1.4 Sustainability

Mark Schemes

Course	SL IB Environmental Systems & Societies (ESS)
Section	1. Foundations of ESS
Topic	1.4 Sustainability
Difficulty	Medium

To be used by all students preparing for
SL IB Environmental Systems & Societies (ESS)
Students of other boards may also find this useful

1a

Indicative Content	Commentary
Natural capital and natural income can be distinguished as follows: • Natural capital is the stock of a natural resource **OR** the sum of a natural resource in a given environment; [1 mark] • E.g. a forest ecosystem / the fish stocks in a commercial fishery / fertile agricultural land / natural mineral deposits (in a mining region); [1 mark] • Natural income is the flow of materials or services that can be harvested from a source of natural capital (if it is appropriately managed) **OR** the growth/increase/interest on a source of natural capital over time; [1 mark] • E.g. yield of timber/medicine/game (from forest) / yield of fish (from fishery) / yield of crops (from agricultural land) / extraction/utilisation of minerals/ores (from natural deposits); [1 mark]	To answer this question successfully you need to make very clear the differences between two or more closely linked concepts - in this case natural capital and natural income The terms natural capital and natural income are very easy to confuse If you are finding this concept tricky, try to remember the following analogy: money in a bank (sometimes referred to as **capital**) may gain **interest** over time if it is carefully managed Natural income is effectively the interest that humans can **live off and benefit from**, if natural capital is **sustainably managed** There are plenty of other sources of natural capital and natural income not listed here - but it is worth remembering the examples given in this mark scheme

1b

Indicative Content
Urban green spaces can be considered as natural capital in the following ways: Any **three** from the following: • Air pollution reduction, leading to cleaner air / improved health / reduced healthcare costs; [1 mark] • Provision of areas for education/tourism/leisure, and physical activity, which can help reduce obesity/stress levels; [1 mark] • Aesthetic, cultural, and spiritual value to humans as people derive enjoyment/inspiration/spiritual connection from spending time in nature / appreciating the beauty/diversity of natural environments; [1 mark] • Increased economic value of nearby homes due to the presence of green spaces; [1 mark] • Enhanced biodiversity, providing habitats for various species (e.g. insects/invertebrates, mammals, birds and plants) / supporting pollinators (e.g. bees); [1 mark] • Flood mitigation by absorbing precipitation / increasing infiltration, reducing flood risk; [1 mark] • Water filtration and purification, ensuring that water entering rivers and aquifers is filtered/clean; [1 mark] • Rivers/lakes (within urban green spaces) may serve as a source of water for communities; [1 mark] • Cooling effect / mitigating the urban heat island effect / reducing cooling costs for nearby homes; [1 mark] • Act as carbon sinks / oxygen source, absorbing carbon dioxide and releasing oxygen, contributing to climate regulation; [1 mark] • Providing a source of food, timber, and fertile soil for agriculture and other sustainable practices; [1 mark]

Model Answer	Commentary
Urban green spaces can be considered natural capital, firstly, because they act as natural filters, removing air pollutants and improving air quality [1 mark]. Secondly, they provide areas for education, tourism, leisure, and physical activity, promoting mental and physical well-being [1 mark]. Lastly, they enhance the aesthetics of the surrounding area and increase the economic value of nearby properties [1 mark]. In these ways, urban green spaces are valuable assets that contribute to the sustainability and liveability of urban environments.	The command word 'outline' requires you to give a brief account or summary Using terms such as 'firstly', 'secondly' and 'lastly' can help to structure your answer and indicate to the examiner that you have given a sufficient number of separate points to gain all 3 marks

2a

Indicative Content	Commentary
The terms sustainability and sustainable development can be distinguished as follows: Any **three** from the following: • Sustainability refers to the responsible use/management of resources in a way that allows for their natural regeneration and minimises harm to the environment; [1 mark] • Whereas sustainable development is a concept that focuses on meeting the current needs of society without compromising the ability of future generations to meet their own needs; [1 mark]	The command word 'distinguish' requires you to make clear the differences between two or more concepts or items Whenever you are asked to contrast or distinguish between two terms, a good technique is to use the word '**whereas**' to demonstrate to the examiner that you are **directly contrasting** one term with the other These two terms are often confused by students, so try

