M16/4/ENVSO/SP2/ENG/TZ0/XX/M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2016

Environmental systems and societies

Standard level

Paper 2

18 pages

Subject details: Environmental systems and societies SLP2 Markscheme

Mark allocation

Candidates are required to answer **ALL** questions in Section A **[25]** and **TWO** questions in Section B **[40]**. Maximum total = **[65]**.

1. A markscheme often has more marking points than the total allows. This is intentional.

2. Each marking point has a separate line and the end is shown by means of a semicolon (;).

3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.

4. Words in brackets ( ) in the markscheme are not necessary to gain the mark.

5. Words that are underlined are essential for the mark.

6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **WTTE** (or words to that effect).

8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script.

10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

Section A

1. (a) (i) (0.8 million male + 0.8 million female =) 1.6 million/1,600,00;
0.8 million for males and females; **[1 max]**

Accept 1.5 million to 1.7 million.
Do not accept answers that give 1.6 without the million.

(ii) slightly concave profile/broad base/high young population/nearly ½ population are below 15/ indicates high birth rate;
….and will lead to a high number in child-bearing/most fertile age group (i.e.15-24) in the future/shows population momentum;
The shape is typical of stage 2 of the DTM that leads to an expanding population in the future; **[2 max]**

(b) (i) land clearance due to mining/waste dumps/slag heaps leads to deforestation/loss of ecosystem/habitat/biodiversity;
mining has supported an increase in local human population so more land taken away in land clearance/urbanisation/domestic pollution;
road building leading to fragmentation of ecosystems;
tailings/tailings dam breaks releasing toxic waters contaminating aquatic ecosystems;
leachates/runoff from waste dumps/slag heaps contaminating aquatic/river/ lakes/plants;
young fish are unable to survive near mining areas in the Kafue River;
Heavy metals may bioaccumulate in biota and impact higher trophic levels;
SOx/NOx emissions leading to acid rain causing deforestation/acidification of aquatic systems;
wind borne toxic/heavy metal particles adversely affecting plant growth/accumulating in soils;
waste rock dumps and slag heaps create new areas for succession to take place; **[2 max]**

Needs to have an impact not just a statement of mining activity. eg "there are 45 tailing dams that contain toxic waste" is too vague without adding contaminate the water supply.

(ii) respiratory disorders/cancer from inhaling air;
contaminants/particulates/SOxNOx from mining/waste dumps and slag heaps;
metal poisoning/bioaccumulation/magnification (*eg* lung/heart/respiratory/liver/kidney damage/cancers) from ingesting contaminated water/food;
allergic reaction/skin disorder due to contacting heavy metal-laden soil/ toxic water;
mining activity provides employment leading to an increased standard of living so health improves; **[1 max]**
Accept a variety of descriptions for the pollution eg fumes

(c) (i) reduction in woodlands / woodlands 56 to 32% cover;
increase in agriculture / agriculture 40 to 59%;
Introduction of/increase in plantations / plantations 0 to 4%; **[2 max]**

(ii) **Reduction in woodlands due to:**
increased deforestation/clearance for mining/industry;
increased deforestation/clearance for increasing population/settlement/food production;
increased use of forest for fuelwood;
increased pollution/acid rain from mining damaging woodland ecosystems;

Increase in agriculture due to:
increase food demand for growing local population;
growth in export of agricultural crops *(See Fig 4b)*;
governmental policy aiming at increasing income from agriculture / reduce dependence on mining;

Increase in plantations due to:
government investment/schemes/policy promoting plantations;
increased global/local demand for plantation resources (e.g. palm oil);
economic need to diversify production/exports; **[3 max]**

For "plantations" allow reference to cash crops/trees/food crops in context of above MPs.
Students are likely to start with an answer referring to the changes they identified in (c) (i) but they may also use the 3rd change. Please credit any correct reason for a change in Figure 6 even if the change was not included in (c)(i) or is not clearly identified in (c) (ii).

