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Markscheme

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Environmental systems and societies

Standard level

Paper 2

19 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]**.
- The maximum total = **[65]**.

1. Environmental systems and societies uses marking points and markbands to determine the achievement of candidates

When using marking points (<u>All of this paper except</u> Section B, part (c) questions):

i. A markscheme often has more marking points than the total allows. This is intentional
ii. Each marking point has a separate line and the end is shown by means of a semi-colon (;)
iii. Where a mark is awarded, a tick/check (✓) **must** be placed in the text at the **<u>precise point</u>** where it becomes clear that the candidate deserves the mark. **<u>One tick to be shown for each mark awarded</u>**
iv. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

When using markbands (<u>Only</u> for Section B, part (c) questions):

i. Read the response and determine which band the response fits into
ii. Then re-read the response to determine where the response fits within the band
iii. Annotate the response to indicate your reasoning behind the awarding of the mark
Do not use ticks at this point
iv. Decide on a mark for the response
v. At the end of the response place the required number of ticks to enable RM Assessor to input the correct number of marks for the response.

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

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

4. Words that are <u>underlined</u> are essential for the mark.

5. 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** (words to that effect).

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

7. 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.

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

Section A

1. (a) Using **Figure 1(a)**, identify the amount of municipal solid domestic waste generated per capita in Malta. **[1]**

600 kg/yr / 600 kg yr^{-1};

Units required for credit

(b) Suggest two reasons why the amount of municipal solid domestic waste generated per capita differs between Slovakia and Malta. **[2]**

a. Slovakia has more campaigns to educate the public on the reduction of waste;
b. Slovakia has laws to require less material used in packaging/reusing materials / stricter laws/regulations regarding littering;
c. Slovakia taxes/charges a higher fee on waste disposal;
d. Slovakia subsidizes home composters / citizens compost more at home (reducing organic material wasted);
e. Malta has more packaging due to higher levels of imported goods;
f. Malta may have a higher consumerism attitude/cornucopian / Slovakia may favor a self-sustained life-style/ecocentric;
g. Malta receives more tourists (per capita) than Slovakia;
h. Malta authorities estimate/measure waste weight more accurately;
i. Less gardens in Slovakia generate less yard trimmings;
j. Slovakia may have more efficient technology that produces less waste;

***Note to examiners**: No credit for economic reasons, as the two countries have practically the same income level.*
No credit for reference to differences in waste disposal methods, as these would not reduce per capita waste production; only manage them more efficiently.
No credit if statement does not indicate the higher amount of waste produced in Malta.
No credit for difference in population size, as this does not impact "per capita" value.

(c) (i) Describe the trend shown in the use of incineration as income level increases in **Figure 1(b)**. **[1]**

(As income level increases) the use of incineration increases/ positive correlation;

***Note to examiners:** No credit for stating that **l**ow and lower-middle income countries do not practice incineration at all; this is not a trend.*

(c) (ii) Suggest two reasons for the trend shown in the use of incineration as income level increases in **Figure 1(b)**. **[2]**

a. As incomes rise incineration plants become more affordable / incineration requires huge initial investment/entails high maintenance cost;
b. Technological advances allow for waste to energy production (available only in higher income countries);
c. As incomes rise, there is more waste that needs to be dealt with/landfills would fill up faster, increasing the need for incineration;
d. Higher skilled workers required (available only in higher-income countries);
e. As incomes rise, EVS may shift/better education promotes sustainability/decrease in the environmental impacts of landfills/open dumps;
f. because land values might increase, resulting in a desire for more space efficient solutions;

