N09/4/ECOSO/SP2/ENG/TZ0/XX/M

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

MARKSCHEME

November 2009

ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 2

17 pages

General Marking Instructions

Assistant Examiners (AEs) will be contacted by their team leader (TL) by e-mail (or telephone) – if by e-mail, please reply to confirm that you have downloaded the markscheme from IBIS. The purpose of this initial contact is to allow AEs to raise any queries they have regarding the markscheme and its interpretation. AEs should contact their team leader by e-mail at any time if they have any problems/queries during the marking process.

Note:

The DHL courier service must be used to send assessment material to your team leader/senior moderator and to IB Cardiff. (However, this service is not available in every country.) The cost is met directly by the IB. It is vitally important that the correct DHL account number is used.

If you have any queries on **administration** please contact:

Barry Evans
Examinations Administration Department (EAD)
IB Cardiff
Peterson House
Malthouse Avenue
Cardiff Gate
Cardiff CF23 8GL
GREAT BRITAIN

Tel: +(44) 29 2054 7777

Fax: +(44) 29 2054 7778

E-mail: barry.evans@ibo.org

1. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.

2. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.

3. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases write a brief annotation in the **left hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.

4. Unexplained symbols or personal codes/notations on their own are unacceptable.

5. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer (next to the mark allocation for Section A). Do **not** circle sub-totals. **Circle the total mark for the question in the right-hand margin opposite the last line of the answer.**

6. For Section B, show a mark for each part question (a), (b), *etc*.

7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.

8. Section A: Add together the total for each question and write it in the Examiner column on the front cover.

Section B: Insert the total for each question in the Examiner column on the front cover.

Total: Add up the marks awarded and enter this in the box marked TOTAL in the Examiner column.

9. After entering the marks on the front cover check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the front cover. **We have script checking and a note of all clerical errors may be given in feedback to examiners.**

10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.

11. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark all the answers and use the marks of those answers that have the highest mark, obviously up to the prescribed number of questions for the paper or section of paper, **unless the candidate has indicated the question(s) he/she wants to be marked on the front cover**.

12. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Make a comment to this effect in the left hand margin.

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 markscheme, then award the mark.
- Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalizing them for what they have got wrong.
- Remember that many candidates are writing in a second language. 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. Indicate this with "**ECF**", error carried forward.
- Units should always be given where appropriate. Omission of units should only be penalized once. Indicate this by "**U-1**" at the first point it occurs. 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) grassland/forest/woodland/heather moorland/moorland/temperate grassland/peat bog/marsh/deciduous forest/coniferous forest/river/stream/lake/rocky shore/sandy shore ***[1]***
*Award **[1]** for three correct answers.*

(ii) a collection of ecosystems sharing similar climatic conditions ***[1]***
Accept any reasonable definition.

(iii) temperature, precipitation, insolation / solar radiation / sunlight ***[1]***
*Award **[1]** for three correct answers.*

