

Markscheme

May 2026

Environmental systems and societies

Higher level

Paper 1

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Subject details: Environmental systems and societies HLP1

Markscheme

Mark allocation

Candidates are required to answer:

- **ALL** questions
- The maximum total = **[70]**.

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

When using marking points:

- 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 **precise point** where it becomes clear that the candidate deserves the mark. **One tick to be shown for each mark awarded**
- iv. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

When using markbands (Only 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 underlined 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 **OWTTE** (or 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.

1. With reference to **Figure 1(d)**, state the average precipitation range throughout the year in Mauritius. [1]
- 32.43 to 252.4 (mm) / 252.4 to 32.43 (mm) ;
 - $(252.4 - 32.43 =) 219.97$ (mm);

Note to examiners: Units are not required.

2. (a) Suggest the importance of education programmes to the conservation of biodiversity. [1]
- Fosters/develops sense of ownership/stewardship/environmental ethics;
 - Inspires/motivates/create awareness in people to take action to conserve biodiversity/prevent loss of biodiversity;
 - Encourages people to contribute financially to conservation efforts;
 - Encourages protection of biodiversity for future generations / teaches how to protect/conserve biodiversity;

Note to examiners: do not accept only “spreads awareness/understanding” without link to action.

- (b) With reference to **Figure 2(b)**, calculate (to **two** decimal places) the percentage of flowering plant species that are endemic to Mauritius. [1]
- $(273 / 691 \times 100 =) 39.51$ (%)

Note to examiners: Do not accept incorrect rounding e.g. 39.50(%).

- (c) Outline why Mauritius has a high proportion of endemic species. [2]
- Island is geographical isolated and migration is restricted / Island was created through volcanoes away from other land masses with limited migration;
 - Geographical isolation has led to evolution of new species/speciation;
 - Geological age of the island allowing evolution and speciation to occur overtime;
 - Varied topography allowing development of specialized adaptations/features/speciation;
 - Varied niches/ecosystems/habitats allowing evolution/speciation;

Note to examiners: Do not accept only “geographical isolation/remote island”.

- (d) State **one** ecosystem service that would be adversely affected by the change in forest cover shown in **Figure 2(c)**.

[1]

Preventing soil erosion / flood prevention / carbon sequestration / production of oxygen / photosynthesis / filtration of air particles/pollutants / filtration of water / conservation of biodiversity/genetic resources / provision of habitat/food for wildlife / production of rain clouds/rain (due to reduction in evapotranspiration) / microclimate/temperature regulation / nutrient cycling / pollination;

Note to examiners: Do not accept tangible goods/products/economic services.

Do not accept only increase in GHGs/air pollution”.

Do not accept “home” instead of habitat.

Only mark the first response if more than one answer is given.

Accept other reasonable responses.

3. (a) With reference to **Figure 3(a)**, outline how the presence of mangroves can reduce water pollution from land-based sources entering coral reefs.

[2]

- a. Mangroves bind/intercept sediments from land that could reduce clarity of water within coral reefs;
- b. Mangroves bind/intercept sediments from land that could smother corals/organisms;
- c. Mangroves absorb/bind/intercept nutrients from land that could cause eutrophication/excessive algal growth within coral reefs;

Note to examiners: Do not accept only “mangroves intercept sediments/nutrients to prevent sediment/nutrient pollution”.

Do not accept answers referring to pollutants which are not shown in Figure 3a e.g. plastics/pathogens/metals.

- (b) With reference to **Figure 3(a)**, outline how loss of coral reefs could impact seagrass ecosystems.