***Note to examiners**: Accept ECF only if the reason linked is valid for the response in 1c(i).*

(d) Evaluate the use of recycling as a solid domestic waste strategy. **[3]**

Advantage [2 max]:
a. Can reduce the amount of primary resources used/consumed/mined/(e.g. by manufacturing products from recycled material);
b. Reduces the amount of waste going to landfill/incineration / less land required for landfills;
c. Has potentially lower risk of producing pollutants/greenhouse gases/leachate contamination of water resources;
d. Potential to create more jobs;
e. May raise environmental consciousness / promote more sustainable consumer behavior;
f. Reduces ecological footprint / protects wildlife/ecosystems;
g. After initial (high) investment (for setup and operation), it may prove to be cheaper than most other disposal methods;

Disadvantage [2 max]:
h. Recycling facilities can be expensive/require high levels of technological expertise/energy intensive to setup/operate/maintain;
i. The infrastructure required for collection can be demanding/expensive to organize/operate;
j. Recycling may not reduce the consumer production of waste / may give a (false) sense of fulfilling obligations towards environmental protection;
k. Not all waste can be recycled / some can only be recycled a number of times;
l. Recycling can lead to some pollution too (toxic chemicals used in recycling process);
m. products made from recycled material are of lower quality;
n. may be difficult to enforce public compliance with recycling procedures;

***Note to examiners**: One mark can be credited for a balanced appraisal. Example. Although recycling can be expensive for low income countries the reduction of water and air pollution makes it a positive choice for the overall health and wellbeing of its citizens.*

No credit to "recycling reduces the amount of waste produced" as this is not valid.

2. (a) Using **Figure 2(b)**, state the source that has the highest contribution of nitrogen delivered to the Gulf of Mexico. **[1]**

Corn and soybean crops;

(b) Using **Figures 2(a)** and **2(b)**, outline two reasons why nutrient pollution in the Gulf of Mexico is difficult to manage. **[2]**

a. The pollution is nonpoint source / making it difficult to focus management effort on single origin;
b. Pollution comes from such a large area/many states, it can be hard to manage/regulate;
c. Since the leading cause of pollution is from agriculture, it might be hard for governments to prioritize river health/protection over farming/food production;
d. The Gulf of Mexico can be far from the source of pollution, so individuals doing the polluting might not be aware of/care about the effects;
e. Expensive/difficult to remove nutrients/restore the ecosystem;
f. Education programs/subsidizing alternative practices to reduce nutrient pollution can be expensive/might not have buy in;
g. Pollution sources can come from more than one country and international agreements/cooperations can be difficult to achieve;

***Note to examiners**: Credit any other reasonable suggestion of equal merit*

(c) Explain how nutrient pollution could impact aquatic food production in the Gulf of Mexico. **[4]**

a. Excess nutrients can lead to algae blooms/eutrophication...;
b. ...blocking sunlight that results in aquatic plant death/reduced primary productivity;
c. reducing oxygen source in water;
d. Aquatic organisms/fish die/reduced secondary productivity from lack of oxygen;
e. Decomposition triggers positive feedback loop of death and decomposition, reducing oxygen further;
f. Dead zones which kill fish/aquatic organisms negatively affecting food production/capture fisheries;
g. Toxins from certain types of alga form, impacting shellfish harvests due to (paralytic) shellfish poisoning;

***Note to examiners**: Max 3 for only describing eutrophication feedback loop without linking to food production.*
No credit for biomagnification/bioaccumulation up the food chain

(d) Outline two management strategies that could be used to reduce the production of nutrient pollution. **[2]**

a. Education campaigns regarding the impact of nutrient pollution / stressing the local impacts rather than the far-away impacts on the Gulf (easier to motivate local stakeholders) / e.g. less grass clippings/organic residues in urban gardening;
b. Use of updated technology to improve appliances for cleaning so phosphates aren't as necessary / phosphate-free detergents;
c. Create incentives/subsidies to use soil conservation / sustainable farming practices e.g. organic fertilizers/crop rotation/contour farming/grazing away from riparian areas;
d. Outlaw/fine the use of practices producing a lot of nutrients e.g. monocropping/tillage/inorganic fertilizers/detergents with phosphates/grazing near riparian areas;
e. Planting of riparian buffer zones/terracing/cover cropping/agroforestry to reduce run-off of nutrients;
f. Installation of scrubbers in industries / reducing dependence on fossil fuel combustion/using cleaner/renewable energy sources to reduce emission of nitrous oxides;
g. Wastewater treatment/stormwater management to prevent runoff from urban areas;

Note to examiners: *Credit any statement of equal significance and validity.*
No credit to reference to pesticides, as these are not relevant to "nutrient" pollution.