• Sustainability primarily concerns resource use / environmental impact, whereas sustainable development encompasses a broader approach to development that considers social/economic/environmental factors; [1 mark] • Sustainability emphasises maintaining a balance/equilibrium, whereas sustainable development implies progress/improvement/positive change; [1 mark] • Sustainability focuses on the overall state/condition, whereas sustainable development emphasises the process of achieving that state; [1 mark] • Sustainability can be applied to various aspects of life, such as ecosystems/resources/communities, whereas sustainable development is specifically applied to human activities and their impact on the environment/society; [1 mark] • Both sustainability and sustainable development aim to promote responsible resource use / ensure the wellbeing of present/future generations, but sustainable development has a broader scope and includes considerations of societal/economic aspects; [1 mark] • Both sustainability and sustainable development involve the responsible use/management of resources, but sustainable development adds the dimension of societal wellbeing / equitable distribution of resources; [1 mark]	to remember the following example/analogy: Imagine a forest with a limited number of trees. Sustainability would involve responsibly harvesting a few mature trees each year, ensuring that new trees have enough time to grow and replenish the forest. This approach focuses on maintaining the long-term health and balance of the forest ecosystem. On the other hand, sustainable development would involve not only managing the forest sustainably but also considering the needs and well-being of the local community of people. It would involve creating opportunities for economic growth, social progress, and improved quality of life while still ensuring the forest's long-term sustainability. Sustainable development looks beyond the immediate resource use and integrates environmental, social, and economic aspects to build towards sustainable progress.

2b

Indicative Content
Dietary choices impact the size of an individual's ecological footprint in the following ways: Any **two** of the following: • The ecological footprint of a meat eater is generally larger compared to that of a vegetarian; [1 mark] • Meat production requires a greater energy input than growing crops / contributes to higher greenhouse gas emissions (contributing to a larger ecological footprint); [1 mark] • Meat eaters consume food belonging to a higher trophic level, which is less efficient; [1 mark] • Raising livestock and producing feed for them requires land, leading to an increased ecological footprint; [1 mark] • The transportation of meat for processing increases the ecological footprint, particularly for imported goods; [1 mark] • Choosing a diet based on locally sourced goods/food products can reduce the ecological footprint / reduce transportation distances **OR** imported goods/food products increase the ecological footprint; [1 mark] • The transportation of goods/food products, especially over long distances, increases fossil fuel consumption and contributes to a larger ecological footprint; [1 mark] • The consumption of processed/packaged goods/food products results in an increase in material consumption for packaging, increasing the ecological footprint; [1 mark] • Greater food consumption rates lead to a larger ecological footprint as more natural resources (e.g. land/fossil fuels/water/irrigation) required to meet increased demand; [1 mark]

3a

Indicative Content	Commentary
The purpose of an Environmental Impact Assessment is to: Any **two** from the following: • Prevent/limit the environmental damage/impact caused by a specific project/development; [1 mark] • Provide a baseline assessment of the environmental/social/economic impacts of a project/development; [1 mark] • Predict/evaluate the possible environmental damage/impacts of a project and determine its sustainability; [1 mark] • Suggest solutions/mitigation strategies to address potential problems / minimise adverse effects/impacts/damage associated with the project/development; [1 mark] • Act as a tool for making informed planning decisions regarding a proposed project/development, taking into account its environmental implications and overall sustainability; [1 mark]	The command word 'outline' requires you to give a brief account or summary Many development projects may require an EIA, depending on their potential environmental impacts Examples of projects that may require an EIA include: • Mining and mineral extraction • Infrastructure development, such as highways and airports • Energy projects, such as wind farms and hydroelectric dams • Industrial facilities, such as chemical plants and oil refineries • Land use changes, such as deforestation or wetland reclamation

