

Markscheme

November 2020

Environmental systems and societies

Standard level

Paper 1

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Subject details: Environmental systems and societies SLP1 markscheme

Mark allocation

Candidates are required to answer **ALL** questions. Total = **[35]**.

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 **OWTTE** (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.

1. (a) dry scrub woodland / littoral woodland / seasonal forest; [1]
- (b) 2000–2500 mm precipitation per year / over 100 mm/high precipitation in every month of the year / high rainfall throughout the year;
...means that water supply is not limiting, allowing for rapid plant growth;
warm temperatures consistent all year / mean temperature ranges from 25–28°C all year;
...contribute to plant growth throughout the year / high rate of photosynthesis
...allows for rapid decomposition of organic matter and rapid nutrient cycling; [2 max]

Note: Award [1] for the environmental condition, and [1] for relating this to high GPP.
Do not accept “fertile soil” or “tracellular model”.
Do not accept ‘high precipitation/warm temperatures’ without recognition it occurs throughout the year.

2. (a) chest/underbelly colour (green v. grey/blue);
 head colour;
 neck/throat marking (red v. grey/blue);
 beak colour;
 foot colour; [1 max]

Note: Do not accept only 'colour is different'

- (b) competition / inter-specific competition;
 competition for nesting sites/food (where their distributions/habitats overlap ie
 altitudes 600–800 m);
 resource partitioning; [1 max]

- (c) both species nest in holes in trees;
 both species eat fruit and nuts;
 the imperial amazon feeds only in dense forest, whereas the red-necked amazon
 feeds in forests and plantations/red-necked amazon also eats in banana and
 citrus plantations;
 the red-necked amazon lives between 0 and 800 m, whereas the imperial
 amazon lives between 600 and 1300 m/at higher elevations / both live between
 600 and 800 m; [3 max]

Note: Must be evidence of comparison in the response: at least one compare and one contrast
 statement for full marks.

- (d) $\frac{(1250 - 160)}{160} \times 100 = 681(\%)$ / $\frac{(1250 - 170)}{170} \times 100 = 635(\%)$; [1]

Note: Accept between 635 and 681. Accept values with decimals.

- (e) Red necked amazon (RNA) more social so protection in numbers from predators,
 reducing mortality rates/increasing survival rates / imperial amazon (IA) lives
 singly so at greater risk of predation;
 RNA more social so greater breeding success/greater choice of potential mates /
 IA has reduced mating success due to solitary behaviour/may not breed again
 after the loss of a mate during the hurricane / IA may die if it loses its partner;
 RNA eat fruit from banana and citrus orchards/wider variety of food sources, so
 less competition for food / IA has a more limited food source so has greater
 competition for food;
 RNA less specialized/can adapt to a number of different habitats so less affected
 by hurricane damage to the forest;
 IA being outcompeted for nesting sites by the RNA;
 time taken for rainforest to recover after hurricane means delay in recovery of IA / humans
 replant orchards so food source for RNA recovers more quickly;
 initial population of RNA was higher in 1980; [2 max]

3. (a) strongest hurricane in Dominica’s history / fastest (maximum) wind speeds/wind speed of over 250 km/hr and therefore most destructive;
has been many/22 years since the last hurricane, so people were not prepared;
last hurricane had much lower maximum wind speeds, so people were not expecting such a damaging storm; [1 max]

Note: Do not accept only ‘very high wind speed’.

- (b) rising sea temperatures result in greater hurricane strength/stronger maximum wind speeds;
the two largest hurricanes occurred after 1979, when sea temperatures increased above the 1971–2000 average;
there is no relationship/no clear relationship;
the relationship is not consistent as smaller storms occur even after sea surface temperatures exceed the 1971–2000 average/higher sea temperature in the early 1940s did not result in a hurricane; [2 max]

- (c) 100% of food crops were destroyed in the hurricane (reducing food availability);
damage to coral reef ecosystems reduced fish catch;
wild food sources within the forest (eg nuts, fruits) destroyed;
delays to food supply due to time needed to regrow local crops;
food transportation disrupted due to loss of/damage to roads/bridges/airports/ports;
soil erosion/landslides reduced soil fertility/area available for cultivation;
heavy rains leached soil nutrients/reduced soil fertility;
contamination of freshwater with oil/chemicals reduces water available for irrigation;
disruption to electricity supply resulted in spoilage / unable to store food due to lack of refrigeration; [2 max]

Note: Do not accept only ‘hurricane damages food crops’.

