Environmental systems & societies SL

Timezone 1

To protect the integrity of the assessments, increasing use is being made of examination variants. By using variants of the same examination, students in one part of the world will not always be responding to the same examination content as students in other parts of the world. A rigorous process is applied to ensure that the content across all variants is comparable in terms of difficulty and syllabus coverage. In addition, measures are taken during the standardisation and grade awarding processes to ensure that the final grade awarded to students is comparable.

Contents

Grade boundaries

Standard level overall

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 9	10 - 19	20 - 32	33 - 42	43 - 54	55 - 65	66 - 100

Standard level internal assessment

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 8	9 - 13	14 - 16	17 - 20	21 - 23	24 - 30

Standard level paper one

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 8	9 - 12	13 - 16	17 - 19	20 - 23	24 - 35

Standard level paper two

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 9	10 - 16	17 - 23	24 - 31	32 - 38	39 - 65

Standard level internal assessment

Recommendations for IB procedures, instructions and forms

A word count program or feature is needed so that examiners do not have to spend time counting words on scripts that appear to be too long.

Teachers need to know appendices are penalised.

Continue to encourage teachers to write their comments throughout IA. Handwritten/electronically annotated versions of the student work so that it is clearer where/how teacher marks were awarded.

Teachers are still uploading scripts with the students' names and school code/name.

The range and suitability of the work submitted

There was a mix of different types of IA work: surveys, data mining, field work and lab work. The school campus was popular for fieldwork, surveys and as a model, and also there were some home investigations.

There are still a number of narrative, descriptive essays using secondary data and poorly designed surveys. Literature review style reports also still appear.

There is a broad range of topics submitted.

Common topics were: a connection between footprints with either EVS, gender or age. Air, water or land pollution, and climate change were often part of data mining. Waste management was common this session, including plastics. The use of seeds and plants in the lab with various treatments. Interesting investigations: Noise/Light pollution, while abiding by IB's experimentation policy, with monitoring birds, bats and other animals in a non-stressful way. Efficiency of portable chargers, and the electricity they require. Invasive species impacts. Sea grass and climate change. Surveys on vertical farming to supporting conservation.

The use of mobile applications beyond the use of digital probes has been exercised and there is uniqueness in the approach.

Most teachers make comments either directly on student work, or the separate document, which was an optional upload this session. Teacher comments assist the moderators in making the judgement for the mark.

There was a range of data analysis techniques from ANOVA analyses to simple averages and percents.

The quality of secondary data investigations varied the most, usually with too little data being used. Also many surveys have poor questions and are often not well analyzed.

A number of reports had no environmental issue being a health, biology, geography or economics focus. Other reports had one or two sentences linking the social issue to the environment but in a general way only. The IA is designed to focus on the environmental issue and this should be emphasised to students.

The risks, ethics and safety considerations were generally suitable. The main aspect being missed is the risks behind handling soil samples. Very few reports broke the IB experimentation policy, mostly linked to adding animals to an aquarium or terrarium and having them die.

Student performance against each criterion

Identifying the context

The majority of RQs were relevant to ESS, and often included the EI. Students generally perform well in this criterion.

Common areas of weakness are unfocused or broad RQs, a too general EI and poor linking of the EI to the RQ asked. Many candidates gave well rounded local connections to their investigations.

RQs in general could be more focused, a number contained two questions, sometimes even three. This will cause issues in the planning section as well. The terms "effect" or "affect" or “impact” are vague. Students should be more specific in their research questions; mentioning the independent & dependent variables, with ranges, or detailing the two comparisons. The RQ is also specific when the time and spatial ranges are included.

Some EIs are still only focused on human health, geographic or economic issues. This is not appropriate for ESS.

The choice of the EI should inform the decision on the wording and focus of the RQ. The third aspect making the connection is essential here.

Overall, the RQ should be able to have an investigation carried out

Planning

Most students attempt a plan ranging from highly detailed ones that could be repeated to those containing just a sentence or two that are unrepeatable. Many more students this session wrote too brief, unrepeatable plans. This session also contained plans that did not attempt to answer the RQ, or switched one of the RQ variables to another.

Planning for sufficient data collection to answer the RQ and providing justifications for the choices made in the plan are often the hardest aspects of this criterion. The aspect most often missing is the safety, ethics & risks.