(iii) amount of sunlight/solar light/insolation;
amount of rainfall/precipitation/irrigation system;
temperature;
competition for space;
adequate nutrients/minerals/suitable soil/addition of fertilizers;
level of pests/disease/use of pesticides;
type of tree that is planted/suitability of tree crop to the local climate conditions;
Human impacts through metal pollution in soil/water supply / impacts of acid rain on plants/soil / climate change/global warming; **[2 max]**

Accept any other reasonable points.
*Award **[1]** for two or three correct responses and **[2]** for four correct responses.*

(d) (i) Miombo; **[1]**

(ii) biome is made up of many ecosystems / an ecosystem is within a biome;
an ecosystem involves an interdependent community of organisms whereas a biome is made up of separated communities;
an ecosystem is in a particular location whereas a biome is found over scattered locations;
biome types are few and restricted, while types of ecosystems are many and variable; **[2 max]**

Definitions by themselves are not enough for a mark. A clear distinction must be made for a mark.
Linking the two definitions by a "whereas" would only gain a mark for biome as it should include the 1st marking point.

(e) (i) population size;
reduction in population size;
genetic diversity within a species;
numbers of reproducing/mature individuals/reproductive rate;
geographical range/degree of habitat fragmentation;
quality of habitat;
area of occupancy/size of habitat;
degree of endemicity;
specialised habits (*eg* prey that are rare);
threats to habitat/species;
probability of extinction; **[1 max]**

*Award **[1]** for two of the above.*

(ii) distribution covers a large total area so more habitat is conserved;
distribution is scattered over country so includes a diversity of habitats;
distribution includes wetlands that have a particularly high diversity / are particularly threatened on a global scale;
parks and Game Management Areas are clustered together/2 are round which reduces edge effects;
joined/unfragmented Game and Park areas provide a large producer food base for supporting long food chains/top carnivores / providing stability;
Game Management Areas are often distributed around the National Parks providing a buffer zone;
National Parks are often linked together by Game Management Areas that will provide corridors for migration/mixing of populations/reproduction;
proximity of Game and Park areas facilitate integrated policing against illegal poaching/management of tourism/funding; **[3 max]**

(f) *Strength of increasing forestry plantations **[1 max]***.
creation of habitat for some wildlife/replaces some woodland previously lost;
can act as corridors for wildlife;
reduction in land degradation/soil erosion;
creation of jobs/local income;
sustainable supply of wood/exportable goods;
act as carbon sinks/absorb CO_2;

*Weakness of increasing forestry plantation **[1 max]***.
habitat destruction to clear/drain land for forestry plantation;
monocultures with low biodiversity;
monocultures – easy spread of diseases;
introduction of alien species may have deleterious effects (*eg* New Zealand, St. Helena);

*Strength of developing eco-tourism **[1 max]***.
value/commitment to conserve biodiversity/different ecosystems;
development opportunity to involve/employ members of the local community;
greater awareness within the local community – hearts and minds type thing;
increase income/employment from lodges/tourist facilities;
multiplier effect in the local area – food supply etc;

*Weakness of developing eco-tourism **[1 max]***.
tourists can destroy the very resource they come to see (eg trampling/introduction of invasive species/invasive species);
pollution from tourism/development (eg sewage/domestic waste);
roads created for tourist can fragment the habitat;
multi-national companies rather than local communities often benefit financially;

Valid appraisal drawing on previous points made **[1 max]** eg:
ecotourism is more sustainable if numbers are carefully managed because it does not rely on destroying an existing habitat as creation of some forestry plantations do;
Both options have less impact than mining so it would be beneficial if either/both replaced mining;
The economic benefit of diversifying Zambia's income would be greatest if both/more than one of these options were implemented; **[5 max]**

Creating jobs/income can be credited under both plantations and ecotourism.

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.

