



**ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 1**

Wednesday 14 May 2008 (afternoon)

1 hour

Candidate session number

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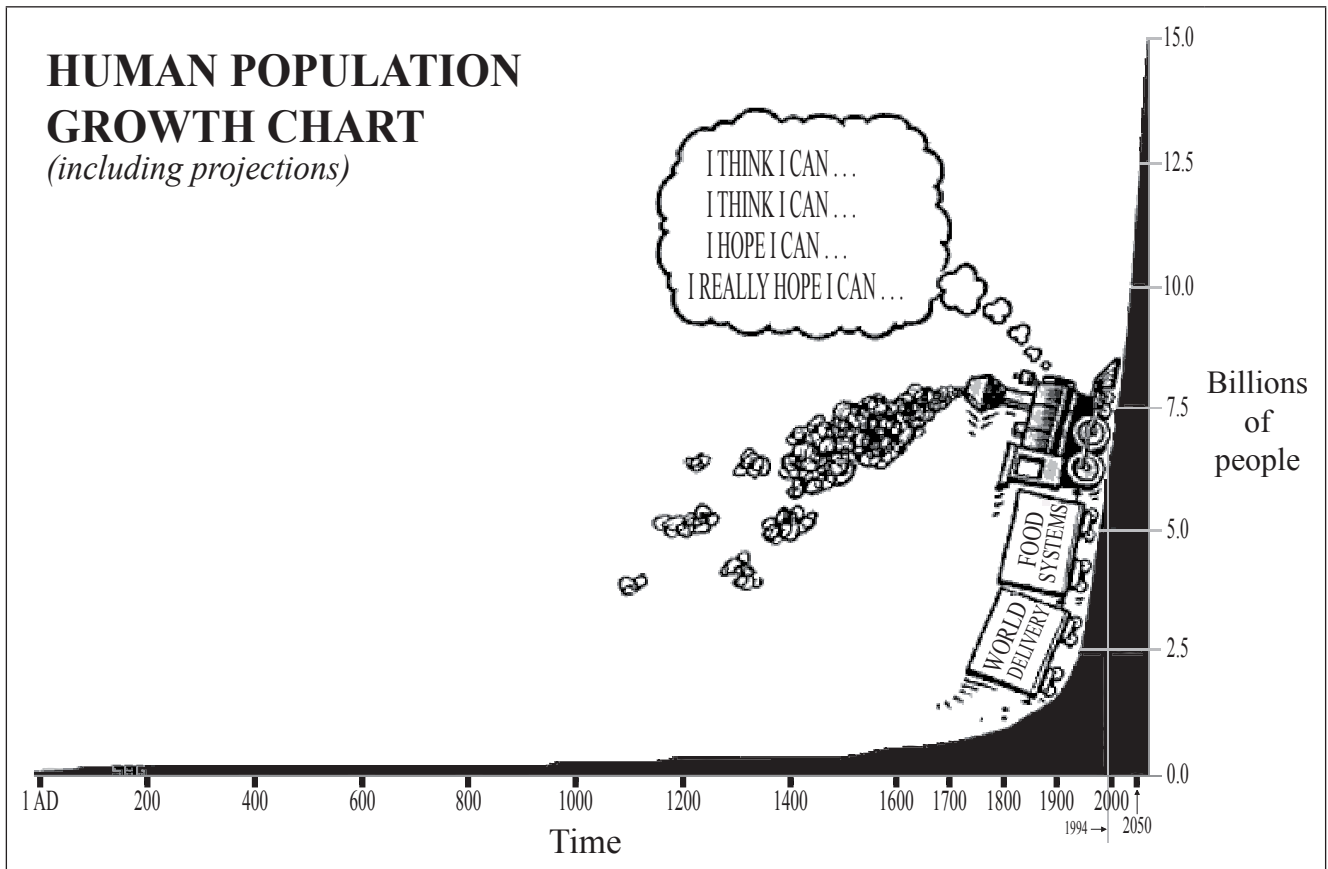
INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions in the spaces provided. You may continue your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the number of answer sheets used in the appropriate box on your cover sheet.



1. **Figure 1** shows a cartoon about global population increase.

Figure 1



[Source: adapted from www.greenberg-art.com/.Toons/.Toons,%20Environ/Populationchart.html]

(a) Determine the projected human population in 2050. [1]

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.....

(b) Describe the pattern of population growth shown in **Figure 1**. [1]

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(Question 1 continued)

(c) Describe **two** ways in which food systems might be changed to meet the increased demand for food in the future. [2]

- 1.
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- 2.
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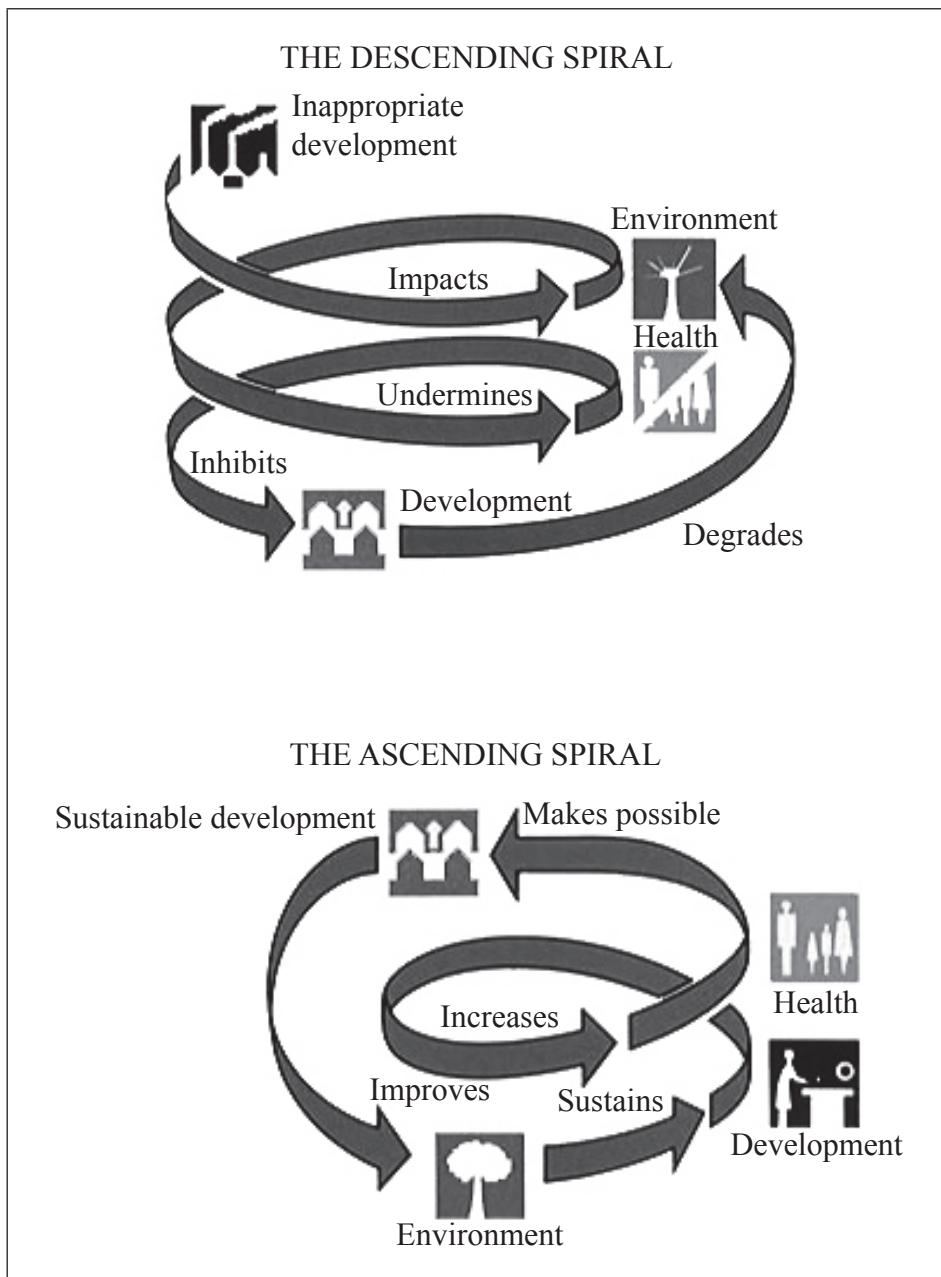
(d) Describe **two** obstacles facing governments who wish to reduce population increase in their countries. [2]

- 1.
.....
- 2.
.....