3. (a) Calculate the difference between carbon stored in kelp in the ecosystem with and without sea otters. **[1]**

180 ($g\,C\,m^{-2}$) – 14 ($g\,C\,m^{-2}$) = 166 ($g\,C\,m^{-2}$);

(b) State the trophic level of sea urchins in the kelp forest ecosystem shown in **Figure 3(a)**. **[1]**

Primary consumer/herbivore/second trophic level;

(c) Explain how a reduction in sea otter numbers may impact the biodiversity of the kelp forest ecosystem. **[3]**

a. Sea otters are keystone species as top predators / their loss may lead to a positive feedback loop of decreasing biodiversity;
b. Without sea otters to feed on sea urchins, urchin numbers increase / so do all other herbivores (crabs, snails) initially...;
c. ...overgrazing kelps / reducing kelp abundance...;
d. ...decreasing primary productivity of kelp forest ecosystem / resulting in less energy available for higher trophic levels...;
e. ...reducing secondary productivity of aquatic species / reducing amount of crab/snail/fish populations...;
f. ...leading to local extinctions reducing species diversity;
g. Reduction in habitat diversity results in the loss of nursery areas/ecological niches for some species reducing species diversity;
h. Reduction in numbers may lead to bottleneck effects / loss of genetic diversity;

Note to examiners: *Do NOT credit "increase in sea lions due to reduced competition", as this is not supported by* ***Fig. 3(b)****.*

(d) Outline how the protection of sea otters could help mitigate climate change. **[2]**

a. more sea otters would result in control of crab/snail/urchin population...;
b. increasing/stabilizing kelp abundance;
c. Increasing primary productivity/photosynthesis;
d. resulting in higher assimilation of carbon dioxide/removal from atmosphere;

Section B

4. (a) Outline two inputs and two outputs of matter in soil systems. **[4]**

Inputs

a. Dead organic matter falling from plants (leaves, fruits) / animals (dead body/tissues, manure);
b. Inorganic material/nitrates/phosphates/nutrients from decompostion of DOM;
c. Inorganic matter from erosion/weathering of parent material/bedrock;
d. Water through precipitation/irrigation/infiltration/urination;
e. Nutrient addition via anthropogenic fertilisers;
f. Organic matter/nutrients/minerals/dust by wind/water deposition;
g. Nitrogen fixation by soil bacteria;

Outputs

h. Uptake nutrients by plants;
i. Loss of nitrogen by denitrification (to atmosphere);
j. Loss of water by plant uptake/evapotranspiration;
k. Loss of matter/nutrients through soil erosion by wind/water;
l. Loss of water via surface run off/evaporation;
m. Loss of soluble nutrients through leaching;
n. Water drainage/percolation to groundwater storage;
o. Emission of CO_2 from respiration of soil organisms;
p. Methane (CH_4) emitted from decomposition of DOM (anaerobic methanogenic bacteria);

Note to examiners:*The question asks for an outline, so do not credit responses that simply name/identify inputs/outputs e.g. water/nutrients/organic matter*

(b) Explain how anthropocentric and technocentric value systems influence how soil resources are managed. **[7]**

Anthropocentric:

a. An anthropocentric viewpoint argues that humans must sustainably manage the global system;
b. This might be through the use of taxes/environmental regulation/legislation;
c. Debate would be encouraged to reach a consensual, pragmatic approach to solving environmental problems;