*Do not penalize candidates for writing in bullet pointed lists – if this technique is used appropriately ie to summarize or outline a list of points within an essay at an appropriate point. However, a candidate who has not shown **any** evidence of being able to write a paragraph with a developed, logical line of reasoning would not be able to achieve maximum marks.*

Section B

2. (a) Gaia hypothesis views Earth as a self-regulating system/homeostatic system/living organism;
…maintaining life-supporting conditions/equilibrium;
…through negative feedback mechanisms;
…*eg* where any changes in global temperature/ocean salinity/O_2 concentration stimulate mechanisms to inhibit/reverse that change;
living organisms interact with non-living elements to form habitable conditions on Earth / it proposes that the evolution of life on earth stabilised global temperatures/atmospheric composition/ocean salinity making the planet more habitable;
eg "Daisy World" where high temperatures promote growth of more reflective daisies;
humans are part of the living system, do not dominate it or have any intrinsic right of exploitation / but may contribute to positive feedback mechanisms destabilising equilibrium in the short term; **[4 max]**

(b) *Definitions (2 max):*
Sustainable yield (SY) may be calculated as the rate of increase in natural capital, that is, that which can be exploited without depleting the original stock or its potential for replenishment / correct formula;

Sustainable development - "development that meets current needs without compromising the ability of future generations to meet their own needs.";

Similarities:
both refer to exploiting the environment in a manner that does not reduce the potential for future exploitation / does not deplete the original stock;
both refer to living within the natural income of a system / living on the interest of natural capital;
both will maintain an equilibrium within the system;
both rely upon natural productivity/goods/renewable resources/natural capital;
both are economic (rather than ecological) terms;

Differences:
sustainable yield refers to a given resource but sustainable development refers to many resources/human activities;
sustainable yield is usually only applied to goods/renewable natural capital whereas sustainable development includes services/assimilation of wastes/intrinsic values;
sustainable yield is usually evaluated on an annual/seasonal basis whereas sustainable development is evaluated over an indefinite period;
sustainable yield may be estimated simply as the annual gain in biomass or energy through growth and recruitment whereas sustainable development may be quantified by ecological footprint;
there is considerable debate over what constitutes sustainable development whereas sustainable yield is a clear mathematical formula;
different value systems/political agendas/ideologies may have varying approaches to sustainable development whereas there can be only scientific debate over reliability and statistical rigor of sustainable yield (evaluate its limitations); **[6 max]**

*Award **[4 max]** if only similarities, or only differences, are given.*
There is always difficulty in fairly crediting "differences" in responses that just give descriptions of each of the two items being contrasted. Credit for "differences" should not be given for simple descriptive statements regarding one item, UNLESS there is a clear/explicit point of contrast being made with the other item. This may be successfully done through "whereas/however" statements, a comparative table, directly paired statements etc.
A dot annotations should be added to the first part of the difference and then the tick annotation when the difference is made.

(c) **MEDCs may be more sustainable because…**
they may be more able to afford more sustainable technology/practice (*eg* hydroponics/organic farming/biological pest control);
may be more environmentally aware due to greater media/communication technology (and so adopt more sustainable farming methods);

MEDCs may be more unsustainable because…
they can afford to import a large proportion of their food supply / incur high food mileage which is unsustainable;
industries may exploit LEDCs where restrictions on unsustainable practices/technologies (*eg* pesticides) are more lax;
may tend to favour meat-rich diets/eating at higher trophic levels that are less sustainable;
they may over-produce and generate considerable food waste for economic reasons/quotas which reduces sustainability;
they employ commercial intensive farming techniques that impose unsustainable impacts/pressures on soils/water;

LEDCs may be more sustainable because…
may be unable to afford commercial farming technology that tends to be less sustainable;
are more likely to have hunter-gatherer practises / rely on subsistence farming which may be more sustainable;
may tend to have strong cultural/historical/spiritual links with the environment and so put high value on sustainability/environmental protection;