[2]

- a. Loss of coral reefs reduces protection against storms/ocean currents which could damage seagrass;
- b. Loss of coral reduces habitat/nursery areas/breeding ground for (migratory) species that contribute to seagrass community/ecosystem;
- c. Loss of corals reduces the nutrient levels/organic material content that enters the seagrass ecosystem decrease of growth/biodiversity/quality of the seagrass ecosystem;
- d. Species that lived in the coral reef may migrate to the seagrass, increasing competition for food/space and adversely impact the seagrass ecosystem;
- e. Loss of coral reduces its fish population, which may lead to an increase in the seagrass due to reduction in seagrass grazing (by the fish);

Note to examiners: Do not credit responses without impact on seagrass ecosystems.

- (c) With reference to **Figure 3(c)** and **Figure 3(d)**, evaluate the use of transplanting coral to restore coral reef ecosystems at Pointe aux Feuilles.

[6]

Pros [4 max]:

- a. Helps ecosystem recover from damage / helps to regenerate/restore coral reef biodiversity/habitat;
- b. Can save rare species/endemic species/species under threat;
- c. Contributes to increase in biodiversity / helps maintain food webs / contributes to productivity/complexity of ecosystems;
- d. Improves area for tourism/recreation (and associated income);
- e. Increases coastal protection from storms/cyclones (protecting human life/land/property/settlements/seagrass ecosystems/mangrove systems) / absorbs wave energy and protects land from coastal erosion;
- f. Improves local fisheries by providing nursery/breeding grounds / enhances available food source for locals / provides employment for local people;
- g. Contributes to local cultural value;
- h. Corals filter the water improving water quality/clarity;

Cons [4 max]:

- i. Potentially only short-term fix/does not remove the cause of the damage eg extensive predation by crown of thorns/*Drupella* sea snails / warmer waters due to climate change / ocean acidification / marine pollution / over-fishing / storms/cyclones;
- j. Success rates may be low / unlikely to fully restore the original ecosystem;
- k. Is expensive / requires expertise/qualified staff;
- l. Takes time to grow and develop;
- m. Requires continual monitoring/reviewing;
- n. While area is developing/growing area will need to be protected/policed/regulated / movement of boats/people will need to be regulated/restricted;
- o. Corals transplanted may have limited genetic diversity (due to propagation from asexual reproduction) limiting resilience/making them vulnerable to disease;
- p. Ethical concerns regarding human intervention/artificial regeneration;

Award [5 max] for both pros and cons.

Conclusion [1 max] must be balanced, presenting arguments for both sides, with a clear value judgement. E.g. Although transplanting corals helps the ecosystem recover from previous damage this is only temporarily as the causes of damage e.g. ocean acidification/presence of crown of thorns have not been addressed and hence this approach is not effective in the long run.

Although it takes time for the corals to grow and community to develop, in the long run, coral transplanting will contribute to maintaining/increasing biodiversity and hence overall this is of great value to conservation.

Note to examiners: Do not accept only “restores coral reef ecosystems/populations”.

4. (a) With reference to **Figure 4(a)**, calculate the natural increase rate of the population of Mauritius. [1]
- a. $(\text{NIR} = \text{CBR} - \text{CDR} / 10 = (9.8 - 9.0) / 10 =) 0.08 (\%)$;
 b. 0.8 per 1000;

Note to examiners: Working out is not required for the mark. Do not accept only “0.8”.

- (b) Suggest why the natural increase rate differs from the population growth rate given in **Figure 4(a)**. [1]

Due to migration/emigration (out of the country – hence lower population growth rate than natural increase rate)

Note to examiners: do not accept only immigration (movement into the country). Accept first response.

- (c) With reference to **Figure 4(b)**, outline potential issues for the future economic development of Mauritius. [2]
- a. Reduction in birth rates/low young population suggest a declining future work force;
 b. Overall, proportionally smaller workforce limiting economic growth/development/GDP (15–64 year olds – economically productive);
 c. More resources needed to support independent living for aging population;
 d. More finances required for health care system for aging population;
 e. Overall, proportionally smaller workforce to support aging population / increase in dependency ratio (under 15 years and over 64 years);
 f. Smaller workforce to support pension schemes;

