warming. Due to the systems approach underlying the different topics of this course, diagrams and sketches are a very good way of illustrating environmental processes. The most competent students were able to develop their own generated diagrams.

Criterion E: reasoned argument

Arguments were sometimes detailed, but many were superficial and made assumptions that the evidence did not support. To score highly for this criterion students must produce a persuasive argument in relation to the research question. A clear line of argument can be perceived when there is recurrent reference to the research question throughout the essay and where findings and discussion points are presented in the context of the overall aims of the research. Many essays had simple ideas presented as the pros and cons of the topic with an overall summary. Many of these ended up being narrative with no data to back up the points made. Many of the low scoring essays were simply descriptive or narrative with no real argument. Although personal opinions are acceptable, candidates should remember to substantiate them with available evidence. Some essays, dealing with topics such as vegetarianism or hybrid cars, contained so many weighted words and so much biased propaganda, that the resulting work could not be considered to be in the least bit scientific.

Criterion F: application of analytical and evaluative skills

This criterion was a good discriminator separating the excellent essays from the more mediocre. The essays that did attempt some primary data collection often ended up with higher marks as they managed to do more analysis, evaluation and justification. It is not good enough to simply quote results without evaluating their reliability. Essays that were essentially descriptive rather than experimental often failed to address this criterion well. The candidate must make it clear how the data and information being presented in the essay help to answer the research question. On the other hand, few essays carried out very sophisticated statistical treatments. Students need to be trained to look critically at the data and information they generate or cite.

Criterion G: use of language

Candidates generally scored well in this criterion. There are in fact two aspects to this criterion: the use of clear and precise language on the one hand and the use of terminology appropriate to the topic on the other. Generally candidates used appropriate terminology and communicated ideas clearly. In a few cases, candidates employed colloquial expressions and informal language. Figures and tables were not always clearly and completely annotated with titles, units and symbol identification, thus weakening communication. Unfortunately, some students used non SI units.

Criterion H: conclusion

Some candidates did not make a clear distinction as to where the discussion of the results finished and where the conclusion started. It is recommended to have a subsection headed "Conclusions". The conclusion does not depend on the quality of the argument; it must simply be consistent with it. In many cases, candidates failed to refer to unresolved questions and new questions that had arisen as a result of the research. In a good conclusion the candidate will refer back to the research question or the hypothesis derived from this, and state to what extent the question has been answered or the hypothesis supported. Where possible the conclusions should be verified by reference to the literature. Many suggestions for further investigations were too simplistic.

Criterion I: formal presentation

There was a considerable variation in the way the essays were presented. The vast majority of the essays submitted looked good superficially; even some weak candidates can produce a well presented essay. Word processing and the use of Microsoft Word to provide footnotes or endnotes have raised the standard of presentation. However, there were a number of common problems, where candidates needed guidance, which are discussed below (under "Recommendations for the supervision of future candidates"). Among them it is worth noting that many students cited references in the body of the text that were listed in the list of references or the opposite when many references listed in the bibliography were not mentioned in the body of the essay. The source of figures and tables were often not cited. Many candidates also misused the appendix, either using it to present relevant information for the essay or to attach material that is not needed for the essay. Candidates should be reminded that the information in the appendix is not taken into consideration when assessing the essay (since the appendix is not integral part of the essay). Very often the extended

essays followed the same layout used for the internal assessment laboratory reports. The layout of the essay should be different and correspond to the outline and style of scientific papers.

Criterion J: abstract

Almost every essay included an abstract, but many candidates did not pay attention to the requirement for the three aspects of an abstract: research question, scope and conclusion. The element that students found most difficult was to describe the scope of the investigation. Some students are still writing more than 300 words and indicating as much at the bottom of the abstract, which confirms lack of knowledge of the requirements for this criterion.

Criterion K: holistic judgement

In order to gain high marks students must clearly show a high degree of personal input and imagination. The comments provided by the supervisor are very useful when awarding marks for this criterion. One recent addition to some supervisor's reports which examiners have found very useful is some indication of the student's responses during the *viva voce*. However, as mentioned before, many supervisors failed to provide any comments. When the investigations have been carried out at outside institutions or universities or are library based research, the supervisor's comments are essential to evaluate the candidate's initiative and engagement. Sadly, a few essays appeared to have been submitted in the subject as a "catch-all" subject for things relating vaguely to the environmental systems and societies topic

Recommendations for the supervision of future candidates

The candidate must be supervised throughout the whole process, not just at the beginning and/or end. The supervisor must ensure that the candidate knows the requirements of the extended essay and is aware of the differences from internal assessment practical work. The amount of time many supervisors spend with the candidate appears either insufficient or excessive. Rather than allowing the student to select a research topic from a list given by the supervisor, it is recommended that the student provides a list of topics of interest and the supervisor helps to select one of them and refine it to a manageable research topic. This way the student feels "ownership", increasing their motivation and engagement. Supervisors should strongly encourage the candidate to undertake some practical or field work and furthermore encourage them to study issues from their school or local environment. A good research question is one that asks something worth asking and that is answerable within 40 hours/4,000 words. The structure of the essay should be consistent with the table of contents. In some cases candidates used headings on the table of contents which did not appear in the text of the essay.

Many candidates need additional assistance when selecting the material to be included in the appendix section. Appendices often included all raw data which could have been omitted or condensed. Essays are not required to have an appendix. Important data should always be in the body of the essay. Many candidates used the appendix as a way to avoid exceeding the word limit of the essay. Many essays presented very good illustrative material, but often diagrams and pictures were copied directly from the sources and included in the essay with no commentary or attempt to explain them in context. Students should always indicate the sources of their illustrations. In general, it is better to show pictures of the student doing the

field work, than present unrelated images from the Internet. The use of significant figures is a common problem. When averaging results, more significant figures should not be given than those used in the individual measurements. Supervisors also need to ensure that candidates know how to distinguish between reliable and dubious information obtained from the Internet. Supervisors should always write a report when completing the cover sheet of the essay. Additional information could help the examiner understand the personal engagement of the candidate. For example, when the number of hours spent with the student discussing the extended essay was zero (in particular), it is necessary to describe how it was possible to guarantee the authenticity of the essay in such circumstances.