The procedure to collect data should provide enough detail to ensure repeatability. When the plan is written in a narrative format the repeatability is often low.

Field based investigations must detail the rationale for the location/site choice, and detail the actual sites chosen within the location. Then the collection of a sample or data from the site must also be specified. When students doing field work included images/maps of set-up and locations this was helpful.

Survey or questionnaire investigations should include the questions and justify why these questions are asked. The survey should not be in an appendix. How and why the participants are chosen, and how the survey is distributed are part of the procedure for a survey.

Secondary data investigations must mention the source used to collect the data and the ethics behind why this is a suitable data source. How the data is extracted from the database or website should be detailed in the plan.

In laboratory investigations the justification for the independent variable treatments should be given. When possible, lab work should include a control set up. Adequate relevant data for lab work usually means 5 different treatments with 5 trials each. Images or photos of the setup are very useful.

The collection of sufficient data varies depending upon the type of statistical manipulation that will be done to answer the RQ. This must be addressed in the plan. Secondary and survey data usually require more data points than a lab based investigation.

There is no need to copy out test kit instructions or how to set up a spreadsheet, calculate statistics or how to create a survey. It is sufficient to state that an application or kit has been used, giving the name for repeatability purposes.

Results, analysis and conclusion

All raw data collected and used to reach a conclusion should be in this section of the report. A number of students included the raw data in an appendix. This is not appropriate.

All raw data should be processed in some way to show the patterns and trends that allow the RQ to be answered in a conclusion. Various statistical tests appropriate to the data collected can be applied to the data to help determine a conclusion. Most students attempted some processing of the raw data, even if the raw data was initially graphed. A wide range of statistical tests were used by students. All calculations must be checked by the teacher to ensure the maths is correct.

Secondary data and surveys had instances of students presenting data and graphs/charts they had not created themselves. Generally, these presentations do not directly answer the RQ making the analysis and conclusions being drawn weak. The use of surveys and interviews is a good method to gather non-parametric data. Then this data has applied to it either descriptive or inferential statistics for a complete analysis. The choice of tests for surveys and interviews, and other data does need some guidance from the teacher. There are flow chart and guides available online to help with this.

Students that included a calculation of validity or reliability and referred to this in the conclusion tended to do well in this criterion.

Conclusion sections sometimes blend environmental issues with data analysis, spilling over into the discussion.

Some students wrote conclusions that were not supported with data but were rather generalizations and/or suppositions/personal opinions. There were cases where students cherry-picked their data to then say they could “prove” their hypothesis to be true.

Discussion and evaluation

The discussion aspect of this criterion is often very brief, missing or does not relate the conclusion to the EI. Stronger investigations have students who use literature and research—as well as their own data—to refer back to the EI.

The evaluation aspects are generally answered in more detail. Most students can identify or describe strengths, weaknesses and limitations, and many can discuss these. The modifications for the weaknesses and limitations are usually appropriate but often are not detailed enough. Most students are now attempting some further areas of research, but these can be rather superficial.

When secondary data is used, students can end up evaluating the original researchers methods rather than their own decisions on how to extract the secondary data.

The discussion often is found in parts of the analysis, conclusion and application sections.

Applications

The majority of investigations included a solution. A number of students add this to the end of the DEV section rather than having a separate section. In some reports, candidates have struggled to suggest solutions directly related to the environmental issue or the research question.

There were many generic solutions with a general evaluation using "more education" "more laws or regulations" or "awareness campaigns". Students seem to find it difficult to have one named solution and then evaluate this. Rather, they describe a number of solutions and give a general evaluation.

Strengths are more often explored, limitations and/or weaknesses missed.

Evaluation is usually the weakest part of this criterion.

Communication

The reports are generally well-constructed and clear. They are organised and use appropriate ESS terminology. Clear titles and subheadings are part of good communication. Students should be careful using provocative, emotional or biased words or phrases.

The conventions of using metric, scientific naming conventions and labelling tables, figures and graphs should always be followed for clarity.

The use of an appendix is penalised in COM.

Reports that used an essay format and had very limited or no sections did not meet aspect 1 or 3 of this criterion.

Most students kept within the 2250 word count. Some students try to circumvent the word count using tables for the plan or evaluation, or even analysis.

