DP IB Environmental Systems & Societies (ESS): SL

Your notes

Resource Use in Society

Contents

Natural Capital & Sustainability

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Renewable & Non-renewable Natural Capital

Photo by trevor pye on Unsplash

***Natural capital** is the term used to describe resources from nature that are managed by humans because they provide goods or services*

- Natural goods and services can include directly **marketable goods**, such as timber and crops, or broader **ecological services**, such as the flood protection provided by mangroves, or the erosion prevention and climate regulation services that forests provide
- **Renewable** natural capital includes natural resources that can be **replaced** or **regenerated** at a rate equal to or faster than they are being used

- On the other hand, **non-renewable** natural capital includes natural resources that **cannot** be replaced or regenerated at a rate equal to or faster than they are being used
    - This is because these resources are either **irreplaceable** or can only be replenished over **geological timescales** (i.e. extremely long periods of time)


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Renewable Natural Capital

- **Living species and ecosystems**: these include forests, wetlands, coral reefs, and grasslands, which can **regenerate** through natural processes - these systems are typically able to do this due to their ability to harness solar energy and use photosynthesis to convert it into biomass
    - For example, forests (which provide fuel wood for many communities and are harvested for timber) have the capacity to regenerate through seed dispersal and natural growth, allowing new trees to **replace** the ones that have been **harvested**
    - Likewise, wetlands (which play a vital role in maintaining water quality, regulating floods, and providing habitat for diverse species) can self-sustain and regenerate, through natural processes like **sedimentation** and **nutrient cycling**, even after disturbances such as droughts or human activities like mining or construction
- **Non-living systems**: these include renewable resources such as **groundwater**, which can be replenished through natural processes, and the **ozone layer**, which can recover through the reduction of ozone-depleting substances
    - For example, groundwater is recharged by **precipitation** and **infiltration**, ensuring that it can be sustainably used as a freshwater resource
    - The ozone layer can also regenerate itself naturally, as long as the emissions of ozone-depleting substances are significantly reduced, allowing the stratospheric ozone concentration to **recover** over time

Non-renewable Natural Capital

- **Fossil Fuels**: coal, oil, and natural gas are **finite** resources formed over millions of years from the remains of plants and animals
    - Once extracted and burned for energy production, they cannot be replaced within human timescales
    - Although not a fossil fuel, **uranium**, used in nuclear power plants, is also considered as non-renewable natural capital as uranium reserves cannot be replenished within human timescales
- **Soil**: while soil is a renewable resource to some extent, it can be considered non-renewable when it is **degraded** or **eroded** at a faster rate than it can be naturally replenished
    - **Unsustainable agricultural practices**, such as excessive tilling and deforestation, can lead to soil erosion and depletion, rendering the soil non-renewable for practical purposes

- **Urbanisation** and construction activities can result in the permanent loss of fertile soil, effectively removing its ability to regenerate in those areas

- **Minerals**: these include various **elements** and **metals** extracted from the Earth's crust, which are **finite** and cannot be replenished within human timescales
  - For example, rare-earth minerals used in electronics and technology, such as neodymium and lithium, are non-renewable resources with limited reserves
  - Similarly, precious metals like gold and silver must be **recycled** or obtained from existing stockpiles once natural reserves have been completely extracted


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Sustainable & Unsustainable Use of Renewable Natural Capital

- It is crucial to manage and use renewable natural capital **sustainably** to ensure its **long-term availability**

Sustainable Utilisation of Renewable Natural Capital

- **Forest Management**:
  - Implementing sustainable forestry practices such as selective logging, reforestation, and maintaining biodiversity can ensure the continued provision of timber, non-timber forest products, and ecosystem services while preserving the integrity of forest ecosystems