- 2. **Figure 2** is a diagram from UNESCO showing relationships between development, the environment and health.

Figure 2 Sustainable development spirals



[Source: adapted from www.portal.unesco.org/education/en/ev.php-URL_ID=29459&URL_DO=DO_TOPIC&URL_SECTION=201.html]

(This question continues on the following page)



(Question 2 continued)

- (a) State, giving **one** reason, what kind of system feedback is illustrated by the descending spiral. [1]

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- (b) Discuss the meaning of the term *sustainable development* with reference to **Figure 2**. [2]

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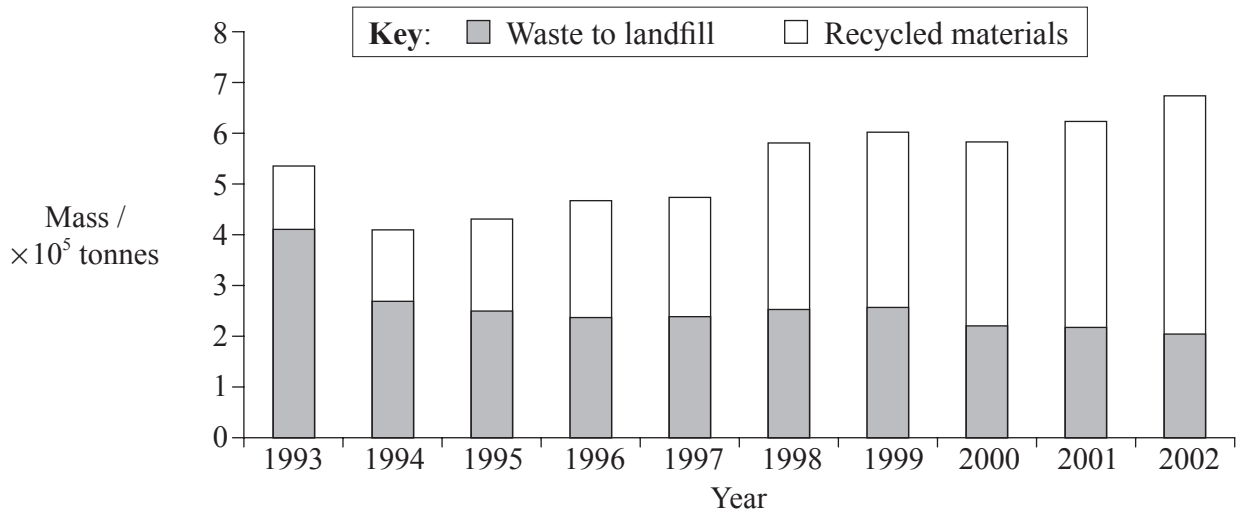
- (c) Evaluate the strengths and limitations of the models shown in **Figure 2**. [2]

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3. **Figure 3** shows amounts of waste being recycled or sent to landfill in Australia between 1993 and 2002.

Figure 3



[Source: adapted from www.environmentcommissioner.act.gov.au/_data/assets/image/12231/graph2_03.jpg]

(a) (i) State, to the nearest hundred thousand tonnes, how much material was recycled in Australia during 2001. [1]

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.....

(ii) Explain why the amount of waste sent to landfill in Australia has remained relatively constant since 1994 despite the increase in recycling. [2]

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(Question 3 continued)

(b) (i) Outline **two** ways in which technology can reduce the amount of solid domestic waste that is sent to landfill within a country. [1]

- 1.
.....
- 2.
.....

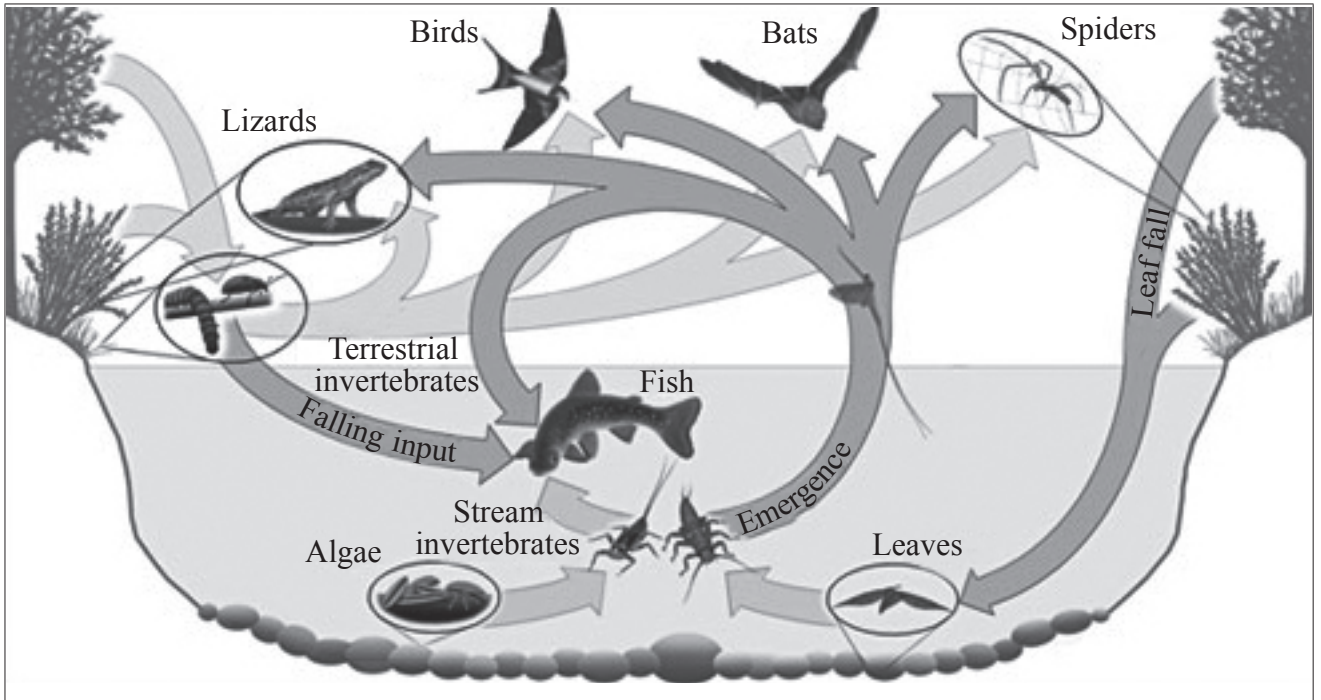
(ii) Explain why the technological solutions you have described in part (b)(i) may still have negative environmental effects. [2]

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4. **Figure 4** shows a food web for a small-scale ecosystem.

Figure 4



[Source: www.isu.edu/departments/strmecol/images/Baxteretal_FWBIol_2005_Fig1b.jpg]

(a) State which trophic level is occupied by the bats in **Figure 4**. [1]

.....
.....

(b) Describe **two** impacts of a reduction in stream invertebrates on the food web of the ecosystem shown in **Figure 4**. [2]

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(Question 4 continued)

- (c) Describe a method used to measure a **named** factor in a small-scale ecosystem you have studied. [3]

Named factor:

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- (d) Describe **two** ways in which the bank side vegetation plays an important role within the ecosystem in **Figure 4**. [2]

1.

.....

2.