5. (a) With reference to **Figures 1(b)** and **5(a)**, describe the relationship between altitude and the locations of sugarcane plantations. [1]
- a. Sugar plantations are mostly found at low altitudes;
 b. As altitude increases there are less sugarcane plantations / as altitude declines there are more sugarcane plantations;

- (b) Outline **two** environmental impacts on coastal waters caused by growing sugarcane nearby. [2]
- a. Run-off input of fertilizers/nutrients can lead to algal blooms/red tides / algal blooms caused by nutrient run-off into coastal waters may produce toxins;
 b. Pesticides/herbicides can have a toxic impact on species within coastal ecosystem / pesticide runoff can lead to bioaccumulation/biomagnification of toxins within coastal organisms;
 c. Run-off containing sediments/suspended solids/turbidity could reduce light penetration into the coastal ecosystem reducing productivity;
 d. Run-off containing sediments could smother/damage benthic/coastal organisms;
 e. Oil spills from farming equipment/tractors may run-off into coastal waters killing some organisms;

Note to examiners: Only mark the first two responses if more than two answers are given.

- (c) Evaluate the sustainability of the processing of sugarcane as illustrated in **Figure 5(c)**. **[4]**

Cons/decrease in sustainability [3 max]:

- a. Sugarcane needs to be transported to mill which requires energy/fossil fuel producing CO₂/GHG emissions/increases ecological footprint / transport of sugarcane requires the use of fossil fuels which is a non-renewable source of energy (and therefore is not sustainable);
- b. Additional energy is required for processing, potentially from fossil fuels producing CO₂ emissions / burning bagasse/biofuel produces CO₂/GHG emissions;
- c. Processing requires input of water/chemicals which may not be produced sustainably / irrigation can lead to soil salinization (which reduces fertility of the soil);
- d. Social/community groups may be opposed to sugar processing near them due to pollution/smell/odour/traffic problems;

Pros/increase in sustainability [3 max]:

- e. Waste from sugarcane farming (biomass) contributes to energy production/used in powerplant;
- f. Bagasse from refining plant is used as biofuel for energy generation/powerplant;
- g. Residue material from refining process is used as conditioner on fields growing sugarcane / organic cane residues (from processing) are sent to be used on sugarcane farms (reduces waste going to landfill);
- h. Ash from energy production is used on farms/applied to fields used to grow sugarcane;
- i. Waste from alcohol production is used as organic fertilizers to grow sugarcane;
- j. Provides economic sustainability via employment;
- k. May help provide community/social cohesion;

Note to examiners: Conclusion [1 max] must be balanced, presenting arguments for both sides, with a clear value judgement. E.g. Although energy is required for processing of sugar, it can be considered sustainable as the process produces bagasse which in turn can be used to provide the required energy.

Note to examiners: Conclusion is not mandatory and full marks can be achieved through consideration of both pros and cons.

Do not accept “sugarcane processing produces zero waste.”

Do not accept only “sugar cane is a water intensive crop”.

Do not accept “production of emissions/toxic gases” instead of carbon dioxide/greenhouse gases.

Do not accept only “organic fertilizers are used for growing sugarcane”.

6. (a) Identify **one** advantage and **one** disadvantage of the trend in tourist numbers as shown in **Figure 6(b)**.

[2]

Resources; NB use table for responses

Advantage (1 max)	(increase in tourist numbers leading to) increase in revenue/economic growth/income/jobs/improvements in infrastructure/funds for conservation;
Disadvantage (1 max)	increase in resource use / importing more food / increase emissions/ waste generated by more people / pressure on water resources / increase in pollution e.g. littering/sunscreen; increase damage to habitats/biodiversity/wild areas e.g. via trampling / local residents are adversely impacted (e.g. increase in house prices/living costs);

Note to examiners: Only mark the first response in each category, if more than one answer is given.

Do not accept only “economic stability”.

Do not accept only “increase in environmental degradation / increase in ecological footprint”.