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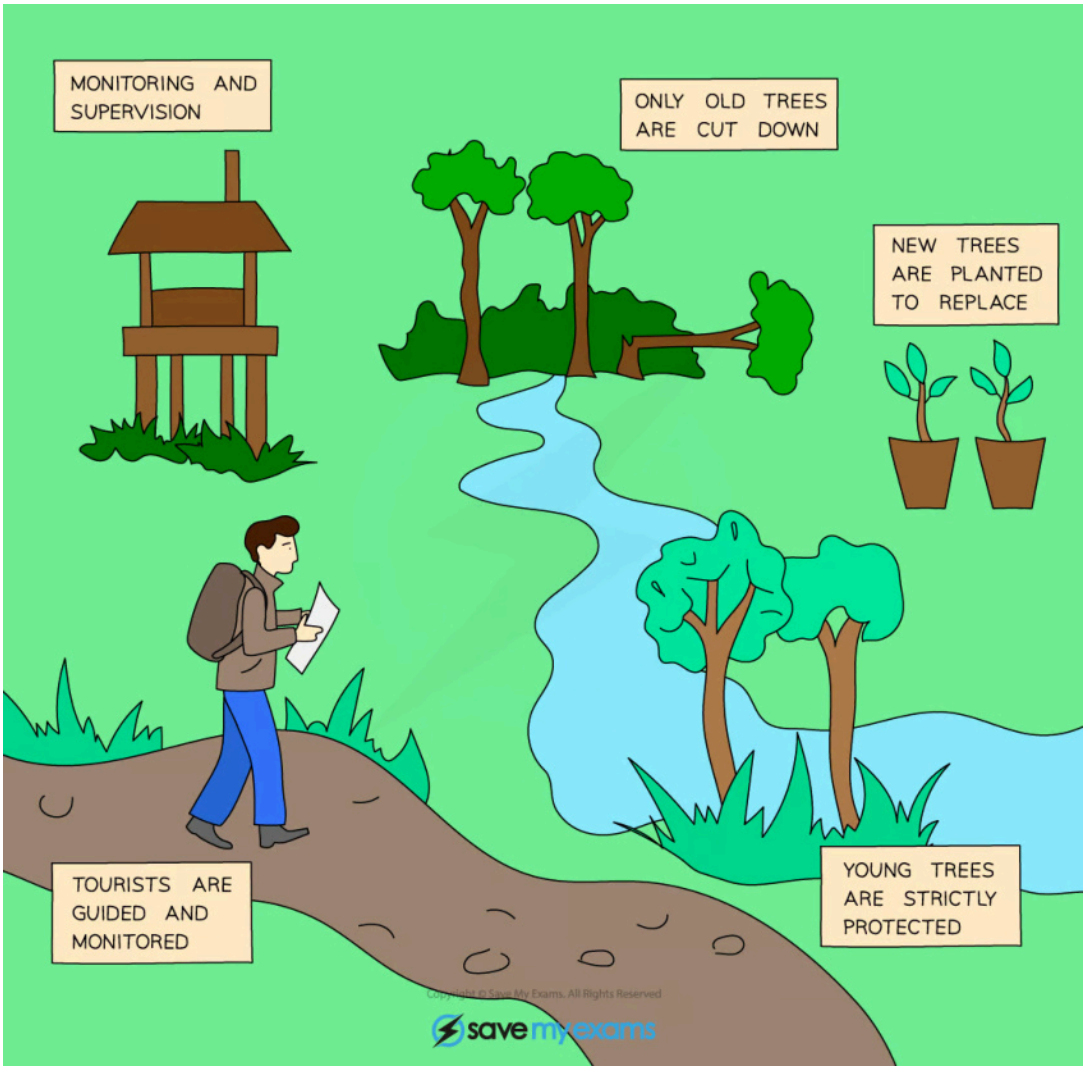
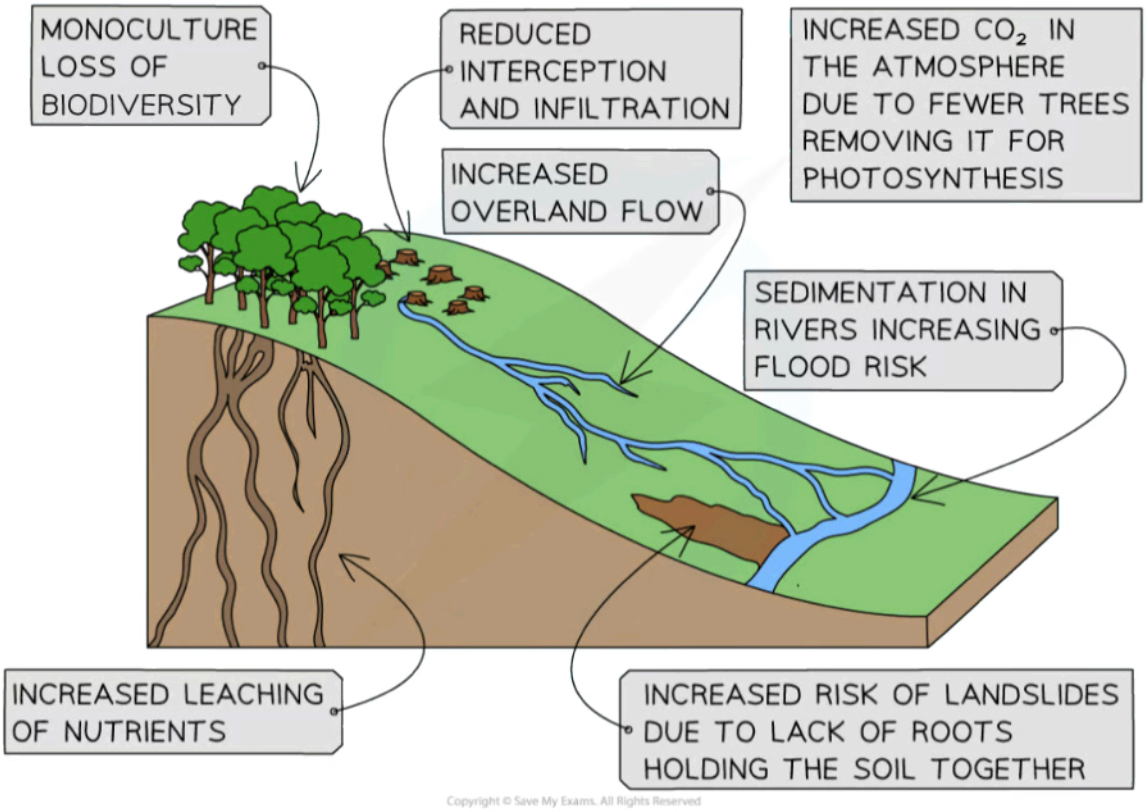