Anthropocentric soil management:

d. Quotas/bans may be set regarding quantity/type of fertilisers/pesticides used;
e. Unsustainable farming practices e.g. monocropping may be outlawed;
f. Incentives may be provided for sustainable farming practices/soil conservation methods e.g. terracing/crop rotation/organic fertilization;

Technocentric:

g. Technocentrics generally argue that technological developments should prevent agricultural yields from being limited / economic growth is considered a priority;
h. A technocentric viewpoint argues that technology / technological developments provide solutions to restore the environment;
i. Emphasis on scientific analysis/expertise to guide decisions (over a wider basis of participation);

Technocentric soil management

j. Soil productivity is maximised through large scale industrial agriculture that heavily relies on machinery/fertilizers/pesticides;
k. The efficiency of soil use is improved though technologies such as precision irrigation and sensor monitoring systems in order to promote soil productivity;
l. Biochemical developments to produce biodegradable pesticides/GMOs may increase productivity with minimal damage to soils;
m. Soils may be protected by promoting urban agriculture/vertical farming/hydroponics;

***Note to examiners**: Award [4 max] per EVS. Credit any statement of equivalent significance and validity.*

(c) To what extent are human food production systems more greatly influenced by cultural factors than they are by political, environmental or economic factors? **[9]**

The following guide for using the markbands suggests certain features that may be offered in responses. The five headings coincide with the criteria in each of the markbands (although ESS terminology has been conflated with 'understanding concepts') This guide simply provides some possible inclusions and should not be seen as requisite or comprehensive. It outlines the kind of elements to look for when deciding on the appropriate markband and the specific mark within that band.

Answers may demonstrate

Understanding concepts and terminology:
Food production systems are influenced by factors such as scale; industrialization; mechanization; fossil fuel use; seed, crop and livestock choices; GMOs; water use; fertilizers; pest control; pollinators; antibiotics; legislation; and levels of commercial versus subsistence food production. Each of the above may have cultural, economic, political or environmental enablers.

Breadth in addressing and linking:
Cultural factors (beliefs, traditions, food preferences; religion) with political factors (international agreements, legislations, national security) and environmental factors (local climate, biomes, landscape, topography, soils, degradation) and economic factors (export/import, cash crops, cost of technology, land tenancy, employment).

Examples: Food production systems of different societies, including cultural/political/environmental/economic factors that might drive food production choices; Examples of legislation/laws/subsidies or lack thereof; Examples of economic drivers such as cash crops/subsidies;

Balanced Analysis: Of whether, and to what extent, cultural factors have a greater influence on food production systems than political, environmental and economic factors. Could include a range of societies with different factors that drive selection of food production systems;

A conclusion that is consistent with and supported by analysis and examples given e.g.: Cultural, economic, environmental and political factors all influence the nature of food production systems in complex and integrated ways that are difficult to isolate but perhaps the bottom line is in the environmental factors that ultimately determine what processes and crop choices are possible and effective.

Please see markbands on page 19.

5. (a) Outline four reasons why the carrying capacity of human populations can vary between countries. **[4]**

Countries may have higher carrying capacity because:
a. They have more efficient resource use (e.g. energy efficiency/more productive agricultural methods);
b. They have a greater land area / natural availability of resources;
c. Their advanced technology grants them access to wider range of resources (e.g. nuclear / newly discovered oil reserves) / substitutes "natural" resources with synthetic (e.g. plastic, synthetic textiles / more efficient waste management;
d. They have more advanced sanitation/health care;
e. They have EVS that favours sustainable development practices/conservation/pollution management:
f. They have more funds available for sustainable development practices / conservation / pollution management;
g. They import a greater amount of resources;

Countries may have lower carrying capacity because:
h. They have higher levels of resource consumption per capita;
i. They have higher degree of environmental degradation / lower natural productivity / harsher climate;

Note to examiners: *Credit any valid converse statement and any statement of equivalent significance and validity.*
Do NOT credit responses referring to different sizes of populations as this does not affect carrying capacity.
Credit identification of any factor causing variance without stating higher/lower.