Accept any other reasonable response

- (b) With reference to **Figure 6(c)** calculate the percentage change in fish production between 2010 and 2021.

[1]

$$((28\,769 - 5887)/5887 \times 100 =) 388.687(\%) / 388.69 (\%) 388.7(\%) / 389 (\%)$$

Note to examiners: Working out is not required for the mark.

Do not accept incorrect rounding of the final answer.

- (c) Explain **three** ways in which climate change could impact future fish catches in Mauritius.

[3]

- a. Increase in water temperatures could shift some species further away from the island to cooler waters/water with optimum temperatures (resulting in lower catches) / increase in water temperatures may shift some species towards the island (increasing fish catches);
- b. Increase in water temperatures could destroy breeding habitats and reduce fish catches / increase in temperature may increase range/habitat area for breeding (and therefore increase fish population/stocks);
- c. Increase in water temperatures may result in death of some species (that are unable to adapt and contribute to reduction in fish catches);
- d. Increase in water temperatures can increase life-cycles of some species overall reducing their size/life spans and overall reduction in fish population/catches;
- e. Increase in water temperatures could reduce breeding success of fish (reducing catch sizes);
- f. Increase in water temperature can reduce dissolved oxygen levels and reduce number of fish (and therefore reduce catches);
- g. Increase in water temperature could increase photosynthesis/plankton/marine flora growth which increase food sources for fish increasing catches / increase in water temperature may result in reduced plankton growth resulting in lower fish numbers (and their reduction in catch size);
- h. Increase in water temperatures could cause coral bleaching and resultant loss of coral reefs could reduce fisheries/fish stocks;
- i. Increase in carbon dioxide levels could increase photosynthesis/plankton/marine flora growth which increase food sources for fish increasing catches;
- j. (Increase in carbon dioxide could cause) ocean acidification that would reduce plankton growth and therefore lower fish numbers (reducing catch size) / ocean acidification creates unsuitable living conditions for the fish therefore reduces the fish populations/catches / ocean acidification contributes to coral bleaching/destroys corals and therefore reduces mating/breeding grounds/habitats for the fish (thereby lowering fish populations);
- k. Increase in storms/cyclone events can reduce period of fishing/destroy habitats reducing stock;
- l. Changing currents may displace fish towards/away from fishing grounds used by Mauritius;
- m. Increase in upwellings, releasing nutrients into surface waters which increases primary productivity and contributes to increase in fish population/stocks / decrease / reduction in upwelling will result in reduction in nutrients within the surface waters which reduces primary production and hence reduces fish population/stock;

Note to examiners: Only mark the first three responses if more than three answers are given.

Do not accept “change in climate/global warming” instead of increase temperature/carbon dioxide levels”.

Do not accept only “increase in temperature changes migration patterns of fish”.

- (d) Outline how the fishing industry in Mauritius could avoid the tragedy of the commons.

[5]

Explanation/definition of ‘tragedy of commons’ [1 max]

- a. Over-exploitation of fisheries can lead to their collapse / exploitation of fisheries despite leading to long term loss/detriment to others / a shared resource for which no clear owner can be identified and is over-exploited to its detriment;

Argument for avoiding tragedy of commons

- b. Treaties/agreements between countries/companies/stakeholders to limit/manage fishing;
- c. Lobbies/agreements to reduce catches to below maximums sustainable yields (MSY) / fishing below the maximum sustainable yield (MSY);
- d. Education/campaigns for fishermen/local community/stakeholders to limit fishing/use of non-damaging methods;
- e. Laws/regulations/enforcement/fines to restrict fishing/sport fishing/introduction of invasive species/number of fishing boats;
- f. Continual/accurate monitoring of fish stocks is required;
- g. Provide alternative income generation for local communities/fishermen;
- h. Develop alternative fish sources eg aquaculture;
- i. Licences/seasonal permits/quotas/targets/temporary bans to limit over exploitation of fish stocks/to below MSY;
- j. Use of mesh net sizes that allows juvenile/young fish to escape/reducing bycatch / restricting the minimum size of individual fish which are allowed to be caught;
- k. Establishing no take zones/marine protected areas that act as fish sanctuary/nursery/spawning grounds;
- l. Avoid use of fishing methods that are destructive to the habitat eg use of poisons/explosives/bottom trawling;
- m. Avoid inappropriate discard/loss of fishing gear leading to ghost fishing;
- n. Use of food labelling of fish for sale e.g. use of sustainable certification (to encourage purchase of sustainably produced fish/discourage over-exploitation of fisheries) / change consumer behaviour through use of food labelling/certification of fish from sustainable sources;