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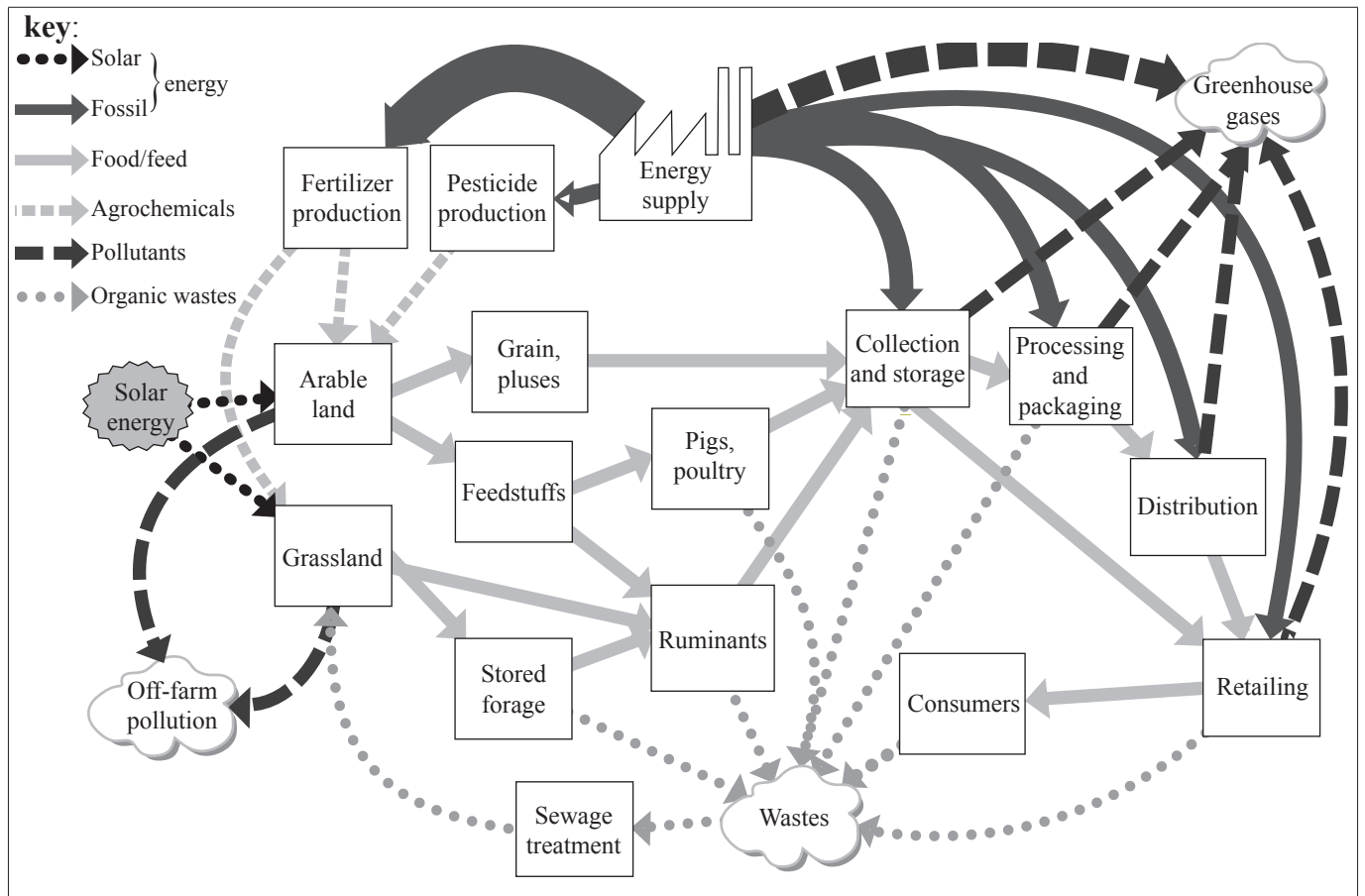
- (e) Name the natural process of change in vegetation that may occur over time on the banks of the river in **Figure 4**. [1]

.....



5. Figure 5 shows flows through a food production system.

Figure 5



[Source: adapted from www.systems.open.ac.uk/objects/DickM/foodchain2.gif]

(a) Explain, with reference to **Figure 5**, how this food production system may contribute to global warming.

[2]

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(This question continues on the following page)



(Question 5 continued)

(b) Distinguish between the terms *pollutant* and *organic waste*. [2]

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(c) Explain how the energy efficiency will differ between the arable components and the livestock components of the system in **Figure 5**. [1]

.....
.....

(d) State, giving **two** reasons, whether this system is more typical of a food production system in an LEDC **or** an MEDC. [2]

1.
.....
2.
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(e) Outline **two** factors that currently restrict the large scale use of renewable energy sources. [2]

1.
.....
2.
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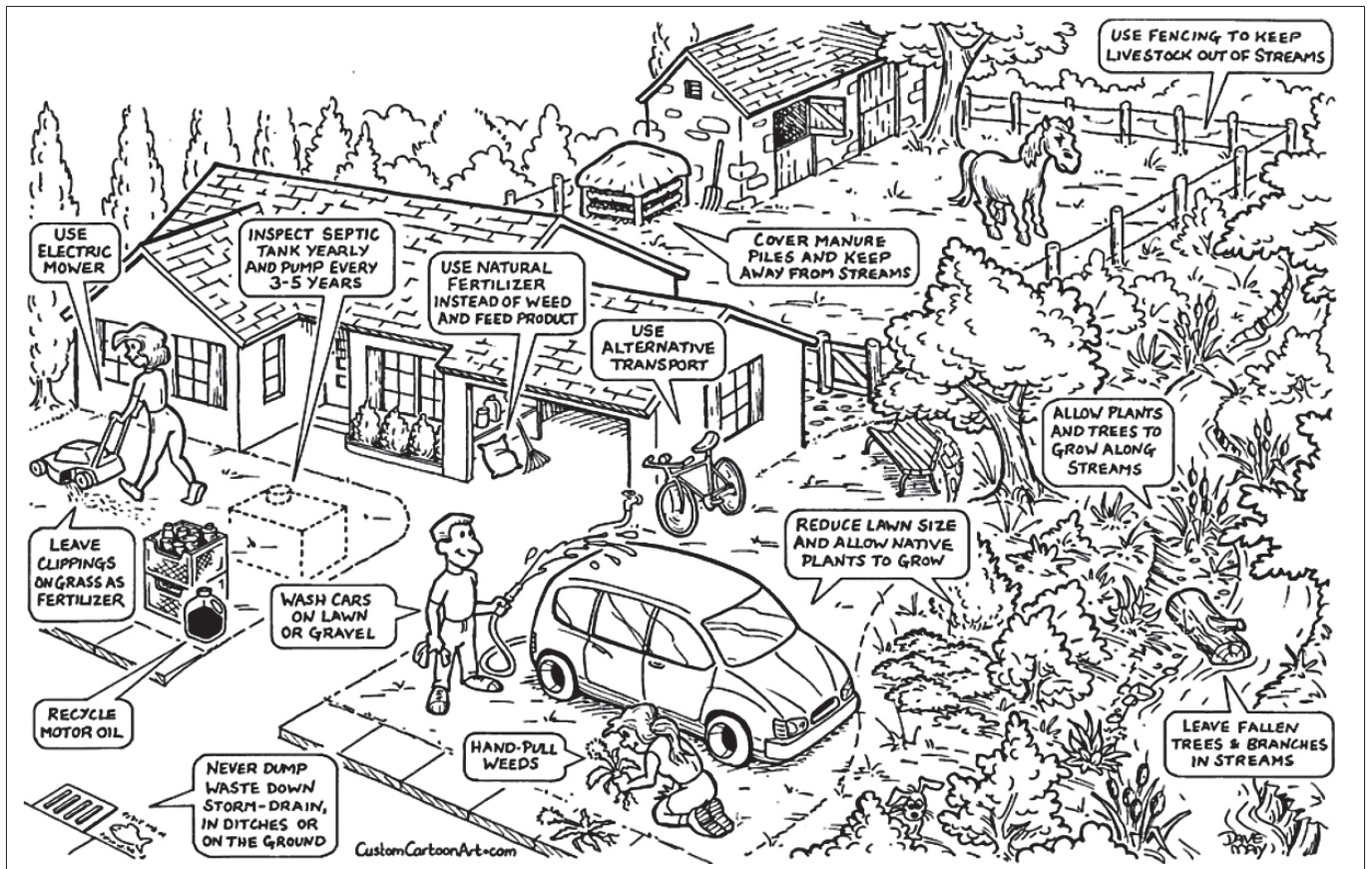
(f) Explain how burning fossil fuels contributes to the formation of tropospheric ozone. [3]

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6. **Figure 6** is an information poster designed to show how individual actions can help to promote sustainability.