LEDCs may be more unsustainable because…
may depend on exporting food products and so invest in less sustainable farming technology/practices / cash crops are grown rather than food crops on productive land, these are often less sustainable monocrops;
tend to have higher population growth rates leading to unsustainable/rapid increases in food production / leading to unsustainable/intensive production systems/use of marginal land to meet growing demand;
practice slash and burn as a cheap strategy/due to population growth but this is unsustainable in the long term;

*Award **[7 max]** for marking points above, and **[1 max]** for an explicit and valid conclusion that is justified by points raised.*
Note to examiners: An isolated statement eg "Increased economic development leads to reduced sustainability" or an unjustified opinion eg "I think LEDCs have less sustainable farming systems" should not be considered as a valid conclusion.
*The conclusion must be **supported/justified** by points raised.*
eg historically, economic development has generally led to reduced sustainability, but recently this is beginning to change in some MEDCs;
low economic growth and reduced individual needs lead to sustainable food production system, however rapid population growth results in most LEDCs to revert to unsustainable practices as they try to increase food productivity;

[8 max]

Alternative points of equivalent validity, significance and relevance to those given, should be credited.

Expression of ideas **[2 max]**

3. (a) the initial gradient of both S and J-curves is low due to limiting factors / low numbers reproducing / sub-optimum gender ratios / unmodified habitat;
initially (as these limiting factors are overcome, as biotic potential exceeds environmental resistance) exponential increase / positive feedback occurs in both S and J-curves;
in S-curves, (new) limiting factors eventually slow the population growth/maintain equilibrium/plateau (the population has reached its carrying capacity);
eg limited food / increased predation/disease / accumulation of wastes / competition;
limiting factors may be density dependent / provide negative feedback mechanism to maintain this equilibrium;
in J-curves, limiting factors eventually lead to rapid decline/population crash;
eg seasonal climate change / disease / overexploited food resources (typically r-selected species);
while both S and J curves may be influenced by density independent factors, it is the density-dependent factors that bring about an equilibrium in S-curves; **[4 max]**

*Award **[3 max]** for responses that indicate no difference between S and J-curves.*

(b) *Definitions: [2 max]*
Crude Birth Rate (CBR) is the number of births per thousand individuals in a population per year;
fertility is the number of births per thousand women of child–bearing age (fertility rate) / average number of children a woman has in her lifetime (total fertility);
CBR can still gain credit if no time element is added

Strengths
CBR/fertility both make it possible to compare relative numbers of births in populations of different size/times;
CBR is more directly related to/gives a better indication of overall growth rate/natural increase rate (NIR) / CBR when used in combination with CDR gives an indication of natural rate of increase;
fertility can be used to infer the role of women/cultural values/contraception may be influencing population growth;
TFR of 2.1 (2.0 to 2.5 depending on nation's death rate) is considered the replacement rate, so it is a straightforward indication / almost as precise as NIR itself of positive vs. negative growth (reduction of population);
FR is an efficient way to get an immediate indication of whether a population policy has effect/ suffers less from statistical ambiguity / only tool in cases where complete statistical data are not available, as in most LEDCs;

Weaknesses:
CBR/fertility do not give the actual numbers/increase in a population;
CBR/fertility do not take migration/immigration/emigration into account;
CBR/Fertility data collection reliability is not the same in all countries (unaccounted births/unrecorded communities especially in LEDCs and civil conflict areas);
CBR/fertility do not take death rates into account /infant mortality rates;
Fertility rate does not take into account the proportion of women of child bearing age/ gender ratios;
Fertility rate is ambiguous because the concept of "child-bearing/reproductive age" is uncertain (some suggest 15-44, others 15-49 / in some cultures women may commonly bear children outside this range); **[6 max]**