- (d) reduction in photosynthesis so less oxygen produced;
reduction in trees results in loss of carbon sink / reduction in trees/photosynthesis reduces carbon dioxide uptake;
loss of leaves means more precipitation reaches the ground causing surface runoff/ causing more soil erosion/loss of soil nutrients;
less uptake of water by plants resulting in increased flooding;
loss of plants/trees reduces water infiltration into aquifers/groundwater;
loss of habitat for species (reducing biodiversity);
loss of habitat reduces food supply / loss of trees reduces food sources;
loss of trees reduces available timber/wood for human use;
loss of trees means reduced transpiration, reducing atmospheric moisture,
reducing precipitation and thereby affecting local climate/microclimate;
loss of shade means hotter ground temperatures/loss of cooling effect of forest on local climate/microclimate;

[3 max]

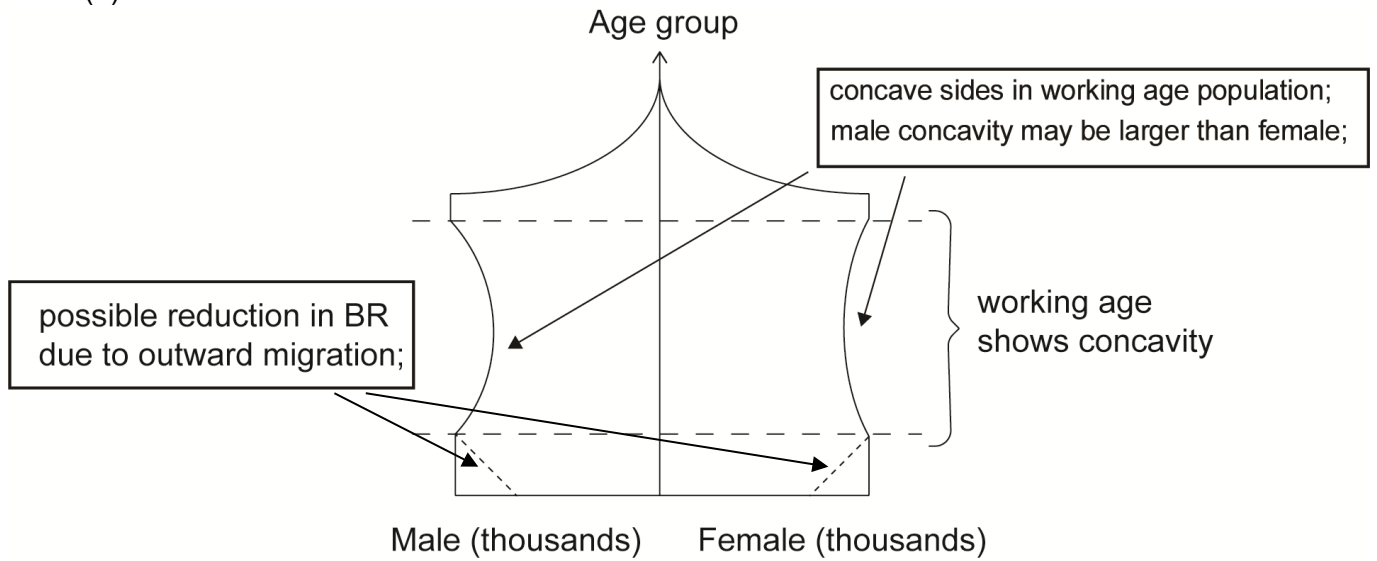
Note: *Accept other reasonable responses which are specific to ecosystem services provided by forests. Hence, do not accept 'contamination of freshwater by oil/chemicals reduces water/fish supplies / erosion of soils reduces nitrogen cycling/nutrient availability'.*

- 4. contour ploughing;
 - ... slows down surface runoff;
 - ... allows infiltration to occur;
 - ... less sediment is washed into the rivers;
- stone lines;
 - ... slows down surface runoff;
 - ... allows infiltration to occur;
 - ... less sediment is washed into the rivers;
- mulching;
 - ... residue on the surface of the soil reduces rainfall impact;
 - ... residue on the surface holds water, reducing runoff;
 - ... less sediment is washed into the rivers;
- terracing;
 - ... flat steps on steep slopes slow down surface runoff;
 - ... allows infiltration to occur;
 - ... less sediment is washed into the rivers/ flat areas are more stable and the soil is less likely to slide down the slope;
- planting trees/agroforestry/intercropping with trees;
 - ...trees intercept precipitation/rainfall, reducing surface run-off / absorb water reducing run-off / increase infiltration due to root systems;
 - ...roots stabilize/hold soil;
 - ...reducing loss of nutrients/top soil;

[3 max]

Note: [1] for naming the technique and [2] for outlining how it reduces soil erosion.