Sustainable forestry

- **Fisheries Management**:
  - Setting catch limits, implementing seasonal fishing restrictions, and establishing marine protected areas can help maintain fish populations at sustainable levels, allowing for continued fishing activities and the preservation of marine biodiversity
- **Renewable Energy**:
  - Harnessing renewable energy sources such as solar, wind, and hydroelectric power helps reduce reliance on fossil fuels and minimises environmental impacts, providing a sustainable energy alternative

Unsustainable Utilisation of Renewable Natural Capital

- **Deforestation**:
  - Clearing forests at a rate faster than their regeneration can lead to habitat loss, soil erosion, and contribute to climate change
  - Unsustainable logging practices and large-scale conversion of forests for agriculture or infrastructure development are examples of unsustainable utilisation



Environmental impacts of deforestation

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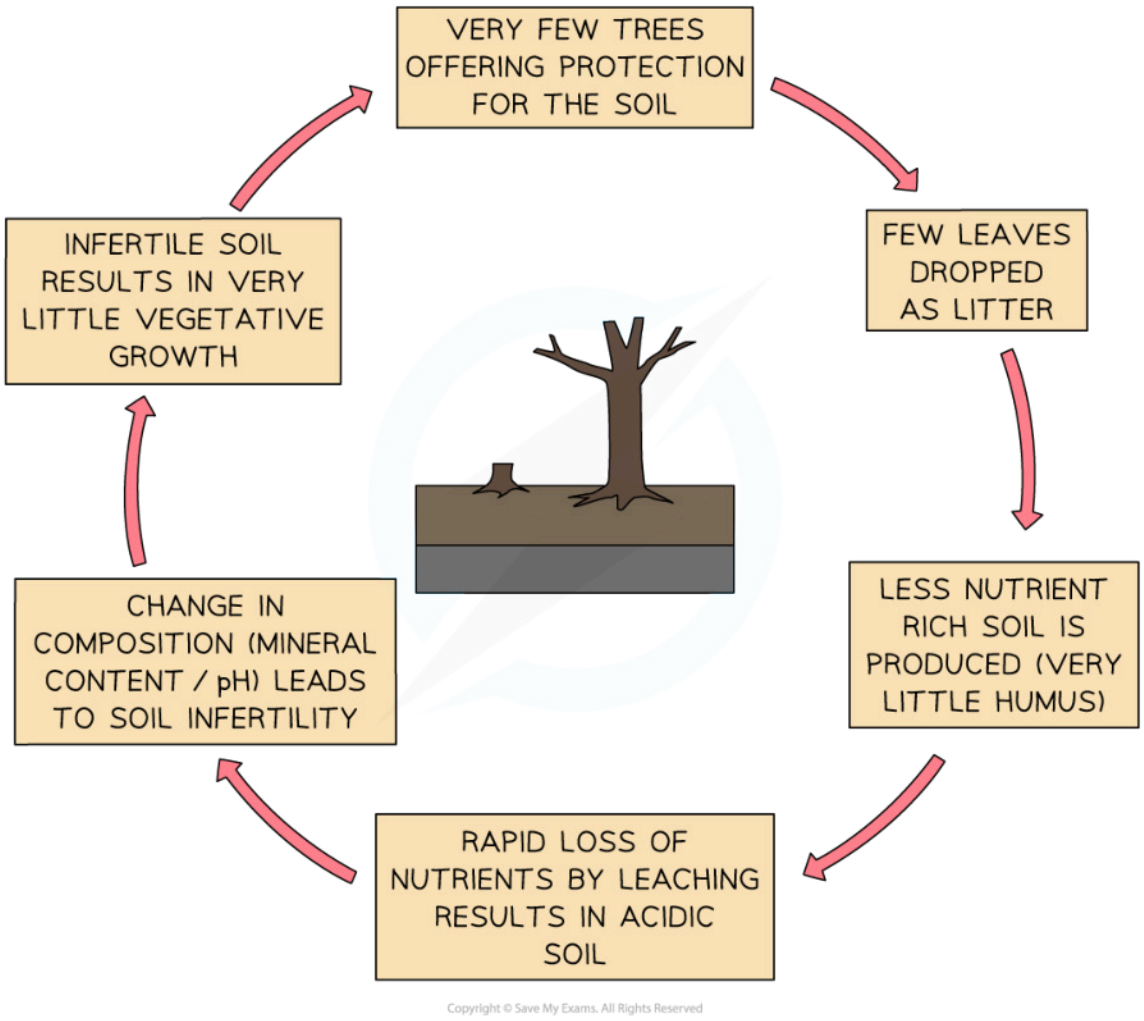