Recommendations and guidance for the teaching of future students

The report should not contain school, teacher or student information.

The use of an appendix is inappropriate; it will not be marked.

Academic integrity should be followed and appropriate citations should be made using a consistent referencing system. All source material must be referenced.

All of the criteria should be practised through the practical activities prior to the IA being undertaken.

The IA assessment criteria should be shared with the students and students should have seen some exemplars of complete IA reports.

Teachers must give feedback on one complete report and allow the student to edit their report.

Teachers need to provide comments on the final submitted reports to explain the mark they are awarding for a criterion.

Teachers should approve the RQ and plan before the student starts to gather data. This should include an indication from the student on which statistical tests they wish to use. The teacher can provide verbal feedback on whether the student's plan and processing will answer the RQ. A descriptive or a human health, geography or economics RQ is not appropriate.

Teachers should encourage students to think about the EI & research in depth first before creating a research question. They should make sure the RQ is focused enough to be answered adequately within the word count.

Students would benefit from practising writing plans for a variety of types of investigation. Including site choices and sample techniques for fieldwork, extracting data from a database and the sharing of a survey with justifications for the questions. All plans should be in enough detail for repetition.

All plans should have a method/procedure that is fully repeatable by another person using the protocol in the report.

All plans must have a safety, ethics and risks section. The use of a risk matrix can be helpful. The experimentation policy should be checked each year in case of updates.

Raw data must be included in the main body of the report. The details of the processing formula or tool should be stated and ideally a worked example shown.

Data cannot be copied and pasted from a survey or a secondary data source and be considered suitable for the investigation.

Appropriate graphical or display techniques for the data and manipulation should be used. For example, calculating an average of growth over time is not appropriate, and plotting this on a bar chart does not help answer an RQ looking at whether a change influences growth.

The calculations and statistical tests should be checked for accuracy, before drawing conclusions from the results.

All validity or reliability manipulations should be commented upon in the analysis and/or conclusion.

The discussion should discuss the EI and ideally include research/theory that is then cited.

The evaluation should look at main issues with the written and actual procedure done.

Only one solution is required in the APP section and this solution should be evaluated. This solution and evaluation should not be generic but rather specific for the EI and conclusion.

An accurate word count should include all components that count towards a mark. Plans and evaluation in table format will still be part of the overall word count. Data, citations/bibliography, figure titles and section headings are not counted as part of the word count.

Teachers are asked to ensure that the reports do not exceed the word count or if they do, then to clearly indicate on the report (with a line) the exact place where the word count has been reached.

Teachers should encourage candidates to present the sections of their reports in the order suggested by the criteria. Reports that have a Conclusion and or APP before DEV at the end of the report may risk being considered unorganized. Students should be encouraged to be concise and avoid repeating the same content throughout the report.

There should be deliberate efforts by teachers to do more research and practical demonstration in class to help students better understand how to properly research and write a scientific report that is truly balanced and informative as well as can be replicated.

Further comments

Better guidance is needed in the planning stages and ongoing monitoring to ensure the IAs will be appropriate and enable the student to complete all aspects of the criteria to the best of their ability.

The use of AI should be carefully monitored, and fully cited.

Standard level paper one

General comments

The majority of G2 respondents considered the difficulty of the paper to be appropriate. Compared to the paper from last year, approximately 80% considered it to be of a similar standard, about 10% believed it was more difficult and about 10% thought it was easier. The quality of the paper in terms of clarity of wording, presentation, readability, suitability and inclusivity was considered by most respondents to be either acceptable, good or very good.

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

- Understanding the factors that lead to high plant diversity (Q1b).
- Understanding the process of soil erosion and how different factors contribute to this (Q2a).
- Understanding the characteristics and role of a flagship species (Q2c).
- Understanding the criteria used to design a protected area and applying this to the case study (Q3a).
- Understanding the factors that contribute to productivity in coastal waters (Q3b).
- Understanding what an abiotic factor is and how it can be measured and monitored (Q3d).
- Understanding how to provide a balanced evaluation or discussion which consider both sides of the argument (Q6 and Q7).
- Understanding how to write an appropriate conclusion which uses positive and negative examples and includes a clear judgement statement (Q7).