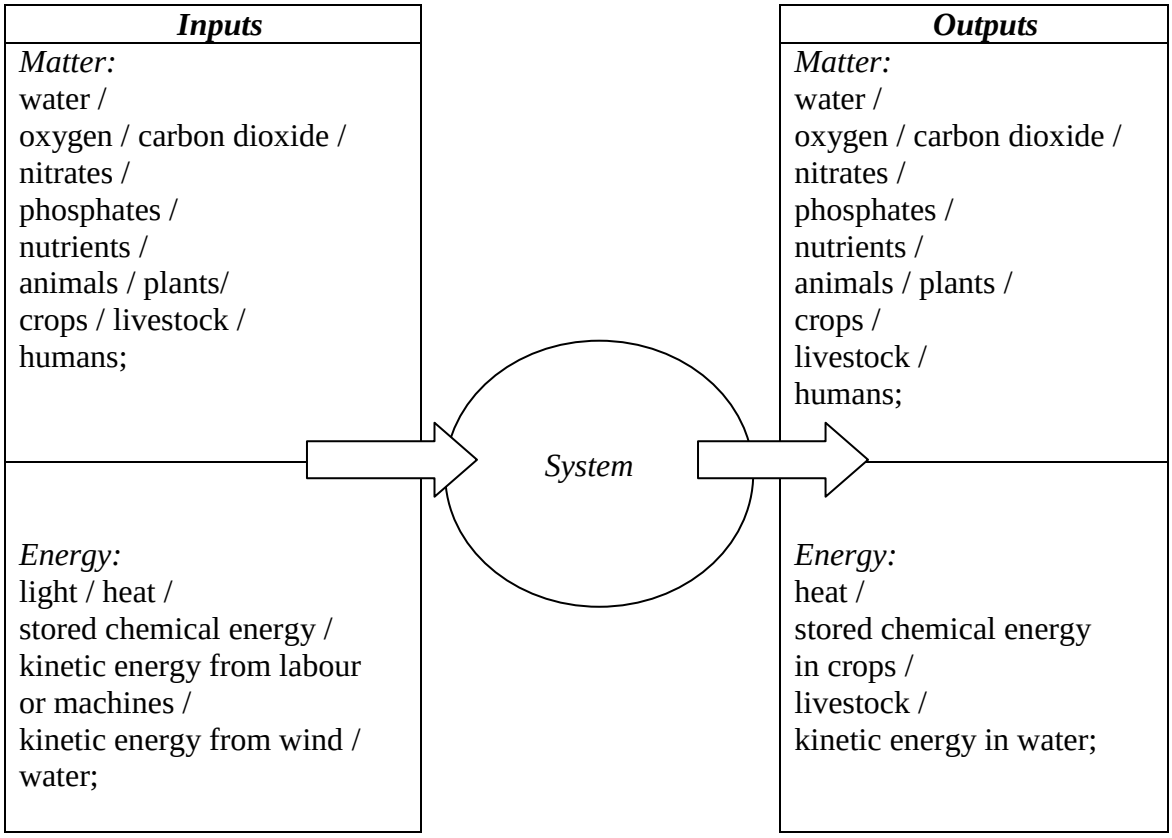
(iv) temperature ***[1]***

(b) (i) $\frac{59}{100} \times 210 = 124$ or 123 ***[1]***

(ii) mammals have been hunted/become extinct on an island with such a high human population density / top carnivores hunted to local extinction / more ecological niches for plants / more habitats for a diversity of plants / plants are food for a very diverse group of animals so have adapted in many ways / mammals are a small group of species in comparison to others ***[1]***
Accept any reasonable answer.

(c) (i) open ***[1]***

(ii) ***[2 max]***



*Award **[1 max]** for two inputs and two outputs for matter.*
*Award **[1 max]** for two inputs and two outputs for energy.*

(d) (i) UK population has generally increased/increased by about 50 %, NYMNP population decreased/NYMNP small decrease then increase then decrease ***[1]***

(ii) these people are of working age and probably support the under 16 and over 60s ***[1]***

(iii) there are more people who are in retirement/over 60/65 in the NYMNP than the rest of the UK so more to support in the community;
there are fewer younger/under 16 people so there will be fewer workers in the future unless others move in;
there are no large centres of population/large towns/cities in the NYMNP; ***[2 max]***
*Allow any two reasonable responses up to **[2 max]**.*

(iv) in NYMNP compared with rest of UK there are no employment opportunities/fewer farm labourers/fewer rural jobs/reduction in dairy farming/more mechanization of farming/fewer farmers/land is marginal so farmers move away/colder climate than further south so people move/ younger workers move to cities/hard lifestyle and young do not choose it; ***[2 max]***
*Allow any two reasonable responses up to **[2 max]**.*

(e) less densely populated part of the UK so easier to define a national park area / more rural/mountainous/beautiful parts of the UK / fewer large cities/urban conglomerations / fewer areas of high population density so less likely to have been degraded or built upon ***[1]***

(f) (i) *ecological*: it is a successful colonizer so can outcompete and take over from other plant species/form a monoculture;
economic: bracken spores are toxic/poisonous/can harm/kill animals/ sheep/cattle / grass will not grow if bracken takes over; ***[2 max]***

(ii) soil may be contaminated and so other species affected and killed/ may not kill the bracken as the rhizomes can then regrow/ may move through the soil to water courses and kill other plants there/ expensive to apply; ***[2 max]***

(g) people have lived in the UK for a long time and all of the land is owned by someone/ unlike the USA where much is still federally owned/ political difficulty of moving large numbers of people away from the areas/ too hard/expensive to move people away/buy the land/ easier to manage the land with people in place; ***[2 max]***
Allow any two reasonable responses up to ***[2 max]****.*

(h) moors are kept at a subclimax by grazing / grazing removes young tree seedlings / grazing animals eat edible species so stop succession continuing / trees would grow / birch and alder would be pioneers / larger slower growing trees (oak/ash) would develop / deciduous forest would develop if left long enough / bracken would colonize and outcompete other plants ***[1]***
Accept any reasonable answer.