***[4 max] f**or answers that only address weaknesses or strengths*
*Award **[2 max]** for definitions.*

(c) *Direct influences: [4 max]*
pro-natalist policies may provide tax/welfare incentives for larger families/having children increasing fertility/CBR/NIR/population growth; *(strength)*
In principle these are particularly appropriate/employed by governments for a declining/aging population; *(strength)*
In practice, however, they have proved to be notoriously ineffective at controlling growth; *(weakness)*

anti-natalist policies (*eg* one-child policy/free contraception) may reduce fertility/CBR /NIR/population growth; *(strength)*
they can be effective for countries where population growth is too high / Anti-natalist policies can be effective if populations are compliant/because contraception is more readily available (*eg* free contraception in China*)*;(*strength)*
but they can give rise to female infanticide/selective abortion causing gender imbalances; (*weakness)*

Indirect influences: [4 max]
healthcare policies/improvement may improve medical technology/services, decreasing CDR/IMR/increasing NIR;*(strength)*
these may benefit the community in terms of health/lifespan;*(strength)*
…but they may lead to rapid population growth and to the costs associated with a youthful population (due to reduced CDR/infant mortality);(*weakness)*
education may improve sex education/career employment/female emancipation, decreasing fertility/CBR/NIR/population growth;*(strength)*
but they can lead to declining/aging population growth;(*weakness)*
economic growth/capitalist ideals/agricultural improvements may reduce desire for large families decreasing fertility/CBR/NIR/population growth;*(strength)*
improved agricultural technology may reduce need for offspring to provide farm labour thus reducing CBR/fertility;*(strength)*
...but increased food production may provide better nutrition leading to reduced infant mortality/short term population increase;*(strength/weakness)*

*Award **[5 max]** for responses that address only weaknesses or only strengths. Where responses misidentify direct v indirect influences, mark first point they make wrong, but award any succeeding points with ECF.*

*Award **[7 max]** for marking points above, and **[1 max]** for an explicit and valid conclusion that is justified by points raised.*
*Note to examiners: An isolated statement eg "Anti-natalist policies have the greatest effect on population growth" or an unjustified opinion eg "I think educational policies are best at regulating population" should not be considered as a valid conclusion. The conclusion must be **supported/justified** by points raised.*
eg educational policies are the most effective because they not only control population growth but increase human equality in communities;
indirect policies are more effective as they address issues more holistically; **[8 max]**

Alternative points of equivalent validity, significance and relevance to those given, should be credited.

Expression of ideas **[2 max]**

4.

(a)

Sandy soils	Clay soils	
larger air spaces provide more O2 to roots increasing productivity /	*smaller air spaces provide less O2 to roots decreasing productivity;*	***[1]***
better drainage preventing waterlogging & increasing productivity /	*poorer drainage promoting waterlogging & decreasing productivity;*	***[1]***
more prone to leaching of nutrients decreasing productivity /	*less prone to leaching of nutrients increasing productivity;*	***[1]***
weaker capillarity/water retention so suffer water loss reducing productivity /	*stronger capillarity/water retention so avoid water loss "increasing" productivity;*	***[1]***
provide weak anchorage for plants reducing productivity /	*provide strong anchorage for plants increasing productivity;*	***[1]***
subject to rapid temp change > unstable root environment reducing productivity /	*resists temp change > stable root environment increasing productivity;*	***[1]***
less compact/light soils promoting root growth/easier to work increasing productivity /	*more compact/heavy soils resisting root growth/resist ploughing decreasing productivity;*	***[1]***

[1 max] if the soils are compared but not linked to productivity.

Link to productivity is expected, but credit should be given if it is not mentioned against each point but is unambiguously evident from introduction/context. Also credit where the candidate mentions "sand is better because … " but with no explicit mention of clay or vice versa. **[4 max]**

