M08/4/ECOSO/SP2/ENG/TZ0/XX/M+

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MARKSCHEME

May 2008

ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 2

11 pages

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 <u>underlined</u> 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) $(18\,482 \div 600\,461 \times 100 =) 3.01\% / 3\%$; ***[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 km^2) 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; ***[7 max]***
*Award **[4 max]** if no reference is made to examples.*

(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; ***[5 max]***
*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.*

(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]***