(b) Evaluate the effectiveness of environmental impact assessments (EIAs) in promoting sustainable development. **[7]**

(Pro) EIA can promote sustainabillity by… [4 max]
a. Assessing impacts of project;
b. Identifying mitigation measures to avoid impacts;
c. Can be used as a form of government responsibility;
d. Provides basis for more informed decision making;
e. Raises local awareness of issues / involves the public sector;

(Con) EIA can fail to promote sustainability because: [4max]
f. Can't reflect views of all stakeholders equally;
g. Recommendations aren't always acted on / no requirement to implement EIA proposals;
h. Insufficient expertise / lack of training for practitioners / no globally accepted standards;
i. EIA may not be extended to include all aspects of project e.g. social aspects/unforseen impacts;
j. May ignore/misreport certain aspects due to corruption;

Note to examiners: Allow ***1 max*** for effective appraisal supported by arguments e.g. *Even a poorly conducted EIA is preferable than none at all, as it would at least shape a mentality of caring for sustainability;*

(c) Human population growth always results in a loss of biodiversity.
Discuss the validity of this statement. **[9]**

The following guide for using the markbands suggests certain features that may be offered in responses. The five headings coincide with the criteria in each of the markbands (although ESS terminology has been conflated with 'understanding concepts') This guide simply provides some possible inclusions and should not be seen as requisite or comprehensive. It outlines the kind of elements to look for when deciding on the appropriate markband and the specific mark within that band.

Answers may demonstrate

Understanding concepts and terminology of factors associated with human growth that influence biodiversity such as pollution, climate change, habitat destruction, hunting, fishing, illegal trade, invasive species, overharvesting, mass extinction, background extinction rates; endangered species, species-based/habitat-based, in situ/ex situ conservation, nature reserves, stewardship; keystone species; flagship species; reserves; zoos; breeding/re-introduction programmes; gene banks; CITES; education/raising awareness etc.

Breadth in addressing and linking: wide range of positive and negative impacts on biodiversity associated with range of human activities linked to population growth.

Examples: examples of species/habitats that have been affected by human population growth/encroachment; examples of species recovery efforts/successes/extinction;

Balanced Analysis evaluating the extent to which human population growth has always led to a reduction of biodiversity and the extent to which sustainable conservation efforts have reduced this loss.

A conclusion that is consistent with and supported by analysis and examples given e.g.: Current extinction rates are way above background extinction rates and this is largely due to the impacts from a growing human population. Despite a wide range of partially successful conservation efforts the net rate of biodiversity loss is still increasing.

Please see markbands on page 19

6. (a) Outline the role of water in regulating global average temperature. **[4]**

a. Water bodies absorb solar energy in larger quantities (than land ...high heat specific capacity/low albedo);
b. Evaporation absorbs heat (negative latent heat flux);
c. …and vapour carries (via convection currents/tropical cyclones) heat to higher latitudes…;
d. …condensation of vapour into clouds releases heat (positive latent heat flux) to colder latitudes (thus stabilizing/regulating the heat deficit between Tropics and Poles);
e. ocean currents transfer excessive heat from Equator to Poles / cold current move to opposite direction cooling areas;
f. water bodies act as carbon sinks / absorb CO_2, thus reducing global warming;
g. Water vapour is a greenhouse gas increasing global temperature;
h. Ice/snow/(white) clouds have higher albedo/reflect more insolation (than land), thus reducing global temperatures;

(b) Explain how urban air pollution could lead to significant economic losses. **[7]**