Figure 6



[Source: [www.customcartoonart.com/ images/Eco%20Poster.gif](http://www.customcartoonart.com/images/Eco%20Poster.gif)]

- (a) Explain why the poster recommends that manure piles are kept away from streams. [1]

.....
.....

(This question continues on the following page)



(Question 6 continued)

- (b) (i) Identify, giving reasons, **two** actions from **Figure 6** which will promote species diversity. [2]

Action 1:

Reason:

Action 2:

Reason:

- (ii) Explain why species diversity is considered to be an advantage to an ecosystem. [2]

.....
.....
.....

- (c) Suggest **two** reasons why grass cuttings and natural fertilizers are recommended as fertilizers rather than artificial fertilizers in **Figure 6**. [2]

1.
.....

2.
.....



MARKSCHEME

May 2008

ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 1

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

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General Marking Instructions

Subject Details: Ecosystems and Societies SLP1 Markscheme

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a “/” either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- ◆ Words that are underlined are essential for the mark.
- The order of points does not have to be as written (unless stated otherwise).
- If the candidate’s answer has the same meaning or can be clearly interpreted as being the same as that in the mark scheme, then award the mark.
- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalising them for what they have got wrong.
- Effective communication is more important than grammatical accuracy.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded.
- Units should always be given where appropriate. Omission of units should only be penalized once. Ignore this, if marks for units are already specified in the markscheme.
- Do not penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

1. (a) accept answers between 10 and 14 billion; [1]
- (b) exponential;
rate of population increase increases over time; [1 max]
Accept responses with a step by step description that demonstrates that the rate of increase is increasing.
- (c) more intense production;
input of technology *e.g.* GM crops to increase yields / farm machinery;
bringing new land under production *e.g.* through irrigation / hydroponics;
additional fertilizers to increase yield;
more efficient transport (as less food decays);
better storage (as less food decays); [2 max]
Accept any other reasonable responses, but only if they lead to an increase in yield. Do not accept suggestions to limit food consumption as the question is about meeting increases in demand.
- (d) traditions *e.g.* for large family sizes;
religious resistance to contraception *e.g.* Catholic countries;
pressure for sons *e.g.* in farming countries causes increased birth rate to secure a son;
remote areas with no access to information/contraceptives;
lack of education;
few alternatives for women;
economic costs of funding family planning/medical improvements;
value of large populations for economic growth; [2 max]
2. (a) positive feedback because the effects of the problem make the problem worse; [1]
Award [0] if no reason is given for positive feedback.
- (b) traditionally defined as development which meets the needs of the current generation without compromising ability of future generations to meet their own needs; but in this context it suggests development which has a positive role in enhancing the environment;
and is dependent in some way on a healthy population; [2 max]
Accept any other reasonable responses.
Award [1 max] if no reference is made implicitly or explicitly to figure 2.
- (c) simple, easy to see the connections;
shows clearly how actions in one area can have a knock on effect on the original development;
can distinguish between positive and negative actions and consequences;
but far too simple, detail of what constitutes sustainable as opposed to inappropriate development is not clear;
exact natures of the causal relationships are not explained; [2 max]
Award [1] for a strength and [1] for a weakness.

3. (a) (i) 400 000 (tonnes) / 4×10^5 ; [1]
- (ii) Allow [2] for explanation in which increase in waste is implicit.
total amount of waste produced has increased;
but a larger proportion is now recycled;
explanation:
as demand for goods increases people consume more;
economic/industrial growth so more waste produced;
increase in packaging over time;
some products cannot be recycled so will still have to be sent to landfill;
new landfill sites may have been opened so little incentive to reduce waste;
increase in population has led to more consumption;
some people simply do not bother to recycle; [2 max]
- (b) (i) Award [1] for **two** of the following.
recyclable packaging (e.g. cartons / recycling bins / devices);
transporting waste to other countries;
incineration technology;
use of computers/IT to reduce paper storage;
manufacturing goods which can be recycled; [1 max]
Accept other reasonable responses.
- (ii) collecting recycling still uses petrol/energy;
waste is sent elsewhere but still contributes to global economic footprint;
incineration produces atmospheric pollutants; [2 max]
*Negative environmental effects should relate to response given in (b)(i).
Award [1 max] if not.*

4. (a) trophic level 3 / tertiary trophic level / secondary consumer / carnivore; [1]
- (b) amount of leaves/algae in the stream could increase as no longer consumed;
with knock-on effect on abiotic conditions/impact on species in the food web as visibility is reduced;
less food for fish so they may eat other things, knock-on effect on other prey species;
decline in numbers of bats/spiders/birds/frogs that depend on invertebrates (emergent phase) as food source; [2 max]
- (c) *named factor: e.g. pollution of a fresh water ecosystem*
method:
kick sampling and nets to measure numbers of invertebrates in stream;
compare with previous/baseline studies;
refer to biotic indicator keys and evaluate state of river from invertebrates present
e.g. biotic indices; [3 max]
Accept any other reasonable responses.
Award [0] if no named factor.
- (d) habitat for prey species;
contribute leaves as food for invertebrates;
acts as protection against erosion;
important for photosynthesis;
may shade stream, thus control temperature;
contributes nutrients to the water/soil; [2 max]
- (e) succession;
trampling;
erosion;
evolution; [1 max]

5. (a) nitrogen oxides/carbon dioxide from power station as fossil fuels are burned;
greenhouse gases emitted in transportation and distribution as exhaust fumes;
methane from ruminants (not shown on diagram);
emission of gases as food is processed/packaged; [2 max]
Award [1 max] for general responses in which specific gases are not identified.
- (b) a pollutant is any substance/agent (such as heat) added to the environment by
human activity, at a rate greater than that at which it can be rendered harmless by
the environment / and which has a negative effect on the organisms within it;
whereas organic wastes can be treated and recycled back into the system in a
positive way; [2]
*Award [1 max] if the response has identified that pollutants are harmful to the
environment but organic wastes do not need to be. Award [1 max] if no distinction
is made between the terms.*
- (c) arable more energy efficient than the livestock, as energy will have been lost
along the food chain due to respiration and excretion / 10% rule / second law of
thermodynamics;
livestock more processing required and therefore more energy; [1 max]
- (d) MEDC because fertilizers and pesticides are factory produced;
product processing and packaging is on a grander scale in MEDCs;
complex system;
sewage treatment; [2 max]
Award [0] if MEDC stated with no reason.
- (e) fossil fuel resources are still economically cheaper to exploit;
the technology to harness renewable sources not available on a large scale;
inertia/culture/tradition means that non-renewable resources are favoured;
renewable resources are not able to meet current demand;
locations for renewable energy sources are limited by available sites/politics; [2 max]
- (f) when fossil fuels are burned nitrogen oxide is released;
it reacts with oxygen to form nitrogen dioxide;
nitrogen dioxide absorbs sunlight and breaks up to release oxygen atoms that
combine with oxygen in the air to form ozone; [3]
Award [0] if specific gases are not named.

6. (a) stops organic residues entering streams and causing pollution/eutrophication; [1]
- (b) (i) reducing lawn size – lawns are restricted to grass species and succession cannot occur as they are cut regularly;
allowing plants and trees to grow alongside streams will increase the range of habitats for insect/bird species;
more food/nutrients provided for species; [2]
Accept any other reasonable responses.
Award [0] if no reason given.
- (ii) provides greater stability;
more niches so more alternative food sources within the food web should anything happen to an individual species;
greater genetic diversity so better able to withstand diseases/change;
aesthetic / potential economic value of greater diversity; [2 max]
- (c) removing grass cuttings takes nutrients away from the soil, so there will be a net loss of nutrients;
natural fertilizers less likely to contain harmful toxins which may build up in species (biomagnification);
cheaper;
a way of reducing overall waste/resources/energy used;
a more sustainable strategy;
less likely to cause eutrophication than artificial fertilizers;
artificial fertilizers lead to release of greenhouse gases as they are produced;
natural fertilizers may contribute positively to soil structure; [2 max]
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22086302

**ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2**

Thursday 15 May 2008 (morning)

Candidate session number

2 hours

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided. Refer to the resource booklet which accompanies this question paper.
- Section B: answer two questions from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.