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

- Most students were able to effectively interpret and use data from the Resource Booklet and performed well on Q1a, Q1c, Q1d and Q5b.

Students also performed well on:

- identifying an IUCN criterion that contributed to the change in classification of the Table Mountain ghost frog (Q3c).
- outlining how changes in one population can causes changes in another population within a food web (Q4c).

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

Question 1(a)

Most students correctly answered this question.

Question 1(b)

Few students provided an appropriate response with most incorrectly focusing on factors that contribute to increased plant productivity (e.g. rainfall and sunlight) rather than factors that contribute to plant diversity.

Question 1(c)

The majority of students answered this question correctly. However, a common error was to incorrectly round the number.

Question 1(d)

This question was answered well by the majority of students. A common error was to state 'king protea' or 'rooibos' without the commercial product. A few students also incorrectly included products not in Figure 2(b) such as timber.

Question 2(a)

Students found this question difficult and few achieved any marks. Many paraphrased aspects from Figure 2a without providing a clear explanation of why invasive species could lead to soil erosion. For example, many responses stated that invasive species use a lot of water but then did not link this to desertification which in turn makes the soil more prone to erosion by wind/water.

Question 2(b)

There were a wide range of good responses to this question. A common error was to give answers that were too vague e.g. "causes deforestation" or "damages the environment".

Question 2(c)

Responses for this question were very variable with many students achieving full marks. A common error was to confuse the role of a flagship species with a keystone species or to focus on protea flowers as an economic commodity. In addition, a significant number of students did not attempt this question.

Question 3(a)

Answers varied considerably with some very good responses. However, a significant number of responses incorrectly focused on the management of the park rather than the design.

Question 3(b)

Most students found this a difficult question and few achieved the full 2 marks. Many responses were too vague and lacked the necessary detail.

Question 3(c)

This question was answered well by the majority of students. A common error was not to give the direction of change e.g. stating "population size" instead of "a reduction in population size".

Question 3(d)

This question was poorly answered by most students. Few responses correctly identified an abiotic factor and associated instrument for measuring it e.g. pH using a pH probe/meter. Many answers inappropriately focused on biotic factors or monitoring fire.

Question 4(a)

Responses to this question varied widely with a significant proportion of students obtaining full marks. Popular responses included low number of predators and a large amount of food source available. A common error was to suggest that the penguins were protected from hunting rather than focusing on the habitat being protected.

Question 4(b)

There were some very good responses to this question. However, some responses were too vague and did not indicate how climate change would alter the conditions e.g. increase in ocean temperatures.

Question 4(c)

This question was answered well by the majority of students. A common error was not stating that the population of fur seals would increase or that seals preyed on squid.

Question 5(a)

Many students answered this question appropriately. A common response was to link increased levels of rainfall to increased water levels within the dam.

Question 5(b)

The majority of students answered this question well. A common response was to link periods of high rainfall to low levels of water extraction from the dam.

Question 5(c)

There were a wide range of responses for this question, with most candidates achieving some marks. A common error was to state examples of reducing water usage such as shorter showers without linking it to a strategy e.g. campaigns to educate and change behaviour in order to reduce water use.

Question 6

Responses varied widely for this question. Many responses focused only on reasons that could lead to a reduction in carbon dioxide emissions (pros) and did not also include reasons for why carbon dioxide emissions may remain high (cons).

Question 7

Responses varied significantly for this question. Answers were sometimes too vague with material repeated from the resource booklet without linking it to its impact on species conservation. A small number of students incorrectly discussed ideas which were not in the resource booklet such as captive breeding and use of zoos. Few students achieved either 5 or 6 marks. Many responses only focused on the advantages, which limited them to a maximum of 4 marks. There were very few responses that included a well-balanced conclusion, with most being either too vague or one-sided.

Recommendations and guidance for the teaching of future students

- Students should be encouraged to read the question carefully and thoroughly. Students should practice reading exam-style questions to try and understand what is being asked and then how to answer the question directly.