Note to examiners: Full marks can be achieved without the definition.

Do not accept generic education/awareness campaigns. These campaigns need to be linked to fishing practices.

7. (a) Identify in how many months during 2023 the levels of PM2.5 exceeded the World Health Organization’s guidelines.

[1]

1 (month)

- (b) State a possible source of PM2.5 around Port Louis.

[1]

Combustion of fossil fuels / vehicle emissions/exhaust / emissions from ships/factories /smoke from fires / dust from construction / wind erosion / pollen / emissions from burning plant stubble/waste;

Note to examiners: Do not accept only “buses/cars/ships/industrial activities”.

Do not accept “volcanoes” as there are no active volcanoes on the island.

Do not accept emissions of CO₂ or other gases.

Accept other reasonable responses.

(c) Outline **one** reason why PM2.5 is monitored in Port Louis. [1]

- a. Used as a key indicator of air pollution/quality / Port Louis is an urban/industrial area and therefore is at risk of air pollution;
- b. PM2.5 can cause human health problems / aim to protect human health (asthma/lung/respiratory problems/heart disease);
- c. Provides data to assist in making informed decision to reduce pollutants / PM2.5 levels are monitored to try and ensure healthy/good air quality is maintained;
- d. Particulates could damage building/statues (requiring remediation action e.g. cleaning);
- e. PM could settle over vegetation effecting growth/development;

Note to examiners: Only mark the first response if more than one answer is given.

(d) Suggest **two** advantages of using citizen science to monitor air pollution in Port Louis. [2]

- a. (Involves public participation in collection of data/scientific research) allows wide/large collection of data / identifies level of pollution;
- b. Can lead to wider understanding/knowledge of air pollution/environmental issues/problems;
- c. (Participation is voluntary and therefore) data can be collected relatively cheaply;
- d. Allows for collaboration/sharing of data;
- e. Community groups/citizens can generate ideas that contributes to increasing understanding;
- f. Helps to address real problems by providing data to the authority / advocacy leading to cleaner air policies/further research / encourages government to strengthen regulation/polices and take action;
- g. Has environmental educational/awareness/engagement value for the citizens/society/local residents;
- h. Creating ownership of environment/managing pollution / allows individuals to make a difference/contribute to wider good;
- i. Allows investigation of location, which may not otherwise be monitored (due to lack of funds/experts);
- j. Participants are local and have high availability to monitor air quality;

Note to examiners: Only mark the first two responses if more than two answers are given. Do not accept “data collected is more accurate”.

(e) Outline **one** social benefit of increasing green spaces in the city of Port Louis, as referred to in **Figure 7(c)**. [1]

- a. Green space helps with mental well-being;
- b. Provides (community) spaces for recreation/relaxation/socialisation/with aesthetic value;
- c. Fosters neighbourhood relationships/community cohesion/reduces social isolation;
- d. Green spaces can create feeling of ownership/pride/belonging/connection to the city/area;

Note to examiners: Only mark the first response if more than one answer is given. Do not accept “improves health”.

- (f) Outline **two** economic benefits of greening the city of Port Louis, as referred to in **Figure 7(c)**.