(b) there should be a large number of sampling locations;
to ensure consistency and comparability of results the same sampling techniques should be used in all sampling sites / sampling should be done by appropriate and scientifically rigorous methods appropriate for each parameter required to evaluate;
sampling could be based on a transect with sampling points at varying distances away from landfill site / or should include comparable sites not influenced by landfill;
sampling should be repeated in different seasons / over an extended time period;
direct methods should be employed to identify presence of toxins/pollutants;
e.g. chemical analysis for pollutants in soil, water and biotic components of system;
indirect methods should be employed analysing ecosystem/communities as a whole;
eg biotic indices evaluating species diversity/abundance / their tolerance/sensitivity / presence of indicator species;
The NGO could partner with a government organisation to use its resources and bolster validity / the NGO should show up unannounced to ensure the landfill does not hide evidence/practices;
Independent experts should be appointed to gather the data;

Responses focusing on EIA may still be credited wherever they directly relate to question as asked. **[6 max]**

(c) *Managing impacts **[3 max]***.
acid rain impacts can be managed through prevention *ie* alternative energy/ scrubbers/catalytic converters;
…or through remedial action *ie* liming/fertilisers/replanting;
global warming impacts can be managed through prevention *ie* alternative energy/carbon taxing/energy efficient technology;
…or through mitigation *ie* flood defences/irrigation/afforestation/carbon storage;
both can be managed through education / changing lifestyles to reduce use of Fossil Fuels;

*Relative difficulty **[7 max]***.
impacts of acid rain are more regional/localised and so easier to address;
SOx and NOx (causing acid rain) can be removed from emissions but greenhouse gases/CO_2 (causing global warming) cannot;
…so prevention of acid rain impacts would not depend on the unpopular banning/reducing fossil fuel use, whereas prevention of global warming does;
global warming is subject to positive feedback cycles so once it kicks in there is no telling the tipping point;
anthropogenic acid rain impacts are caused only by the use of fossil fuels, whereas global warming has many other causes (*eg* deforestation/farming of cattle/rice);
Acid rain may cross some international boundaries but global warming crosses all boundaries making international agreements even more difficult to obtain;
...although sometimes global agreements are more easy to obtain than agreements between a limited number of conflicting nations;
there is greater contention over the *causes* of global warming making agreements more difficult;
it is generally easier to reverse the root problem of acid rain (acidity) than global warming (mean global temperature);
...however in some cases actual damage from acid rain (e.g. forest defoliation) already caused is nearly impossible to reverse;
...and much damage from global warming is as yet hypothetical/predicted;
it is often possible to trace regions responsible for impacts of acid rain, but more difficult to attach responsibility for global warming impacts;

*Award **[7 max]** for marking points above.*
*Award a further **[1 max]** for an explicit and valid conclusion that is justified by points raised.*
*Note to examiners: An isolated statement eg "Global warming is difficult to manage" or an unjustified opinion eg "I think acid rain is easiest to manage" should not be considered as a valid conclusion. The conclusion must be **supported**/ **justified** by points raised.*
eg the overall scale and complexity of causes make global warming impacts more difficult to manage;
more people are aware of global warming / Kyoto protocol & UNFCCC exert more political pressure whereas acid rain may be overlooked; **[8 max]**

Alternative points of equivalent validity, significance and relevance to those given, should be credited.

Expression of ideas **[2 max]**

5. (a) global rates of extinction have been relatively constant over long periods;
...and relatively low as extinction was balanced by rates of speciation;
there have been major peaks / 5 mass extinctions with unusually high extinction rates;
... associated with relatively sudden changes in natural global cycles *eg* ice age/volcanic activity/plate tectonics;
...or catastrophic events eg, Asteroid impact;
…most recent/current peak is anthropogenic / 6th mass extinction due to human causes;
eg hunting/urbanisation/global warming/habitat destruction; **[4 max]**

(b) *Definition **[1 max]**:*
intrinsic value of a species refers to its aesthetic/ethical/spiritual/ecological/intangible importance;
The use of detailed examples of species to support the answers should be credited in the EoI, not as a marking point.
A definition is not required and may be found within the rest of the answer.