- The requirement of each command term should be taught. It may be useful to practice answering the same question using a different command term to really understand the difference between describe, explain, evaluate etc. Students should also know which command term requires them to include counter arguments and a clear conclusion/appraisal.
- Students need to practice reading data from a wide variety of charts and graphs. It may be useful to increase the use of different types of graphs as a teaching tool to try and help improve interpretation of data and where appropriate extraction of data for use in calculations.
- Students should be given examples of the range of calculations used in ESS and provided regular opportunities to practice these.
- Students should be taught how to plan a 6-mark question with for and against arguments. They should be taught and be able to practice how to write a well-balanced conclusion with a clear value judgement supported by evidence. Providing students with exemplars of good conclusions from the mark scheme and encouraging them to write further examples could be helpful.
- Students should be encouraged to consider the number of marks that are awarded to a question and ensure that enough information has been included to earn full marks (e.g. reasons, impacts, limitations, or examples).
- Students should be encouraged to give focused answers to questions using appropriate ESS terminology. They should avoid using generalised words or phrases such as "pollution/emissions", "impacts/affects", “change” or “greener” as these are too vague for credit. Responses need to be specific, for example, if pollution is being emitted, what kind of pollution and what is its impact. The direction of change, such as “increase/decrease/reduction/lower/higher” should be included and is usually necessary for the mark.
- Students need to ensure that handwriting is clearly legible. If answers are not readable, they cannot be credited. Only dark ink should be used as scripts will be scanned and marked on-screen.
- Students need to keep their responses within the answer box and if extra space is required continue the response on additional pages. If continuing an answer on additional pages, the student should state "see answer booklet" at the end of the answer box and write the exact number of the question on the additional page.
- Students should be discouraged from leaving blank responses.

Students need to apply their subject knowledge and understanding of ESS to this paper. Hence, educators need to ensure the whole syllabus is covered in sufficient detail. This includes ensuring students:

- have the opportunity to conduct fieldwork e.g. collecting data on abiotic factors along a river/stream.
- are able to do a variety of calculations including percentages, percentage increases/decreases, annual increases/decreases.
- are able to correctly round numbers to two decimal places.
- understand the factors that contribute to high plant diversity.
- understand the factors and processes involved with soil erosion.
- understand the role and characteristics of a flagship species and differentiate this from a keystone species.
- understand the criteria used in designing a protected area.
- understand why the rates of productivity are high in coastal waters.
- understand what abiotic factors are and how they can be measured and monitored within an aquatic habitat.

Further comments

There were many scripts that were not legible and therefore hindered accurate assessment. Schools need to provide guidance and support to improve students' handwriting skill. Schools should also organise access arrangements for students with very poor handwriting (details of which can be found in the IB Access and Inclusion Policy).

Students are often writing outside the answer box. This needs to be avoided as part of the answer may be accidently missed when marking. Instead, an additional booklet should be used.

Standard level paper two

General comments

In general, the feedback from schools affirmed the quality and fairness of the paper. The great majority felt the paper was of equivalent difficulty to that of last year and the results bore this out, being very similar if marginally better. The great achievement was that confusion over ozone depletion and global warming appeared less prevalent this year, although this may be due to the nature of the questions.

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

Drawing a flow diagram from given data; impacts on the global ecological footprint; reasons for diurnal changes in tropospheric ozone concentration; acid precipitation; accurate portrayal of anthropocentrism as defined in our guide; early stages of a population S-curve; strategies for sustainable human population growth; nitrogen cycle; ecological pyramids; reliability in field techniques for estimating population numbers; distinguishing impacts of fertilisers and pesticides; natural capital and natural income.

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

Identifying flows on a diagram; mitigation of climate change; reading values from graph; identifying impacts of plastic waste and means of reducing production; evaluation of China's one child policy; field techniques for estimating population numbers; key evolutionary concepts; effect of species diversity and abundance on ecosystem resilience; managing agricultural pollution; inputs and outputs to soil system; negative and positive feedback mechanisms in global warming.

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

Section A

Question 1(a)

The vast majority were able to identify relevant flows from a diagram.

Question 1(b)

Around 50% of candidates struggled to produce a simple flow diagram from given data.

Question 1(c)

Many candidates were able to extract the pertinent information and complete the calculation.

Question 1(d)

Most were able to find an advantage of oceans as a C sink but often struggled to identify a disadvantage.

Question 1(e)

A great majority were able to identify a strategy for mitigating atmospheric carbon storage

Question 2(a)

Most were able to accurately read the given graph, but a few were too inaccurate for credit.