5. (a)



[2 max]

Note: (see sketch) [1] for basic shape, stage 3 characteristics with axes and labels (must include labels for age group and gender)
concave sides in the working age groups;
may have greater outward migration in the male working age side;
may have slight reduction in youngest group to show reduction in birth rates due to loss of fertile adults;

- (b) population is stabilizing/growth rate is slowing, so there will be little additional demand for resources;
population will begin to age so demand for resources will decrease due to fewer children;
birth rates are still high in comparison to death rates so the population is still growing, putting pressure on resources;
stabilizing population will lead to greater prosperity and therefore greater demand for resources;
outward migration means less demand for resources;
development of tourist industry/temporary immigration causes increase in use of some resources, eg water, land for hotels;

[2 max]

Note: Do not credit only 'increase in population results in an increase in resource use / decrease in population reduces resource use'

6. resilience refers to a system's return to equilibrium after a disturbance which relates to how quickly Dominica is rebuilding infrastructure/replanting/repairing; conducting disaster risk assessment before reconstruction ensures that buildings are not placed in areas at risk from future hurricanes/landslides; building hurricane-proof buildings reduces damage from future hurricanes; planting fast-growing crops ensures agriculture/food supplies can recover quickly from damage in the future / planting fast growing crops reduces risk of soil erosion; planting heat-tolerant varieties of food/putting animals in air-conditioned buildings means that rising temperatures from global warming will not negatively affect food supplies/agriculture; focusing on root crops means food supplies are protected from strong winds; using local skills and resources allows Dominica to be self-reliant without the need to import goods/skills potentially leading to a faster/cheaper recovery; community participation in reconstruction which encourages ownership of project/takes into account local conditions is more likely to be successful; **[3 max]**

Note: Connection must be made to resilience. Do not award marks for simply repeating material in the Resource Booklet.

7. **Detrimental [4 max]:**
destruction of corals and therefore reduction in biodiversity and/or productivity;
destruction of mangroves/rainforest and therefore reduction in biodiversity and/or productivity/further reductions in numbers of endangered species;
contamination of freshwater ponds/lakes/wetlands and reduction in biodiversity;
flooding washes toxic chemicals and sewage into the oceans, contaminating reefs;
salinization of the soil through saltwater incursion and reduction in productivity;
destruction of habitat/food resources for animals;
destruction of reefs/coastal wetlands, deltas, etc. which make the coastline more vulnerable to future tropical storms;
increase in food insecurity/malnutrition as food crops destroyed;
loss of jobs for people in agriculture leading to increased poverty;
lack of food/poverty may lead to people hunting for bush meat/selling endangered parrots for the pet trade, reducing biodiversity;
poverty/loss of infrastructure may result in people cutting down trees in reserve areas for fuelwood;
increased poverty on the island may reduce the protection provided to endangered species;
outward migration (of working age population) due to lack of employment/fear of another hurricane results in separation of families/falling birth rates/ageing population left behind who cannot work/increase in dependent population;
re-building puts a strain on natural resources including forest for building materials;
cost of re-building puts a strain on economic development / rebuilding places an economic burden on society;
- Not detrimental [4 max]:**
natural process and ecosystems are adapted to hurricanes and/or recover / damage is temporary;
opens up forest canopy to allow new growth/secondary succession which increases productivity;
allows for better rebuilding to reduce damage in the future;
draws community together in the rebuilding process;
increase in local businesses as foreign companies leave due to danger;

changes physical geography of the land, creating new habitats;
brings in cooler water, reducing risk of coral bleaching;

Note: award **[5 max]** for both detrimental and not detrimental marking points.

Conclusion [1 max]

Conclusion must be balanced

eg In the long-term ecological development may be more adversely affected than social development, as some species may become extinct whereas plans to help rebuild Dominica may lead to a more cohesive society;

[6 max]