(i) c*onservation over human interests*: need to protect more of the Earth from the impact of humans and the destruction that we can cause / other species have the right to live as much as the human species / need to conserve beauty and biodiversity for future generations and for itself;
Award ***[1 max]*** *for any reasonable answer.*

human interests over conservation: the human population will continue to grow and needs as much land/sea as it can get to support itself / we do not have the luxury of stopping people living in or exploiting large areas / animals and plants can coexist with humans and in zoos/seed banks/botanic gardens; ***[2 max]***
Award ***[1 max]*** *for any reasonable answer.*

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) *definition for natural capital*:
natural resources can produce a "natural income" of goods and services, if managed appropriately / *OWTTE*;

definition for natural income:
the annual sustainable yield from natural capital / goods and services that are produced from natural capital without depleting the natural capital / *OWTTE*;

definition for sustainability:
use of global resources at a rate that allows natural regeneration and minimizes damage to the environment / *OWTTE*;

e.g. logging / fishing / game management;

e.g. logging:
truly sustainable enterprises are not just economically sustainable but have the ability to sustain ecosystems (ecosystem function);
the industry must be sustainable economically without having a negative impact on natural systems;
many logging industries are nothing more than resource stripping;
causing loss of species, loss of habitat and loss of ecosystem function;
though forests may be viewed as renewable resource – trees re-grow;
the new forest will perhaps have less diversity than previous forest;
may have a new ecological balance;
in certain forest industries, forests are deliberately planted as crops;
the previous ecosystem is lost as this new crop grows;
though the forest may be viewed as sustainable timber;
there has been a cost to the environment in terms of habitat loss; ***[7 max]***
*Award **[3 max]** if no case studies or examples used within the answer.*

(b) *e.g. game management*:
prior to hunting taking place ecological and environmental studies could be carried out to identify species, habitats and important environmental systems;
this scientific data could be used to help hunters decide where to hunt and how much to catch in order to minimize ecological impact;
endangered species could be identified and their habitats protected from hunting;
scientific investigations may demonstrate the most sustainable method of hunting/game management, *e.g.* targeting of only adult males;
this may be more sustainable and more profitable;
science may be able to model the impact of hunting and model recovery after hunting allowing the industry to predict their impact and thus manage reserves in a more sustainable fashion; ***[5 max]***
Accept other relevant answers.

(c) technology can make resource exploitation more efficient;
this can mean more return and less effort/time;
therefore more resource can be exploited more quickly;
therefore the resource, if renewable, has less time to recover and is thus less sustainable;
e.g. industrial scale marine fishing (pelagic / deep sea);
larger boats, bigger nets and electronic fish-finding equipment mean that more fish can be caught more quickly;
fish populations depleted below replenishment level;
industry becomes unsustainable;
however technology can also be beneficial and aid sustainability if it helps to lower impact and allows for more selective resource exploitation;
e.g. modern "square mesh" technology in fishing nets allows small fish to escape – controls size of fish caught;
only large mature fish caught;
in mining advances in pollution control via technology helps reduce environmental impact; ***[6 max]***
*Award **[4 max]** if examples not used and **[3 max]** if only one side of argument used e.g. sustainability is undermined by technology.*

Expression of ideas: ***[2 max]***

Total: ***[20]***

3. (a) (i) the starling was probably introduced in 1915 / the starling had a very restricted range before 1915;
the data reveals that the geographical range over which the starling is found expanded dramatically over the period 1915–1950 / the geographical range increased by several magnitudes of scale; ***[2]***

(ii) population size could also have been used – this may also demonstrate the magnitude rises over the period 1915–1950; ***[1]***
Accept other reasonable answers.