Urban air pollution can cause
a. Heart disease/lung cancer/respiratory diseases...;
b. ... raising medical/healthcare costs...;
c. ...and causing loss of employment/labour productivity;
d. ...premature deaths reducing workforce;
e. Reduction in agricultural productivity/yields may increase food price;
f. Damage to buildings/monuments/equipment needing costly repairs/maintenance;
g. Increased costs of mitigation/cleaning;
h. Cost of end of pipe technologies;
i. Cost of setting, monitoring and policing air quality standards;
j. Cost of education/raising public awareness;
k. Loss of revenue from tourism in heavily polluted venues;
l. Property devaluation of highly polluted cities/areas;
m. Companies offer hardship compensation for working in heavily polluted cities;
n. Industries may be closed down due to excessive emissions;
o. Switching to alternative energy sources is often expensive;

***Note to examiners**: Award [1 max] for each identified impact. Credit any valid statement of equivalent significance and validity.*

(c) The *Montreal Protocol on Substances that Deplete the Ozone Layer* (1987) is one of the most successful international agreements on a major environmental issue. Discuss the validity of this statement. **[9]**

The following guide for using the markbands suggests certain features that may be offered in responses. The five headings coincide with the criteria in each of the markbands (although ESS terminology has been conflated with 'understanding concepts') This guide simply provides some possible inclusions and should not be seen as requisite or comprehensive. It outlines the kind of elements to look for when deciding on the appropriate markband and the specific mark within that band.

Answers may demonstrate

Understanding concepts and terminology such as ozone depleting substances (halogenated organic gases/chlorofluorocarbons CFCs); Use in aerosols, gas-blown plastics, pesticides, flame retardants and refrigerants; ozone destruction and reformation and dynamic equilibrium; ozone holes; management strategies, laws, legislation implemented in response to Montreal Protocol; multilateral fund; black market ODS; development of alternatives and their impacts; HFCs; ozone depleting substances not covered by Montreal Protocol (e.g. dichloromethane); other international environmental agreements (e.g. Kyoto protocol/Paris agreement/COP agreements/CITES etc);

Breadth in addressing and linking a range of strategies, laws, legislation implemented in response to Montreal Protocol and their success in reducing ozone depletion; relative success of other international agreements;

Examples national laws and regulations to decrease production and consumption of CFCs; including recycling refrigerants, developing alternatives to CFCs (such as HFCs), gas-blown plastics, halogenated pesticides, propellants and aerosols; examples of illegal markets and continued use; examples of other international environmental agreements;

Balanced Analysis evaluating the extent to which the protocol has been successful in terms of international cooperation; speed and extent of ozone recovery; impacts of alternatives; degree of international cooperation, comparison with other international environmental agreements.

A conclusion that is consistent with and supported by analysis and examples given e.g.: Compared with many of the UN attempts to produce international agreements regarding climate change the Montreal Protocol has been significantly more successful particularly in the extent of international support attained. However, the degree of success in specifically restoring the ozone layer may be limited due to black market sales and impacts of new ODS not covered by the Protocol.

Please see markbands on page 19.

7. (a) Outline four impacts of climate change on wild fisheries. **[4]**

a. Increased temperature (especially in Tropical/low-latitude waters) would reduce fish stocks/increase fish mortality / marine species unable to adapt to increased temperatures will be reduced/go extinct;
b. Increased temperatures in high latitude waters might increase fish stocks;
c. Increased temperatures will cause changes in fish migration routes/patterns/ some areas may benefit from immigration of more fish species / most will see steep declines;
d. Increased temperatures reduce survival of juvenile fish/alters mating behavior/reduces reproductive output, thus reducing fish population;
e. Increased temperature will bleach corals/degrade marine habitats/webs;
f. Loss of oxygen in warmer waters is lethal (especially to non-mobile bottom dwellers/in close, shallow water bodies), destroying food webs on which fisheries depend;

***Note to examiners**: Credit any valid statement of equivalent significance and validity; accept reference to freshwater systems.*