[2]

- a. Improved attractiveness of area increases property prices;
- b. Encourages local investments (adding to local economy) / subsidies/tax breaks reduces cost of installing green walls/roofs;
- c. Attracts visitors that spend money in the area / attracting tourists to area may generate foreign exchange;
- d. Increases air quality improving human health (e.g. reduction in asthma) therefore reducing medical costs;
- e. Helps to regulate city temperature that reduces cost of using air conditioning;
- f. Reduces risk of floods/landslides that can be costly;
- g. Green spaces can improve health/well-being/happiness that can increase productivity of workforce;
- h. Managing/maintenance of green areas creates jobs;
- i. Greening the city can be a relatively cheap way to mitigate/reduce GHG/CO₂ levels;

Note for examiners: for credit response must be linked to economic benefit/value.

Only mark the first two responses if more than two answers are given.

Do not accept only “increase in tourism”.

Do not accept only “subsidies/tax breaks”.

8. Discuss the Renewable Energy Roadmap 2030 referred to in **Figure 8(b)** and its aims to achieve energy security for Mauritius.

[6]

Pros (linked to increase availability/reliability/affordability) [4 max]

- a. Reduction in coal will reduce dependency on imports and therefore increase energy security;
- b. Reduction in coal imports will reduce impact of global crisis/events/fluctuating market that impact availability/cost;
- c. Expanding/diversifying range/type of accessible energy sources will increase energy security;
- d. Increasing/expanding/diversifying renewable energy sources that are local/sustainable will increase energy security;
- e. Over time the cost of renewable energy should be relatively low/more affordable;
- f. Energy efficiency could reduce demand for energy and contribute overall to energy security;

Cons (linked to increase availability/reliability/affordability) [4 max]

- g. Cost of increasing/constructing renewable energy sources will initially be high / the switch/implementation to renewable energies would be expensive;
- h. Developing sufficient infrastructure and energy storage for renewables will be costly/time consuming;
- i. Developing renewable energy/infrastructure will require specialised staff/expertise;
- j. It may take longer (than to 2030) to obtain funds/planning permission for renewable energy;
- k. Renewable energy may not be as reliable as fossil fuels e.g. solar/wind are weather dependent;
- l. Increasing energy security by reducing demand/improving energy efficiency will require change in culture via campaigns/legislation e.g. for use of more efficient appliances/energy saving light bulbs;
- m. Biomass takes time to grow/may need to be imported and therefore can reduce energy security;
- n. Reduction in coal may lead to increase in use of oil which does not increase security / 40% of energy will still come from coal/oil which thereby decreasing efficiency of the road map/level of energy security;
- o. Marginalized/poor/rural communities may continue to lack access to energy supplies/limit increase in energy security;

Award [5 max] for both pros and cons.

Conclusion [1 max] must be balanced, presenting arguments for both sides, with a clear value judgement. E.g. Although the transition to renewable energy is expensive the resulting reduction in the use of coal and therefore reduced dependency on coal imports will overall increase energy security for Mauritius;

Accept other reasonable responses.

Note to examiners: Do not accept just “increase in renewable energy is costly/expensive”.

9. Evaluate the potential impact of the National Solid Waste Management Strategy and Action Plan in Mauritius, as referred to in **Figures 9(a) and 9(b)**.

[6]

Positives [4 max]:

- a. Recycling/remanufacture/reuse/repair/circular economy reduces volume of waste/waste going to landfill;
- b. With a reduction in use of landfill there is a reduction in odour/pests (associated health issues)/landfill gases/leachates/associated traffic / less issue with availability of space for landfill;
- c. Reduction in use of area for landfill makes greater area available for other uses (eg housing/recreation);
- d. Recycling/remanufacture/reuse/repair/circular economy reduces use of resources/extraction of materials/reduces ecological footprint / composting can produce compost for use to enrich soils/growing crops;
- e. Reduction in resource use will reduce dependency on imports of goods;
- f. Less energy required for the production on new products/increased security/lower emissions/less air pollution;
- g. Regional sorting stations/composting sites makes use more accessible;
- h. Strategy is likely to create jobs working in sorting/recycling stations/composting sites/remanufacturing/repairing / producing/selling recycled/reused/remanufactured goods could support local economies;
- i. Reducing use of plastics is likely to reduce plastic pollution/litter in the environment;
- j. Creates wider environmental awareness / improved customer choices on less environmentally damaging options/ more environmentally conscious choices;