3b

Indicative Content
Environmental Impact Assessments typically involve the following steps: Any **five** from the following: • Define the scope of the EIA / identifying the key issues to be addressed; [1 mark] • Conduct a (comprehensive) baseline study before beginning the project/development; [1 mark] • Document abiotic conditions/biodiversity/key species/habitats/available resources; [1 mark] • Survey/analyse the opinions/value systems/perspectives/social-economic interests of the local population (that may be affected by the project/development); [1 mark] • Research/evaluate the potential (direct and indirect) impacts (of the project/development) on ecosystems/biodiversity/key species; [1 mark] • Research/evaluate the potential (direct and indirect) social/economic impacts of the project/development on local communities; [1 mark] • Public consultation / engaging with stakeholders/public to gather feedback/input on the proposed project/development / on the EIA itself; [1 mark] • Review / approve the EIA by relevant authorities, such as government agencies or regulatory bodies; [1 mark] • Monitor/assess changes in environmental and socio-economic factors during and after the project/development; [1 mark] • Make recommendations for how to keep project/development inline with environmental/sustainability goals/targets; [1 mark] • Propose mitigation measures to minimise impacts, and suggest reclamation actions after the completion of the project; [1 mark]

Model Answer
EIAs involve several key processes. Firstly, scoping is conducted to define the scope of the assessment and identify the main issues to be addressed [1 mark]. Baseline studies are then conducted to collect data on the existing environment, including factors such as habitats, species, land use, hydrology, human population, and soil characteristics. [1 mark] The next step is impact assessment, where the potential impacts of the project on the environment, both direct and indirect, are evaluated [1 mark]. Mitigation measures are then developed to minimise or avoid these potential impacts, ensuring the project is carried out in an environmentally responsible manner [1 mark]. Public consultation plays a crucial role, allowing stakeholders and the public to provide feedback and input on the proposed project and the EIA process [1 mark]. These steps collectively ensure a comprehensive assessment of the project's environmental impact and promote sustainable decision-making.

4a

	Goods	Services
Definition	Tangible/physical products that are derived from ecosystems and have economic value / can be exploited by humans (for economic gain) **OR** marketable commodities/materials that are harvested/extracted from natural resources and can be traded/consumed; [1mark]	Ecological/natural processes/functions that support life / contribute to human wellbeing **OR** intangible benefits provided by ecosystems to humans/communities/societies that enhance quality of life / the environment; [1mark]

Example	*Example of goods obtained from tropical rainforests include:* Any **one** from the following: • Timber/wood; [1mark] • Plants (e.g. fruits/nuts) / animals (e.g. game) for food; [1mark] • Plant extracts/medicines; [1mark] • Fibres for clothing/other material; [1 mark]	*Example of services provided by tropical rainforests include:* Any **one** from the following: • Vegetation/trees prevent soil erosion; [1mark] • Absorption of CO_2/carbon sink **OR** climate regulation / climate change mitigation; [1mark] • Aesthetic quality/value; [1mark] • Ecotourism/recreation; [1 mark]

4b

Indicative Content
The aims of the Millennium Ecosystem Assessment were as follows: Any **two** from the following: • To assess the consequences of ecosystem change for human health/wellbeing; [1 mark] • To assess the scientific basis for action needed to enhance conservation / sustainable use of ecosystems; [1 mark] • To provide information on the current state/condition/trends of ecosystems / the services they provide; [1 mark] • To explore the options to restore/conserve/enhance ecosystems; [1 mark] • To raise awareness/understanding of the importance of ecosystems / ecosystem services among policymakers/stakeholders/general public; [1 mark]

The findings of the Millennium Ecosystem Assessment were as follows:

Any **two** from the following:

- Ecosystems are vital for human health/wellbeing and provide essential services such as food/water/clean air/protection against natural disasters; [1 mark]
- Human activities have significantly altered ecosystems, leading to the degradation of many services they provide; [1 mark]
- In the last 50 years, humans have changed ecosystems at a faster rate than at any other time in history, which has led to substantial / largely irreversible losses of global biodiversity; [1 mark]
- These changes have substantially increased the poverty experienced by some human societies; [1 mark]
- Biodiversity loss is a major concern, affecting ecosystem stability and resilience; [1 mark]
- There are many opportunities to improve ecosystem management / enhance the services they provide, but these require collective action / effective policies; [1 mark]
- It is essential to integrate the value of ecosystems / ecosystem services into decision-making processes / policies (at all levels); [1 mark]
- Climate change is impacting ecosystems / ecosystem services, leading to increased risks for human health/wellbeing and the need for adaptive strategies to address these challenges; [1 mark]
- If not addressed, ecosystem degradation will substantially reduce the benefits that future generations will be able to obtain from ecosystems; [1 mark]