Diploma Programme
Programme du diplôme
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Markscheme

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Environmental systems and societies

Standard level

Paper 1

9 pages

1. grasslands/woodlands; **[1]**
Must include both grasslands and woodland to be credited.

2. high birth rate;
falling/decreasing/declining death rate / increasing life expectancy;
rapid growth in population / growth rate of 2.54% (32.1–6.7/10) / population has increased almost fivefold since 1960 / high rate of natural increase (NIR) / population is exponentially increasing;
population doubling time of 27.56 years (70/(2.54));
wide base of age-sex pyramid / largest age group is 0–4 years / predominantly young population / high proportion of population are children (under 19); **[2 max]**

Do not accept only values of either birth rate or death rate e.g. "death rate is 6.7/1000"; response needs to specify whether it is high or decreasing respectively.
Do not accept "low death rate" or just "increase/growth in population".
Do not accept "crude birth rate is higher/greater than crude death rate" as this is applicable to other DTM stages.
Do not accept only "many/lots of children / more births/many births".
Do not accept "industry is mostly agriculture/forestry/fishery".

3. (a) *In agroforestry*:
forests/habitats and their biodiversity are maintained / reduces deforestation;
tree/forest cover/root system reduces risk of flooding/flash floods/soil erosion;
tree canopy/plant cover reduces impact of precipitation on soils / soil erosion;
within agroforestry soil maintains organic matter / levels of fertility / trees fix nitrogen in soil / leaves from trees enrich soil;
forest provides a variety of resources *e.g.* medicinal plants/firewood/timber/crops / farmer can get milk and food from agroforestry / forest can provide fodder for animal;
manure from animals can be used as a fertilizer for crops/trees;
land can be used sustainably/indefinitely/over long period of time rather than for a few years;
no burning of woodland reduces amount of carbon dioxide effect on global warming/climate change / forest can absorb carbon dioxide; **[2 max]**

Accept converse statements for tavy method.

(b) tavy is a method that can be considered part of the local culture/traditions;
people tend to have an aversion to change / do not trust change;
if site conditions are poor, rehabilitation can take time / if soil is poor in nutrients it can be difficult to establish agroforestry / trees take time to grow so benefits would not be seen immediately;
agroforestry cannot provide same products as traditional methods e.g. rice;
lack of education to explain the advantages of alternative methods / lack of knowledge about agroforestry / agroforestry is a more complex system to farm / tavy is easier than agroforestry /agroforestry requires more work;
lack of funds to promote agroforestry; **[2 max]**

4. $\left(\frac{87}{154} \times 100 =\right) 56.49\% / 56.5\% / 56\%$; **[1]**

Correct units (%) are required to be credited the mark.

5. reduction in population size;
population size / low population;
number of mature individuals / number of individuals able to reproduce;
geographical range / area of occupancy (i.e. where species are normally found) / extent of occurrence (boundary line that can be drawn around sites that the species occupies);
reduction in number of locations (the species is found in);
degree of fragmentation (e.g. via road or urban development);
quality of habitat / loss of habitat / habitat degradation;
probability of extinction; **[1]**

Link must be made to the IUCN factors, as listed above.

6. *Advantages **[2 max]**:*
zoos provide a safe haven for aye-aye;
they provide an opportunity to research aye-aye biology and behaviour/increase our knowledge;
they can be used to raise awareness/educate the public about the threats to the species/ wildlife in Madagascar;
they can be used to obtain funds to help conservation efforts in Madagascar;
breeding (pairs) can be used to increase the number of aye-aye;
these can be re-introduced into the wild;
*Disadvantages **[2 max]**:*
re-introduced individuals can find it difficult to survive in the wild;
it is difficult to recreate suitable/natural habitats for animals in captivity;
it is morally/ethically wrong to keep these primates in captivity;
captive animals can develop health problems / species can become stressed in captivity / experience behavioural problems in captivity;
international zoos/wildlife parks are expensive to create and maintain;
funds from zoos could instead be spent on habitat conservation efforts / funding for zoos detracts funds from habitat conservation;
does not address the causes of reduction in aye-aye population e.g. deforestation/hunting/cannot stop people killing aye-aye in the wild;
*Appraisal/conclusion **[1 max]** that is balanced and substantiated, for example:*
although international zoos provide an opportunity to increase species numbers through breeding programmes, without tackling the issue of habitat protection the species will remain under threat; **[4 max]**

7. island is too far from the mainland for exchange of genetic information / location of island results in limited migration of species from/to other areas;
geographical isolation has caused speciation / species have developed in isolation/independently / species have adapted/evolved to the conditions on the island;
limited resources on the island required specialization to reduce competition;
climate has been stable for a long time, allowing for specialization of organisms;
there are a diverse range of biomes/ecosystems (providing a diverse range of habitats/niches) / variation in altitude/elevation provides a range of habitats/niches;
tropical rainforests provide many different niches/have high biodiversity;
high biodiversity is associated with larger island size (The Theory of Island Biogeography); **[3 max]**

8. (a) ecological footprint has gradually declined / there has been a small reduction/decline in the ecological footprint;
the ecological footprint has declined from 2 hectares per person (in 1961) to about 1 hectare per person (in 2012); **[1]**

(b) figure 7 only shows individual ecological footprint / EF per person has decreased / individual/personal EF has decreased (not ecological footprint for the total population);
population increased over this period / overall ecological footprint for population increases due to growth in population;
population has increased at a greater rate than decline in individual ecological footprint; **[2 max]**

(c) biocapacity has declined over time due to degradation/erosion of soil;
traditional/tavy method of farming results in nutrient poor soil reducing biocapacity/biological productive land;
traditional/tavy method of farming results in soil erosion/degradation reducing biocapacity/biological productive land;
increase in population reduces biocapacity per person/per capita / increase in population reduces global hectares per person/per capita / with increasing population amount of productive land needs to be divided between more people;
increased population has resulted in more land used for houses/urbanisation reducing biocapacity/productive land; **[1]**