SECTION A

Answer all of Section A in the spaces provided.

The resource booklet provides information on Madagascar. Use the resource booklet and your own studies to answer the following.

1. (a) Suggest why Madagascar has such

(i) high biodiversity. [2]

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.....

(ii) high rates of endemism (species only found in Madagascar). [2]

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(b) (i) Explain why Madagascan species have been vulnerable to hunting in the past. [1]

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(ii) With reference to **named** species from the resource booklet, predict **two** impacts that the introduction of non-native species might have on native species in Madagascar. [2]

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(This question continues on the following page)



(Question 1 continued)

- (c) Construct a model (diagram) that demonstrates why the soil of the central plateau in Madagascar has become degraded. [4]

- (d) With reference to **Figure 8**, explain why reduced-impact logging is likely to be more sustainable than conventional logging. [2]

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- (e) (i) With reference to **Figure 4**, calculate the proportion of Madagascar’s total area which is protected. [1]

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- (ii) Suggest **two** reasons why the **economic** benefits of conservation are being promoted by the authorities in Madagascar. [2]

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(This question continues on the following page)



(Question 1 continued)

(f) With reference to **Figure 10**,

(i) suggest **two** reasons for the variation in animal groups found at sites 1, 2 and 3. [3]

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(ii) evaluate the reserve shown according to principles of good reserve design. [3]

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(g) (i) With reference to **Figure 5**, state the expected total Madagascan population in 2025. [1]

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(ii) Justify whether or not you think the government should attempt to reduce the rate of population growth on the island. [2]

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SECTION B

Answer **two** questions. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.

Each essay is marked out of [20] of which [2] are for clarity of expression, structure and development of ideas:

- [0] Quality of expression, structure and development is poor.
- [1] Quality of expression, structure and development is limited.
- [2] Quality of expression is clear, structure is good and ideas are well developed.

2. (a) Outline the factors which can affect global climate other than those attributed to human activities. [6]
- (b) Describe the significant negative impacts of global warming with reference to specific examples. [7]
- (c) Discuss the possible positive benefits associated with the predicted changes in world climate over the next 100 years. [5]

Expression of ideas [2]

3.

The perspective of the late German green philosopher Rudolf Bahro is accepted that, for worldwide sustainability, industrialized countries need to reduce their impact upon the Earth to about one tenth of what it is at the present time.

[Source: W Rees, M Wackernagel and P Testemale, (2005), *Our Ecological Footprint*, New Society Publishers]

- (a) With reference to a **named** example, outline the concept of an ecological footprint. [5]
- (b) LEDCs tend to have smaller ecological footprints than MEDCs. With reference to case studies explain why this is so. [7]
- (c) Describe **three** national strategies that could be used to reduce an ecological footprint and suggest, giving reasons, which one is most likely to succeed. [6]

Expression of ideas [2]



4.

While much attention has been focused on the impending planet-wide oil shortage, a far greater problem awaits us. Arguably the next world war will be fought over water resources not oil reserves.

[Source: adapted from www.waterconserve.org]

- (a) Describe the Earth's water budget and explain why the distribution of water resources could be a source of conflict in the future. [7]
- (b) Discuss how eco-centric solutions to water resource needs can be applied on a local scale. [5]
- (c) Describe and evaluate the role of techno-centric solutions in meeting the demand for food. [6]

Expression of ideas [2]

- 5.
- (a) Discuss how gross productivity, net productivity and diversity will change over time as a habitat goes through succession. Illustrate your answer with a **named** case study. [5]
 - (b) Explain the present distribution of desert and tundra and discuss the factors controlling their relative productivity. [6]
 - (c) Outline the components of an Environmental Impact Assessment (EIA) and justify your personal viewpoint on the value of EIAs in the environmental decision making process. Refer to a specific EIA in your answer. [7]

Expression of ideas [2]





22086303



**ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2**

Thursday 15 May 2008 (morning)

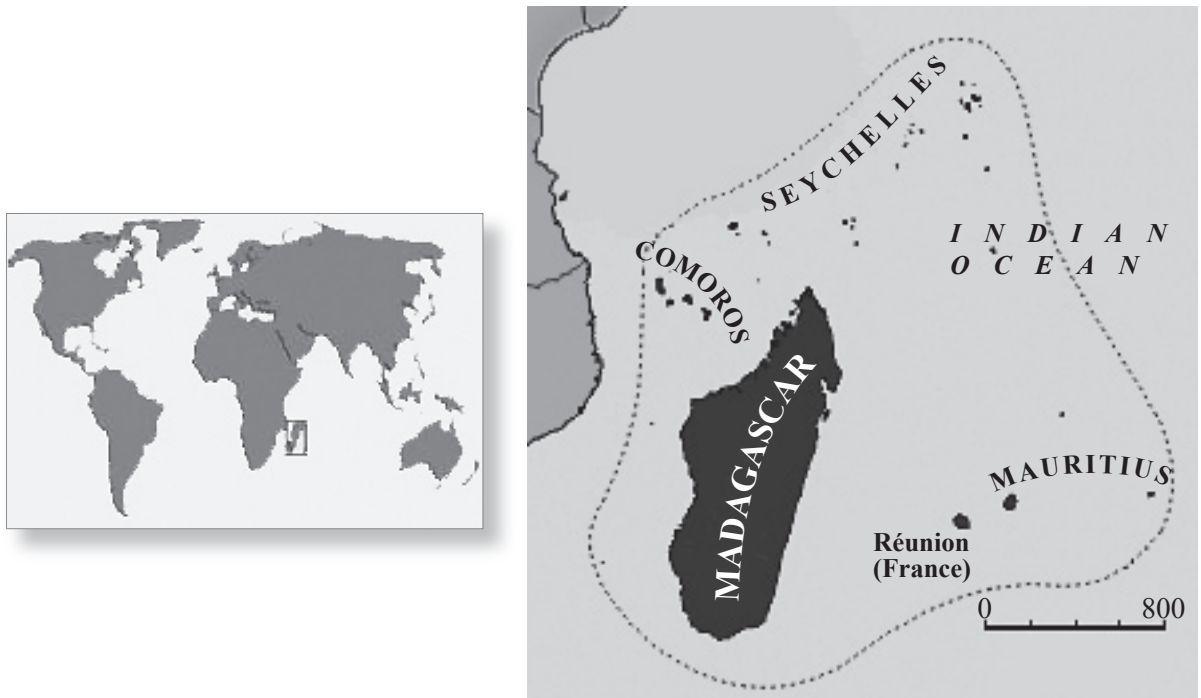
2 hours

RESOURCE BOOKLET

INSTRUCTIONS TO CANDIDATES

- Do not open this booklet until instructed to do so.
- This booklet contains **all** of the resources required to answer question 1.