Question 2(b)

Quite a number of candidates were unable to extract the correct information from the graphic to calculate the % required.

Question 2(c)

The great majority were able to explain the accumulation of plastic in 2017.

Question 2(d)

A good majority could identify and distinguish the impacts of discarded and incinerated plastic.

Question 2(e)

A good majority could likewise identify appropriate strategies to reduce production of plastic waste.

Question 2(f)

A good majority could likewise identify appropriate strategies to reduce production of plastic waste.

Question 3(a)

Vast majority identified time of lowest ozone production.

Question 3(b)

Reasons for diurnal changes in tropospheric ozone concentration were often confused or vague.

Question 3(c)

Surprisingly few could link high SO_2 concentrations with acid precipitation.

Question 3(d)

Responses were often too vague for identifying source of pollutants e.g. factories.

Section B

Question 4(a)

A good proportion of candidates could identify one or two characteristic features of anthropocentrism, but many were confusing it with a cornucopian value system in which there are no restraints on consumption.

Question 4(b)

The majority of candidates had a good idea of processes/mechanisms toward the end of a population S-curve but had little to say about earlier stages.

Question 4(c)

The great majority of candidates were able to evaluate China's one-child policy, but only a minority could review a more extensive range of strategies addressing sustainable population growth.

Question 5(a)

A surprising majority of candidates failed to recognise this as a question simply addressing steps in the nitrogen cycle.

Question 5(b)

Candidates often struggled with this question. They tended to have only a vague grasp of the nature of ecological pyramids and were unable to explain variations in shape.

Question 5(c)

Majority of candidates could describe procedures for estimating abundance of populations but were less commonly able to address issues of reliability attached to each.

Question 6(a)

A majority of candidates were familiar with key terms like mutation, natural selection, survival of fittest and speciation but were often unable to explain these mechanisms in context of evolutionary change.

Question 6(b)

Majority of candidates could offer several ways in which species diversity and abundance affected resilience of an ecosystem.

Question 6(c)

Majority of candidates were able to identify and evaluate a range of strategies for managing agricultural pollution of aquatic systems although a significant number were limited to vague ideas like banning or restricting use of fertilisers. Fertilisers and pesticides were often confused.

Question 7(a)

Most candidates were able to identify relevant inputs and outputs to the soil system. A few only had a vague idea of the boundary to the system and were addressing processes that occurred outside the system (e.g. photosynthesis) or within the system (e.g. decomposition).

Question 7(b)

Great majority answered this question well, clearly describing positive and negative feedback and giving at least one example of each. A minority went on to claim full credit by giving a second example of one.

Question 7(c)

Majority of candidates did poorly on this question having only a vague idea of what is meant by the terms natural capital and income. Many confused the terms with financial/economic values and missed the point of natural income being the sustainable yield of a resource.

Recommendations and guidance for the teaching of future students

There is still plenty of progress that could be made through candidates having a clearer idea of exactly what the command terms expect in response. For example, "outline" and "describe" require more than a one-word answer; "evaluate" requires pros, cons and a final appraisal, etc. The terms need frequent use throughout the course. Peer-marking using mark schemes from past papers may be an effective tool to this end.

Despite the focus of this subject on a systems approach, a great number of candidates struggle to produce a simple flow diagram with clear boxes and arrows representing storages and flows. Perhaps, through the popularity of pictorial diagrams in text books that don't show clear unambiguous connections between arrows and boxes, candidates are picking up habits of just sketching rabbits and trees and placing arrows vaguely in the right direction. Flow diagrams need some precision. Similar imprecision is often seen in candidates reading values from a graph. This is not a soft-edge, imprecise subject; it requires objective, accurate and unambiguous communication.

One very positive observation on this year's cohort was again the level of performance on the part (c) questions, particularly 4(c) and 6(c). These are generally very challenging questions asking for considerably more than just recall of knowledge. A good proportion of candidates have shown themselves capable of rising to the challenge and orchestrating their knowledge into well-formed, justified argumentation. They have identified different sides to an argument and addressed them with a degree of perceptive balance. The key to success here is clearly identifying the pivotal point around which the balance is required i.e. is anthropocentrism helpful or unhelpful in maintaining sustainable populations? Likewise as to whether the pros or the cons of management strategies are more prevalent.