(b) alien species may outcompete indigenous species;
for resources, food, space, habitat;
e.g. North American Gray Squirrel outcompeting British Red Squirrel in the UK;
alien species may prey on indigenous species;
e.g. cats introduced into Australia and New Zealand have had a dramatic impact on small marsupials and ground-nesting birds respectively;
alien species may also carry disease, this has a large impact on indigenous species;
e.g. Red Signal Crayfish introduced to the UK has brought with it a virus that is lethal to the British Crayfish;

also accept:
hybridization;
white-tailed duck;
indirect impacts;
new species changes habitat and then habitat change impacts indigenous species
e.g. Japanese knotweed slowing water bodies causes some species of organism to disappear / ecological impact of rabbits in Australia; ***[6 max]***
Accept both plant and/or animal examples. Award ***[5 max]*** *if the example in each case does not identify both alien and indigenous species.*

(c) *local organizations*: ***[3 max]***
biodiversity is protected if ecosystems and habitats are protected;
this is achieved most effectively and practically if habitats are cherished and protected by local people, communities, individuals, *etc.*;
local policing works best;
if a habitat is viewed as being owned locally it is more likely to be protected;
local communities are likely to notice biodiversity loss first from direct contact with ecosystem;
e.g. urban bush buying by community groups in Perth, Western Australia;

national organizations: ***[3 max]***
may provide legal frameworks for protection;
may result in species protection *e.g.* making hunting of particular species illegal;
may provide reserves and resources to run reserves;
provide funding and resources for research into biodiversity through universities and research institutes;
may act as a vehicle for putting in place international policy on protecting biodiversity;
e.g. English Nature / Woodland Trust / Conservation Volunteers;

international organizations: ***[3 max]***
may help promote global and international biodiversity issues;
may be able to provide funds and resources to supplement national incentives;
may be able to bring international attention and thus weight to cases of biodiversity loss;
may help force national level agencies to carry out biodiversity monitoring and aid biodiversity recovery;
e.g. World Wide Fund for Nature / Greenpeace / UNEP; ***[9 max]***

Accept other reasonable answers.

Expression of ideas: ***[2 max]***

Total: ***[20]***

4. (a) global climates change as a consequence of natural climate cycles, therefore some change in the last 100 years will be natural variation;
climate has also changed as a result of artificial changes in the upper atmosphere due to pollution;
the greenhouse effect means that more radiation is trapped;
chemical pollutants in the atmosphere are there as a result of human activities;
industrialization is cited as a major factor correlated with climate change;
expanding human populations and a broadening of resource needs leading to imbalances in the plants systems;
loss of trees, expanding deserts, loss of snow/ice cover; ***[5 max]***

(b) primarily natural changes in the atmospheric system;
changes/variations in the amount of sunlight in response to extra-terrestrial variables *e.g.* Sunspot activity;
less radiation coming in – climate cools, more radiation – climate warms;
e.g. little ice ages, medieval warm periods;
natural negative feedback systems between atmosphere, ocean and terrestrial surfaces;
human activities – even before industrialization humans were changing their landscape/environment, *e.g.* Australian desert the result of deforestation and thus influences local climate;
geological events such as volcanoes – cause short-term dramatic changes to climate; ***[4 max]***

(c) *global climate change is caused by human activities*: ***[2 max]***
industrialization → atmospheric pollution → atmospheric change influencing climate;
e.g. combustion of coal produces carbon dioxide and heat → change in atmospheric chemistry and physics;

deforestation/desertification → reduces carbon store and assimilation → leading to atmospheric chemistry change;
e.g. Brazilian rainforest / Sahel;

natural climate change: ***[2 max]***
major volcanic eruptions/meteorite impacts have altered climate;
volcanic eruptions/meteorites impacts have thrown large amounts of dust into the atmosphere causing dramatic cooling phases;
ice ages have come and gone with dramatic climate signatures associated with them;
climates are changed by geophysical/astronomical/tilt of the Earth/sunspots/ variation in the amount of energy from the Sun;
natural atmospheric transparency;
climate change is due to natural feedback mechanisms;

evaluation: ***[3 max]***
scientific models and predictions of climate change vary;
e.g. temperature rise ranging from 1°C to 8°C in a given period;
atmospheric modelling involves highly complex calculations and errors are probable / the system being modelled is very complex and therefore difficult to simulate;
climate causes arguments which are often political/dependent on vested interests;

justification: ***[4 max]***
Responses to this question will depend on the candidate's own personal viewpoint but examples could be:

example 1:
stating viewpoint: ***[1 max]***
global warming is the biggest threat to life on Earth ever and we are heading for catastrophe;

evidence: ***[3 max]***
evidence for heating of the Earth is overwhelming;
evidence from increasing greenhouse gases caused by human activities;
ice caps retreating;
glaciers retreating;
sea levels rising;
more floods;
hurricanes increase in severity;

example 2:
stating viewpoint: ***[1 max]***
global warming may be occurring but has throughout the life of the Earth and will bring benefits to many people;

evidence: ***[3 max]***
shift of biomass towards the poles will mean crops can grow where they could not before;
more rainfall in some areas is a good thing;
if the Arctic ice melts, we can mine for minerals and oil under the Arctic sea;
large areas of Siberia and Canada will be warmer and easier to live in; ***[9 max]***