Figure 1 Location map of Madagascar



[Source: adapted from www.biodiversityhotspots.org]

Figure 2 Introduction

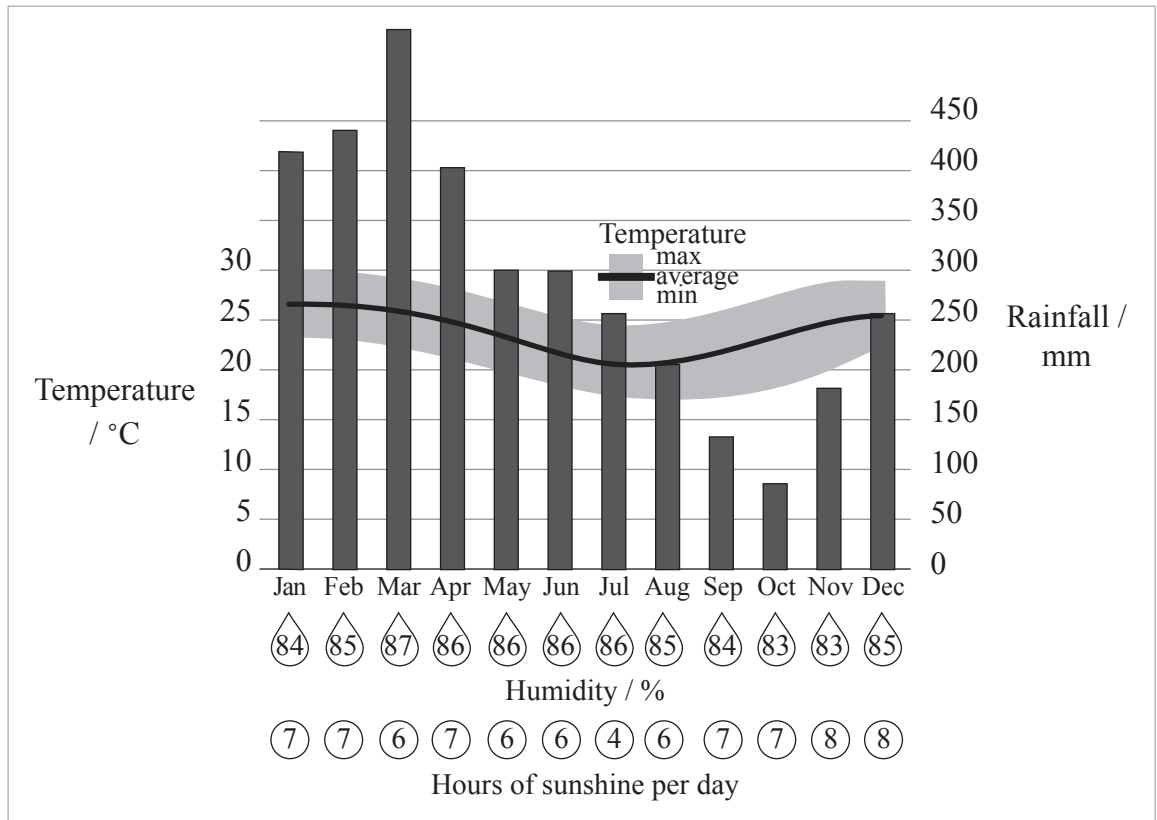
Madagascar has an astounding total of eight plant families, four bird families, and five primate families that are endemic, that is they live nowhere else on Earth. Madagascar's more than fifty lemur species are the island's charismatic worldwide ambassadors for conservation, although, tragically, fifteen more species have been driven to extinction since humans arrived.

Madagascar broke off from the Gondwanaland super continent more than 160 million years ago and is an example of species evolution in isolation. Despite close proximity to Africa, the island does not share any of the typical animal groups of nearby Africa. Instead, Madagascar has evolved unique species, with high levels of endemism (species unique to a geographical location).

The natural vegetation of the island is diverse. On Madagascar, tropical rainforests in the east give way to dry deciduous forests along the western coast. A unique spiny desert covers the extreme south. The island also has several high mountain ecosystems, which are characterized by forest with mosses and lichens.

[Source: adapted from www.biodiversityhotspots.org]

Figure 3 A climate graph for Toamasina, a major seaport in Madagascar. It has an elevation of five metres.



[Source: adapted from www.worldtravelguide.net/a/main/8f350f44-1a25-476a-9457-1c431cc20c8b/563a7dd0-d7f1-4216-8070-81dd4a9981d1/ca1fd421-5405-456e-a14b-f7c65f6c6941.gif]

Figure 4 Madagascar: key environmental facts

Area / km ²	600 461
Vegetation remaining / km ²	60 046
Endemic* plant species	11 600
Endemic threatened bird species	57
Endemic threatened mammal species	51
Endemic threatened amphibian species	61
Extinct species [☆]	45
Human population density / people/km ²	32
Area protected / km ²	18 482

Key: * endemic: species found only in this location
 ☆ recorded extinctions since the year 1500

[Source: adapted from www.biodiversityhotspots.org]

Figure 5 Human impacts

The geographic isolation that allowed Madagascar to evolve diverse and unique species also contributed to its environmental degradation. Because humans did not arrive on the islands until 1500–2000 years ago, the native animals were not initially afraid and were easily hunted by the colonists.

The Malagasy people came to Madagascar from Africa and Asia and imported rice cultivation, slash-and-burn farming and cattle grazing, which are inappropriate for infertile, lateritic soils and were devastating to the fragile ecosystems of the island. The central plateau of Madagascar is almost completely deforested – and is now a lifeless land of infertile, baked red earth. It is estimated that only about 17% of the original vegetation of Madagascar remains.

The 18 million people who live in Madagascar today do not represent a very large number considering the land area of the island. However, the population is growing at more than 3% per year and is expected to double by the year 2025. In an area that is already one of the most economically disadvantaged in the world, this growth rate is putting tremendous pressure on the natural environment. In addition to agriculture, hunting and logging, industry and small-scale mining are growing threats.

On the other Indian Ocean Islands, these same threats have been worsened by the introduction of invasive alien species, brought as food sources, pets or for pest control. Rats, cats and mongooses have devastated populations of birds and small reptiles, while grazing rabbits, goats, pigs, and deer have stripped many landscapes. In addition, exotic plant species such as water hyacinth (*Eichhornia crassipes*) threaten the biodiversity of freshwater ecosystems.

[Source: adapted from www.biodiversityhotspots.org]

Figure 6 Soil degradation on the central plateau


Madagascar suffers from some of the worst land degradation and erosion in the world as seen by the dark areas of the aerial photograph below.



[Source: www.photos.wildmadagascar.org]

Figure 7 Non-native species “cause havoc”

Conservationists have warned that non-native species of animals and plants are causing havoc around the globe after escaping, often with human help, from their native habitats.



Feral pig

Looking down the list, one finds the attractive-sounding water hyacinth and the rosy wolfsnail; the brown tree snake and the feral pig. All of which have proved destructive pests when taken out of their natural environments and introduced into new habitats.

The South American water hyacinth does indeed have lovely purple flowers; but on five continents it has spread from ornamental ponds to choke waterways, stop boat traffic, fishing and swimming, and prevent sunlight and oxygen from reaching plants in deeper water.

Intention or accident

Some pests were originally spread deliberately by humans; the small Indian mongoose was taken from Asia to the West Indies to control rats, but it has wiped out several native birds, reptiles and amphibians, as well as carrying rabies.

Others spread accidentally, hitchhiking in ships’ holds or in packing cases.

Crazy ants, so called because of their erratic movements, killed three million land crabs in eighteen months on Christmas Island in the Indian Ocean.

The World Conservation Union is calling on such bodies as the World Trade Organization to recognise the threat posed by globalization of trade – and even by development aid, as agricultural materials can contain the seeds of non-native weeds.

It also wants sea and airports to watch out for invading species, and says authorities must be ready to act quickly when an infestation is detected.

[Source: adapted from A Craig, British Broadcasting Company, (2005)]

Figure 8 Logging tables

Conventional logging
<ul style="list-style-type: none">▪ Too many roads and skidtrails▪ Too many landings that are too large▪ Substantial canopy opening▪ Subsequent invasion by vines and pioneer plant species▪ Significant damage to other vegetation, including future crop trees▪ Large number of lost logs
Reduced-impact logging
<ul style="list-style-type: none">▪ Reduces soil disturbed in roads, landings, and skidtrails by almost 50%▪ Significantly less canopy opening▪ Better survival of residual trees▪ Faster recovery; shorter cutting cycles▪ Total cost is 10–15% lower▪ Wood waste is reduced by more than 60%

[Source: adapted from www.tropicalforestfoundation.org/rii.html]

Figure 9 Conservation in Madagascar

About 2.7% of Madagascar’s land area is officially protected in national parks, strict nature reserves established to conserve ecosystems and special reserves designed to protect a particular species or a group of species.

Attempts to identify and safeguard the areas remaining natural habitats are being implemented with projects that demonstrate the value of this conservation to the country. For example, in much of Madagascar the economic value of the remaining forests is of enormous importance. Eco-tourism has provided a source of income for local communities.