Strengths:
attaching intrinsic value to species that have no economic value can prevent them being overlooked in decision making;
deep ecologists argue that all species have rights and attributing intrinsic value supports this principle;
…and prevent collapse of ecosystems/loss of biodiversity/aesthetic degradation;
Intrinsic value is likely to promote ecosystem/in situ conservation so preserving whole habitats and many species;
public perception of intrinsic value is often crucial to the success of conservation efforts;
some argue that all species have rights and their intrinsic value needs to be considered;
a wide variety of ecosystems can be conserved as each species has intrinsic value rather than just charismatic species;
educating people with respect to intrinsic value will encourage people to respect even species considered a pest which would help in conservation efforts;

Weaknesses:
Decisions usually have an economic aspect and intrinsic value has no economic value;
intrinsic value is not recognised by some value systems/ anthropocentric / technocentric causing conflicts in decision making;
intrinsic value given to a species may vary amongst social groups according to their aesthetic/ethical/spiritual values / different tribal groups have different totems;
animal rights activists/environmental NGOs may hinder economically important projects (animal husbandry/testing/construction of buildings) on the ground of species' intrinsic value;
applying the ideals associated with intrinsic value may overlook significant human needs (e.g. where human rights may be overlooked / spread of disease/pest organisms);" **[6 max]**

*Award **[4 max]** if only strengths, or only weaknesses are given.*

(c) ***Early demographic/pioneer stages [4 max]***
Influences on EVS:
in early demographic/pioneer stages there is heavy dependence on natural environment that may lead to ecocentric values / valuing spiritual/aesthetic importance of environment;
... and small populations would inevitably promote ecocentric values of small/localised community projects;
…or, with the abundance of natural resources, may lead to cornucopian/anthropocentric values;

Influences on energy decisions:
lack of technology would limit energy choices to those that are simple/readily available (e.g. biomass/animal power for transport/small scale water mills/windmills);
spiritual values may prevent use of some potential resources (e.g. sacred woodlands);

Opinion/conclusion/evaluation:
Overall, at this stage sources would be renewable/sustainable / cause little long-term damage to environment;

Mid-demographic stages [4 max]
Influences on EVS:
with agricultural/economic/industrial development dependence shifted toward technology;
…leading to a more technocentric/cornucopian value system seeing technology providing all the solutions;

Influences on energy decisions:
Fossil fuels then become a popular choice because technology for extraction is available;
…and they are effective/cheap ways of providing power for technological developments e.g. steam/combustion engines;
…and they provided energy security/rapid economic growth/competitive advantage for many countries;
World War research into nuclear weaponry provided platform for development of nuclear energy;

Opinion/conclusion/evaluation:
Cornucopian value system tends to place economic growth over environmental damage;
Increased use of fossil fuels brought greater wealth/welfare to communities;
…but began causing long-term environmental damage;
...and allowed for large-scale developments no longer under local control disempowering local communities;

Later demographic stages [4 max]
Influences on EVS:
as environmental damage/disasters/media reports became more evident ecocentric values became more popular;
green politics/environmental NGOs actively promoted the increase in these values;
In context of perceived need for economic growth, popularity of ecological management values became more popular;

Influences on energy choices:
because of widespread environmental damage/limited lifespan of fossil fuel use, alternative energy sources were sought after;

these energy sources needed to be renewable/"clean" e.g. hydrological/nuclear/wind/solar etc;
advances in technology made alternative energy sources an achievable goal;
global agreements/incentives also motivated this shift toward alternative energies;

Opinion/conclusion/evaluation:
these recent developments will reduce impacts on the environment / increase sustainability;
…and allow for more small-scale/locally supplied energy in keeping with ecocentric ideals;
…and still allow for growth in wealth/welfare of population;

Since the "discuss" command term is employed in this question, full credit should be limited to responses that contain some reflective components by candidate as exemplified under the "opinion/evaluation/conclusion" headings. Such comments are acceptable at the end or throughout the response. **[8 max]**

*Award [**5 max**] where there is no such "opinion/evaluation/conclusion" comment.*

A named country is not required.

Expression of ideas **[2 max]**