Allow agreement or disagreement in the justification as long as it is presented in a logical reasoned argument from a point of view. Answers should also be able to look at the relative importance of both positions – either as agreeing or disagreeing or having a mid-position viewpoint – this is likely to be supported with examples and should be awarded ***[2 max]***.

Award ***[7 max]*** *if both sides of the argument have not been addressed.*

Expression of ideas: ***[2 max]***

Total: ***[20]***

5. (a) *definition*: ***[2 max]***
soil is the abiotic medium in which plants grow;
it contains both organic debris and mineral parts essential for plant nutrition / *OWTTE*;

soil properties compared:
e.g. sandy soils: ***[1 max]***
sandy soils are normally light in colour and free draining;
normally low in organic content;

e.g. clay soils: ***[1 max]***
clay soils are composed of fine mud (clay particles) that hold water and are readily waterlogged;
as normally poorly drained;
they may have a reasonable organic content; ***[4 max]***

Accept any other soils with appropriate properties. Award ***[3 max]*** *for the definition of soil and the properties of one soil only and* ***[2 max]*** *for just the definition of soil.*

(b) *there are several main causes of soil fertility loss*: ***[2 max]***
soils may become "tired" if they are over used, *e.g.* crop after crop will remove vital nutrients and minerals from the soil at a rate greater than they are replaced;
poor soil management may lead to soil erosion and the loss of essential organics and minerals from the soil as well as soil volume;
soil may become contaminated *i.e.* irrigation and high evaporation rates may lead to salt accumulation and fertility problems;
Accept other reasonable answers.

ecocentric methods: ***[2 max]***
soil fertility maintenance may include resting fields (leaving fallow) as part of crop rotation;
mixed cropping;
the addition of organic manure;
sowing legumes as part of crop rotation;
integration of animal husbandry and cropping;
Accept other reasonable answers.

technocentric methods: ***[2 max]***
may include synthetic fertilizers and soil conditioning chemicals;
contour-plowing may be used to prevent soil loss by erosion;
irrigation;
deep-plowing;
scientific monitoring of soil fertility and properties;
use of GPS in planning fertilizer programs; ***[6 max]***
Accept other reasonable answers.

Award ***[4 max]*** *if only ecocentric methods addressed or vice versa.*

(c) *Answer will depend on the food production systems selected. Selected systems must be both terrestrial or both aquatic to allow adequate comparison.*

e.g. slash and burn in Indonesia versus large cereal production in USA / intensive salmon farming in Tasmania versus traditional net fishing off the coast of southern Africa;

intensive salmon farming requires high levels of energy (fuel) therefore risk of pollution and determent to the environment;
traditional fishing uses manual labour and little energy (fuel);

salmon farming requires large input of processed food (often derived from other fisheries);
traditional net fishing harvests wild natural yield and may be sustainable;
however an unintentional by-catch may impact on ecosystem structure (*e.g.* top order carnivore removed – dolphins);

salmon farming employs relatively few people;
traditional fishing is labour intensive and may support local communities;
however increase in population may lead to over harvesting;

salmon farming requires chemical inputs *e.g.* antibiotics, herbicides, antifoulants;
traditional fishing requires no such inputs;

salmon farming may produce substantial amounts of organic pollution → nitrification/eutrophication;
traditional fishing causes little pollution;

justification:
e.g. traditional net fishing is better for the environment because it is less intensive, causes less pollution and uses less energy (fuel) and is potentially more sustainable. however a population growth may lead to increased demand for fish leading to fishing rates beyond a sustainable level; ***[8 max]***
One stance must be chosen in the justification. The stance should be presented as a logical reasoned argument from a point of view. Arguments should be supported with example where possible.

Expression of ideas: ***[2 max]***

Total: ***[20]***