Efforts at species-focused conservation represent important progress for the future of several unique species. A number of lemur species have been bred successfully in captivity, and, in 1997, the first lemur reintroduction program introduced captive-born black and white ruffed lemurs into the Betampona Nature Reserve.

[Source: adapted from www.biodiversityhotspots.org]

Photograph of a black and white ruffed lemur



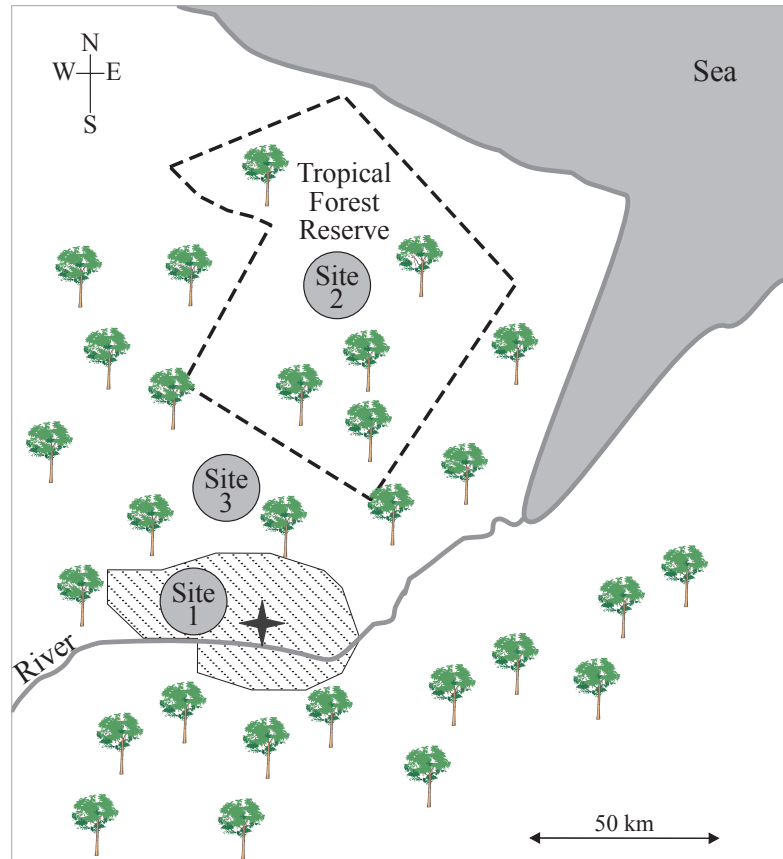
[Source: adapted from www.images.wildmadagascar.org/pictures/1997/sifaka1.gif]

Lemurs have been the focal point of species-based conservation efforts in Madagascar.

[Source: adapted from www.biodiversityhotspots.org]

Figure 10 Tropical forest ecosystem

The diagram below represents a tropical forest ecosystem on the north east coast of Madagascar. The climax vegetation type up to the coastal margin is mixed tropical forest.



Key: village grassland tropical forest

Table of surveyed animal groups present at the three sites shown on the map above.

Animal group	Number of species		
	Site 1	Site 2	Site 3
Lemurs	0	9	2
Tenrecs (rodent-like insectivores)	1	7	3
Geckos and chameleons	3	12	5
Carnivores (fossa, fanaloka, mongoose)	0	1	0
Frogs	0	5	2
Insects	2	14	9
Scorpions	3	0	1

[Source: adapted from www.europe.2007-aliens.org]



MARKSCHEME

May 2008

ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 2

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General Marking Instructions

Subject Details: Ecosystems and Societies SLP2 Markscheme

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a “/”; either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- ◆ Words that are underlined are essential for the mark.
- The order of points does not have to be as written (unless stated otherwise).
- If the candidate’s answer has the same meaning or can be clearly interpreted as being the same as that in the mark scheme, then award the mark.
- Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalising them for what they have got wrong.
- Effective communication is more important than grammatical accuracy.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded.
- Units should always be given where appropriate. Omission of units should only be penalized once. Ignore this, if marks for units are already specified in the markscheme.
- Do not penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

SECTION A

1. (a) (i) a range of ecosystems offering a range of habitats/niches;
favourable abiotic conditions, hot/high insolation and humid/high precipitation;
high productivity can support numerous trophic levels;
complex food webs allow many niches; [2 max]
- (ii) historic isolation has allowed speciation leading to high endemism;
after Madagascar broke away from Gondwanaland, species evolved
independently in response to local conditions;
principles of island geography apply;
many niches so potential for new speciation is high; [2 max]
*Award [2] if response links ideas: "great length of time for speciation and
isolation from the mainland".*
- (b) (i) island colonized relatively recently so species have not developed
escape/evade strategies / not afraid of man; [1]
- (ii) out competing native species *e.g.* Lemurs for food/resources/niches/shelter/
breeding;
bringing disease/pathogens to which native species *e.g.* Fossa are not immune;
direct predation by new carnivores *e.g.* Tenrecs;
indirect disturbance *e.g.* of breeding by presence;
reducing sunlight in deep water *e.g.* water hyacinth; [2 max]
*Named species do not have to be Madagascan but more than one speices
must be named.*
- (c) *Response should be presented as a model. Accept flow diagrams, spider diagrams,
nets, etc. Award [1 max] for responses not given in the form of a model.*
protective forest cover removed;
directly by logging/farming/mining/industry/settlement;
soil exposed to rain and easily washed away/eroded;
soil exposed to high temperatures and baked/dried out;
nutrients leached away;
soil loses fertility and can no longer support plants;
soil degraded and useless as a resource for humans; [4 max]
*Award [3 max] if no climatic factors are mentioned, or the fact that soil is naturally
poor.*
- (d) maintains more canopy so soil is protected from rain/sun;
better survival of residual trees so niches/species protected;
recovery of natural systems after disturbance is more likely;
(in principle) natural interest can be harvested whilst natural capital is preserved; [2 max]
Award [1 max] if response is not explicitly linked to sustainability.

- (e) (i) $(18482 \div 600461 \times 100 =) 3.01\% / 3\%$; **[1]**
- (ii) promotion of development and conservation is the favoured approach of the World Conservation strategy;
incentive for local people to preserve local ecosystems if they can see the economic benefit;
funds from *e.g.* ecotourism can be put back into conservation programmes;
Madagascar is a poor country and economic development is naturally a priority;
an economic alternative to harmful actions; **[2 max]**

- (f) (i) site 2 is a pristine (climatic) climax habitat so exhibits greatest diversity;
site 1 is a disturbed habitat with few trees and arrested succession so lower diversity;
site 3 will experience some disturbance but less than site 1;
some species may only be present in forested areas as this is where they find food *e.g.* Lemurs;
Scorpions favour drier conditions and therefore inhabit the grassland site (1); [3 max]
- (ii) *strengths:*
reserve is relatively large (50 km²) larger reserves are better;
one large reserve generally better than lots of little ones;
reserve surrounded by forest which acts as a natural buffer zone;
isolated from human activity so less chance of disturbance;
already rich in species/high biodiversity/biological hotspot;
- weaknesses:*
remote so access for research/monitoring could be difficult;
remote so difficult to police;
continuing population growth may lead to expansion and increased pressure from the settlement;
not clear whether there are economic opportunities in the reserve for local people;
only one ecosystem type presented here, to be most effective other reserves needed in other locations; [3 max]
Award [2 max] if only strengths or weaknesses are addressed.
- (g) (i) 36 million; [1]
- (ii) yes, government should because population growth rate is high (3%) and population is putting increasing pressure on limited resources;
yes because carrying capacity is likely to be exceeded;
reducing birth rates is often seen as being an important feature of countries that are further along in demographic transition;
more people means more pressure will be put on fragile ecosystems, many of which provide important goods and services and need to be protected;
- no, government should not because population growth rate will naturally stabilize as the country develops;
large population is needed to develop the country economically;
overpopulation is to do with numbers of people compared to resource use, provided resources are used sustainably there is no reason why populations should not grow;
through technology which will develop as the country develops economically, Madagascar will be able to increase its carrying capacity; [2 max]
Award credit for other reasonable arguments.