Negatives [4 max]:

- k. Recycling is only effective if there is a market for recycled goods;
- l. Repair/re-use of goods requires a change in culture/education;
- m. 'Waste plastic free' is not a realistic target eg medical equipment made of plastic/everyone needs to agree;
- n. Compost sites may produce odour/smells/attract pests (and associated diseases) disturbing nearby settlements;
- o. There may be an increase in traffic with transportation of waste increasing GHG emissions/noise disturbances/road congestion;
- p. Strategy may be expensive to implement / expensive to set up/land is required for sorting sites/composting sites/'circular options' for plastic waste;
- q. Not all waste/plastic waste can be composted/recycled/be part of the circular economy;
- r. Some waste will continue to go to landfill (causing potential damage through leachates/landfill gas/smell/litter to nearby habitats/rivers/settlements/require more space);
- s. For circular economy to be successful it requires innovation in design of goods/materials involving research/funding;
- t. Recycling/remanufacturing processes may require more energy than producing goods from virgin resources / recycling/remanufacturing processes produces greenhouse gases;
- u. Requires agreements/structural change from organisations/companies which can be difficult to achieve / people may not adhere to the action plan / it may be difficult to enforce this strategy/to change peoples behaviour / without collaboration it will fail;
- v. Current producers of plastics/certain goods will be detrimentally impacted resulting in reduction in production/threat to jobs;

Award [5 max] for both positives and negatives.

Conclusion [1 max] must be balanced, presenting arguments for both sides, with a clear value judgement. E.g.: The National Solid Waste Management Strategy and Action Plan

in Mauritius, will reduce the pressure on landfill, improve awareness and lower emissions, but due to high economic cost and need for more innovation is unlikely to be successful;

Accept other reasonable responses.

10. (a) List **two** policy changes by the government of Mauritius that could lead to a reduction in carbon emissions, which are shown in **Figure 10(a)**. [2]

- a. Carbon taxes (polluter pays principle) / carbon cap and trading / laws for companies/businesses to reduce the use of fossil fuels/reduce carbon emissions;
- b. Improvements/promotion of public transport / use of electric vehicles in public transport / cheaper public transport;
- c. Discouraging use of private petrol cars eg via higher cost/taxes/parking charges/exclusion areas / increase in recharging points for electric vehicles using renewable energy / promoting/subsidies for electric vehicles / promote car-pooling;
- d. Encourage cycling/walking / improve cycleways/walkways;
- e. Switching (from fossil fuels) to renewable energy sources (eg for source of electricity) / subsidies for the use of renewable energy sources (instead of fossil fuels);
- f. Implementing greater energy efficiencies in homes/building;
- g. Environmental education to change behaviour/attitudes towards a reduction in use of fossil fuels thereby lowering emissions;
- h. Land use change/forestation which absorbs/carbon dioxide/acts as carbon storage;

Note to examiners: Only mark the first two responses if more than two answers are given. Do not accept “ban on fossil fuels” as figure relates to 1990-2020 (when there was no ban in place - Renewable Energy Road Map was only set up in 2021).
Accept other reasonable responses.