9. high level of biodiversity in the area / park is located in area that contains 50% of the island's biodiversity / to protect biodiversity;
threat to habitat due to deforestation / is a deforestation hotspot that threatens habitats/biodiversity / as an attempt to reduce deforestation in the area;
provides a corridor to Masoala National Park;
few villages are located there so it is easier (less opposition from locals) to create the National Park there / has limited effects/restrictions on villages surrounding the area;
potential for ecotourism development in the area; **[2 max]**

10. preserving forests reduces soil erosion / tree roots hold soil / protecting tree canopy reduces impact of rainfall on soil erosion;
forests reduce sedimentation into the bay;
sediment can smother organisms living in the bay;
suspended solids in the bay can reduce light penetration and result in reduction of photosynthesis/loss of plant species;
protection of forest could reduce agricultural activity/urban development that contributes to nutrient pollution/runoff;
run-off/effluents containing nutrients can lead to eutrophication/algal blooms in the bay;
eutrophication/algal blooms could cause anoxic conditions/cause death of fish/reduce biodiversity within the bay;
protection of forest increases carbon sink, which mitigates global warming and reduces warming oceans/ocean acidification which could negatively impact the bay (e.g. loss of coral reefs/loss of fish diversity);
protection of forest increases tourism that generates funds that can be used for conservation of the bay/coast;
protection of forest prevents development of industry that would otherwise release effluents into the bay; **[3 max]**

11. *Illustration of positive feedback using figure 9c e.g.:*
increase in international tourists generates more wealth for developing tourist industry;
more developed industry/better accommodation attracts more visitors; **[2 max]**

Accept other reasonable responses where figure 9c is used to illustrate positive feedback.

12. (a) increased revenues to invest back into conservation;
raises awareness leading to greater support/public engagement with wildlife conservation;
consideration of wildlife as an asset that needs to be looked after;
if local population have jobs in the tourism industry they are less likely to engage in unsustainable tavy farming/fishing activities; **[1]**

(b) growth in tourist sites/hotels could cause loss of habitats/forests;
creation of roads that fragment habitats;
noise from tourism that disrupt wildlife/mating / disturbances caused by tourists can alter animal behaviour;
litter that can degrade environment / harm wildlife;
increased tourism puts greater demand on limited freshwater that is unsustainable / increase demand for limited water resources that competes with wildlife;
greater access to wildlife areas that could lead to increased poaching/illegal fishing/increase capture for illegal pet trade;
increase in tourism could increase demand of goods/services that cause deforestation/use unsustainable resources (e.g. fossil fuels);
animals/wildlife used as a tourist attraction maybe inappropriately/unethically treated / focus on popular tourist sites may leave less visited sites with fewer conservation resources/funds; **[1]**

13. *Argument for development away from traditional lifestyles **[4 max]**:*
reduction in tavy agriculture would reduce deforestation/carbon dioxide emissions/soil erosion/soil degradation / tavy is unsustainable because it results in loss of trees/carbon dioxide emissions/soil erosion/soil degradation / increase in alternative practices *e.g.* agroforestry could increase sustainability by reducing soil degradation/reducing soil erosion/increasing carbon sink;
increase in tourism services could increase investment in conservation / establishing more national parks (to increase tourism) would limit deforestation/protect wildlife;
increase in service industry could reduce dependency on agriculture *e.g.* tavy;
increase education opportunities lead to better environmental awareness;
increased use of family planning/smaller family sizes could reduce population growth and potentially in the long term lower Madagascar's ecological footprint;
migration from rural areas will reduce impact in these areas;
traditional beliefs that aye-aye are evil/bring bad luck/pests and should be killed could negatively impact their population/increase their risk of extinction;
alternative energy sources such as solar/wind power could be more sustainable than the traditional use of charcoal / use of renewable energy does not deplete resources (e.g. wood/fossil fuels)/produces lower emissions of carbon dioxide/greenhouse gases;

*Against **[4 max]**:*
use of alternative farming methods such as intensive farming could lead to soil degradation/loss of nutrients from soil/increase in runoff containing pesticides/nutrients damaging habitats;
migration to/growth of urban/tourist centres could increase deforestation to build more housing;
development of tourist resort/urbanisation could increase loss of mangrove forest/increase edge effect;
migration to/growth of urban/tourist centres could increase water stress in those areas;
migration to/growth of urban/tourist centres could increase discharges of sewage effluent that have a negative impact in those areas / sewage waste from tourism could damage reef systems/cause eutrophication within aquatic systems;
urbanization/growth of tourist centres could reduce biocapacity/amount of productive land;
increase in tourism/urbanisation could lead to more roads that damage/fragment habitats;
tourism could increase damage to coral reefs through boat anchors/trampling;
country does not have systems in place to manage higher levels of solid domestic waste production from tourism / increased littering/waste disposal from tourism could damage habitats/species;
ecological footprint has stayed relatively stable (since 1961);
change in lifestyle is likely to increase consumerism/ecological footprint;
it would take time for land/forest that has been degraded (e.g. through tavy) to become suitable for agroforestry;
food production may become less localized/more intensive;
fewer farmers could lead to dependency on importation of food;

*Award **[5 max]** for arguments for and against.*

*Conclusion **[1 mark]** e.g.:*
change to agroforestry is likely to increase sustainability but it is not so clear that ecotourism will; **[6 max]**

A valid conclusion should be credited if it is explicit, balanced (addresses both sides of the argument) and supported by evidence.
Accept other reasonable responses that link changes in lifestyle to sustainability.