SECTION B

General Essay Markscheme

Each essay is marked out of [20] of which [2] are for clarity of expression, structure and development of ideas.

- [0] Quality of expression, structure and development is poor.
- [1] Quality of expression, structure and development is limited.
- [2] Quality of expression is clear, structure is good and ideas are well developed.

2. (a) *No marks should be awarded for arguments that are associated with human activities which produce greenhouse gases.*

greenhouse effect is a normal/necessary condition for life on Earth and greenhouse gases are produced by a range of natural phenomena;
volcanic activity can produce greenhouse and other gases;
methane can be released by animals/peat bogs;
climate can also be affected by volcanoes which produce lots of dust;
sunspot activity/variations in magnetic field/radiation;
Earth's tilt/variation in orbit around the sun;
position and extent of ice sheets affect albedo/reflectivity;
ocean currents can lead to warming/cooling;
natural fluctuations/changes like El Niño/La Niña;
bush fires can release carbon into atmosphere;
cloud cover can affect albedo;

[6 max]

- (b) change in climate can lead to changes in weather patterns, temperature and rainfall
change in amounts/distribution;
climates become stormier/more unpredictable;
increase in more extreme weather conditions *e.g.* hurricanes;
melting ice/thermal expansion of water will lead to increased sea levels;
which can lead to coastal flooding/inundation;
drought can reduce crop yields;
and reduce water resources;
many of these factors will indirectly lead to social problems *e.g.* conflict, hunger;
this has implications for levels of economic development;
expanding zones of tropical diseases;
- Award [4 max] if no reference is made to examples.*

[7 max]

- (c) some parts of the world will experience more rainfall, improving farming;
colder areas becoming warmer mean that habitat extensions further north and south could occur;
new niches and opportunities for many species;
changing climate could push evolution in new and exciting directions;
as humans realize the impact they can have they might take more care of the environment;
crop productivity will increase due to more carbon dioxide in the air;
economic benefits for some areas *e.g.* higher crop yields / tourist revenue from warmer locations;
new resources are found under melting ice caps / new route ways opened up so improved trade;
new land to occupy;

[5 max]

Expression of ideas: [2 max]

Total: [20]

3. (a) *Responses should be constructed around a case study.*
named country;
ecological footprint is the (hypothetical) amount of land required to support a defined human population at a given standard of living;
to meet its resource needs;
and assimilate its waste;
this defined population could be at any scale *e.g.* an individual/a country;
it should be sustainable over time;
and is a quantitative representation of carrying capacity; [5 max]
Award up to [2 max] for reference to a specific example (could be on an individual's own ecological footprint or for a country). Award [2 max] if no reference is made to an example. Award [1 max] if response quotes specific data about an ecological footprint.
- (b) MEDCs (in general) have much greater rates of resource consumption than LEDCs;
this means demand for energy resources is high;
this is partly because people in MEDCs have more disposable income;
and also because resource use is often wasteful;
MEDCs produce far more waste/pollution as a by-product of production;
LEDCs are often characterized by lower consumption as people have less to spend;
informal economy in LEDCs is responsible for recycling many resources;
as LEDCs develop the difference between footprint size diminishes; [7 max]
Award [4 max] if no mention is made of specific case studies.
- (c) *Award [1] for any of the following, up to [3 max].*
reduced by reducing amounts of resources that are used;
recycling resources;
reusing resources;
improving efficiency of resource use;
reducing amount of pollution produced;
transporting waste to other countries to deal with;
improving technology in order to increase carrying capacity;
importing more resources from other countries;
reducing population to reduce resources use;

Award [3 max] for justifying which is most likely to succeed.
e.g. improving technology in order to increase carrying capacity
technology can increase carrying capacity to cope with increased demand for resources as populations grow;
GM crops for example can be used to increase yields on the same amount of land;
technology can be applied to all aspects of resource use *e.g.* to intensify land use/
cope more efficiently with waste;
the pace of technological change is speeding up which suggests new solutions will be found in the future to current resource problems;
many innovations are still in earlier stages *e.g.* renewable technologies but these could potentially have a huge impact on ecological footprints in the future;
the funding to support technological change exists in MEDCs which currently face the biggest problem with their ecological footprints, so there is a real incentive to address the issue; [6 max]

Expression of ideas: [2 max]

Total: [20]

4. (a) *describing water budget: [3 max]*

only 2.6% is fresh water;
over 80% is in ice caps and glaciers;
0.6% is ground water;
rest of is made up of lakes, rivers, etc.;
Precise figures are not required, but some indication of relative amounts is.

explaining why possible source of conflict: [5 max]

water resources are now becoming a limiting factor in many societies;
availability of water for drinking, industry and agriculture needs to be considered;
many societies are now dependant primarily on ground water which is non-renewable;
as populations grow, greater demands are made on water resources;
as societies develop water needs increase;
when water supplies fail, populations will be forced to take drastic steps, e.g. mass migration/civil unrest/wars may result;

[7 max]

(b) ecocentrism involves an holistic world view;
this implies individuals/local groups making changes which affect the whole;
it also means working with natural processes;
ecocentric involves self-imposed restraint e.g. reuse of bath water;
ecocentric involves emphasis on small-scale e.g. local tube well;
ecocentric involves emphasis on community involvement e.g. locally built micro dams;
ecocentric involves education e.g. local awareness campaigns;
ecocentric focuses on basic needs of those below subsistence e.g. low technology irrigation;
Award [2 max] if ecocentrism is discussed without reference to local application. Features of ecocentrism do not need to be stated explicitly; as the choice of strategy may imply these.

[5 max]

(c) *description: [3 max]*

irrigation using pumped ground water reserves;
genetically modified plant species, disease resistant cereals;
rice with genes to produce more proteins and vitamins;
hydroponics is a good example of a technological solution;
mechanization;
agribusiness/industrial agriculture;
fertilizers/pesticides;

Award [1 max] for any statement which explains what a technocentric strategy might be.

evaluation: [3 max]

techno solutions may represent the only way to increase yield to meet demand;
may have environmental costs/not be environmentally sustainable;
high economic outlay, and therefore not an option for LEDC;
may include both engineering solutions and biotechnology solutions;

[6 max]

Award [4 max] if there is no evaluation. Award [1 max] for any correct reference to Boserup's theory.

Expression of ideas: [2 max]

Total: [20]

5. (a) as succession occurs soils become better structured and more fertile;
this will support greater diversity of producers and larger producers;
therefore gross productivity/primary productivity will increase;
numbers of niches will increase and food webs will become more complex;
diversity will increase;
as food webs become more complex net productivity will increase;
gross primary productivity, net primary productivity and diversity will stabilize as
ecosystem reaches climatic climax; [5 max]
Award [3 max] if no case study is used.
- (b) *explanation for distribution:*
deserts are found in a band approximately 30 degrees latitude;
tundra is found at high latitudes/adjacent to ice margins;
climate is the controlling factor;
and is determined largely by Hadley cells/tricellular model;
deserts found where rainfall is less than 250 mm a year;
tundra also has little rainfall but low productivity is due to low insolation/sunlight;
and low temperatures;
soil may be permanently frozen (permafrost) in tundra;
vegetation is low scrubs/grasses so productivity is low;
in deserts productivity is low due to low/unevenly distributed rainfall; [6 max]
Award [4 max] if no mention made of distribution.
- (c) EIA requires the production/evaluation of a baseline study;
analysis of baseline study and development character used to predict environmental
impact of development;
EIA also addresses mitigation of potential environmental impact associated with
development;
EIA is therefore one important tool that may be used to inform environmental
decision-making;
EIA may lead to changes in the development-avoiding negative environmental
impact;
EIA may be limited by quality of baseline study;
in certain countries the findings of the EIA are often ignored/take second place to
economic concerns;
environmental impact prediction is speculative due to the complexity of natural
systems and the uncertainty of feedback mechanisms thus making environmental
decisions more difficult; [7 max]
*Responses do not need to reflect a balance of values but the personal viewpoint
must be fully justified. Award [5 max] if no reference is made to a specific EIA.*

Expression of ideas: [2 max]

Total: [20]