(b) Explain how sea level change could impact marine biodiversity. **[7]**

a. Sea level is rising due to global warming/increased temperatures…;
b. …causing melting of ice, which adds more water to the ocean…
c. …causing thermal expansion of ocean volume;
d. Sea level rise will lead to increased risk of high tides, coastal flooding…;
e. …leading to coastal erosion, thus loss of coastal habitats/communities…
f. …and loss of breeding grounds for marine predators, e.g. sea lions/walrus/seals/penguins / sea turtles;
g. …reduced predator population will cause imbalance in marine food webs reducing biodiversity (impact of loss of keystone species);
h. Mangroves are resilient to sea level rise up to a point…;
i. …but with accelerating rise rate won't be able to adapt, thus loss of biodiversity;
j. Sea level rise may cause increased sedimentation leading to smothering of corals (less sunlight, algal blooms) and reduction of reef biodiversity;
k. Some marine species might migrate toward upper layers of sea causing imbalances to food webs / increasing upper layer diversity;
l. Sea level rise may flood lower parts of river enlarging estuaries, thus increasing biodiversity;
m. Sea level may rise due to extreme weather events (storm surges) leading to similar events as above;

***Note to examiners:** Do NOT credit reference to inundation of low-lying islands, as habitats ON islands are terrestrial; unless linked to coastal and other marine habitats.*

(c) To what extent could the changing value of freshwater resources lead to conflict between different societies? **[9]**

The following guide for using the markbands suggests certain features that may be offered in responses. The five headings coincide with the criteria in each of the markbands (although ESS terminology has been conflated with 'understanding concepts') This guide simply provides some possible inclusions and should not be seen as requisite or comprehensive. It outlines the kind of elements to look for when deciding on the appropriate markband and the specific mark within that band.

Answers may demonstrate

Understanding concepts and terminology such as inequitable availability and distribution of water resources; water scarcity; water security; impact of climate change and human population growth on water supply; water conservation; grey-water recycling; reservoirs, redistribution, desalination, artificial recharge of aquifers; rainwater harvesting schemes; legislation, convention and agreements at local, national and international level;

Breadth in addressing and linking a range of factors that have led to increasing value/decreasing supply of freshwater along with strategies for reducing water scarcity and maintaining security to reduce social conflict.

Examples of factors affecting value of water; strategies for preventing water scarcity and promoting water security; named social conflicts over water sources.

Balanced Analysis of the extent to which the increasing value of freshwater leads to social conflict and the extent to which this may be mitigated through a range of water-saving strategies and political agreements.

A conclusion that is consistent with and supported by analysis and examples given e.g.: As climate change and growing human populations continue to compound the problem of water scarcity, the value of freshwater as a resource will increase and inevitably attract social conflict. Such conflict may, however, be mitigated through effective water management social agreements.

Please see markbands on page 19.

Section B, part (c) markbands

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below and is not relevant to the question.
1–3	The response contains: • minimal evidence of knowledge and understanding of ESS issues or concepts • fragmented knowledge statements poorly linked to the context of the question • some appropriate use of ESS terminology • no examples where required, or examples with insufficient explanation/relevance • superficial analysis that amounts to no more than a list of facts/ideas • judgments/conclusions that are vague or not supported by evidence/argument.
4–6	The response contains: • some evidence of sound knowledge and understanding of ESS issues and concepts • knowledge statements effectively linked to the context of the question • largely appropriate use of ESS terminology • some use of relevant examples where required, but with limited explanation • clear analysis that shows a degree of balance • some clear judgments/conclusions, supported by limited evidence/arguments.
7–9	The response contains: • substantial evidence of sound knowledge and understanding of ESS issues and concepts • a wide breadth of knowledge statements effectively linked with each other, and to the context of the question • consistently appropriate and precise use of ESS terminology • effective use of pertinent, well-explained examples, where required, showing some originality • thorough, well-balanced, insightful analysis • explicit judgments/conclusions that are well-supported by evidence/arguments and that include some critical reflection.