- (b) With reference to **Figure 10(b)**, describe how climate change may influence cyclones that affect Mauritius. [2]

- a. Higher (sea) temperatures/warmer waters (have more energy) contribute to stronger/more intense cyclones;
- b. Stronger/more intense cyclones (that carry more moisture that) increases rainfall / higher (ocean and air) temperatures will lead to cyclones with more intense rainfall / increase in temperature will increase evaporation which leads to intense/heavy rainfall;
- c. Stronger/more intense cyclones (move faster and) cause higher wind speeds / higher (ocean and air) temperatures will lead to cyclones with higher wind speeds/ higher temperatures leads to strong winds/waves (increasing intensity of cyclone);
- d. Sea-level rise intensifies/contributes to storm surges/flooding;
- e. Higher (sea) temperatures lead to a longer cyclone season/may increase frequency of cyclones;

Note to examiners: Do not accept only “more rainfall/stronger winds” without link to the cause.
Do not accept “climate change/global warming” instead of “higher temperatures/sea-level rise”.

11. (a) With reference to **Figure 11**, outline how the sustainability of Mauritius has changed between 1961 and 2022. [2]
- a. Until about 1971, when EF was lower than biocapacity, Mauritius was sustainable / Before 1971 there an ecological reserve meaning Mauritius was sustainable / In 1961, when EF was lower than biocapacity, Mauritius was sustainable / In 1961, as there was an ecological reserve Mauritius was sustainable;
 - b. After about 1971, when EF has been greater than the biocapacity, Mauritius has not been sustainable / since 1971 there has been an ecological deficit which means Mauritius has been not sustainable / in 2022, when EF was greater than the biocapacity, Mauritius was not sustainable / In 2022 the ecological deficit meant that Mauritius was not sustainable;
- (b) Outline how economic market failure could contribute to the ecological deficit of Mauritius, as shown in **Figure 11**. [2]
- a. Market failure can occur when discharges/emissions/waste/pollutants are released into the environment (eg from a factory at no cost to them);
 - b. These waste products contribute to the ecological footprint;
 - c. These waste products may not be absorbed by the land/area beyond the biocapacity levels of Mauritius, contributing to the ecological deficit / ecological deficit occurs when waste/pollution produced is greater than the land in Mauritius can absorb/the biocapacity;
 - d. The pollutants can damage ecosystems and reduce biocapacity / market can cause excessive use of natural resources (e.g. forest) which reduces biocapacity;

12. Outline reasons for and against the expectation that members of the United Nations (UN) should contribute to the UN Environmental Programme's Environment Fund, referred to in **Figure 12**.

[4]

Pros [3 max]:

- a. Wealthier countries have moral/ethical duty to help developing countries/Mauritius with funds / It is part of being a good neighbour to help those in need;
- b. Countries that have historically been high emitters should now contribute financially to the Fund/help other countries;
- c. Mauritius/SIDS are disproportionately/highly impacted by climate change (and have limited resources) and should be helped financially;
- d. It is a moral/ethical duty to meet any agreements/promises made / as member of the UN they should (fulfill their commitment) and help other nations/contribute to the fund;
- e. Climate mitigation in one country will help the collective (global well-being)/everyone and therefore all nations should meet their obligations to the fund / climate change is a common/shared problem and therefore everyone should help;
- f. Not helping with funding now could lead to greater problems in the future for everyone including climate refugees/loss of global biodiversity/loss of food resources;
- g. States that have promised contributions may find themselves in need of such help in the future / may help develop international relations/trade deals between donating country and Mauritius;

Against [3 max]:

- h. There is no moral duty to help because climate change is a natural process (not necessarily man-made);
- i. The current generation in developed countries are not to blame and should not have to pay;
- j. There is no binding legal obligation to pay and therefore they do not need to contribute to the fund / country may argue that state sovereignty means it has the right to govern its own finances and should not be obligated to contribute to the fund / some states may perceive it to be a high-risk and costly initiative with limited chance of success;
- k. States that have promised contributions may find themselves unable to financially help due to change in economic situation / States do not consider themselves responsible and therefore may decide to focus on domestic priorities instead / there are many SIDS and therefore it can be difficult to finance all of the those in need;
- l. Countries may have poor relationship/conflict with others and may not want to contribute;

Note to examiners: Accept 'nations/states' as an alternative for 'countries'.