Effects of deforestation on the nutrient cycle

- **Overfishing**:
  - Excessive fishing beyond the natural reproduction rate of fish populations can lead to the depletion of fish stocks, disrupt marine ecosystems, and impact the livelihoods of fishing communities
- **Water Extraction**:
  - Excessive withdrawal of groundwater from aquifers can result in depletion, saltwater intrusion, and long-term water scarcity
  - When water is used beyond its natural replenishment rate, it becomes unsustainable

- It is essential to strike a **balance** between **utilising** renewable natural capital to meet human needs and ensuring its **preservation** for future generations
- Sustainable practices and conservation efforts are key to maintaining the **long-term viability** of renewable natural resources


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The Nature of Natural Capital

- Natural capital provides **goods** (tangible products such as timber and crops) and services
- These good and services have great **value** to human societies
  - This value may be aesthetic, cultural, economic, environmental, ethical, intrinsic, social, spiritual or technological

The Value of Natural Capital

Value Type	Description	Example
Aesthetic	The value derived from the beauty, visual appeal, and enjoyment of natural landscapes and biodiversity	Appreciating a stunning sunset over a pristine beach or enjoying the vibrant colours of a diverse coral reef
Cultural	The significance of natural capital in shaping cultural practices, traditions, and identities of communities	Indigenous communities relying on forests for their livelihoods and incorporating traditional ecological knowledge in their practices
Economic	The contribution of natural capital to economic activities through the provision of raw materials, fuels, food, and other tangible products	The logging industry relying on forests for timber production or agriculture relying on fertile soils for crop cultivation
Environmental	The importance of natural capital in providing essential ecosystem services that support the health and functioning of ecosystems	Wetlands purifying water by filtering pollutants or forests sequestering carbon dioxide and mitigating climate change
Ethical	The recognition that natural capital possesses intrinsic worth and deserves ethical consideration and protection	Advocating for the preservation of endangered species to prevent their extinction and preserve biodiversity
Intrinsic	The inherent worth of natural capital, independent of its instrumental value to humans	Recognising the value of untouched wilderness as an irreplaceable aspect of the Earth's natural heritage

Social	The contribution of natural capital to human well-being, including recreational spaces, opportunities for physical and mental health, and fostering social cohesion	Community gardens can provide a space for people to connect with nature, grow food together, and strengthen social bonds
Spiritual	The spiritual significance and connection to nature, with natural capital serving as a source of spiritual nourishment for some communities	Sacred mountains revered for their spiritual significance, where individuals seek solace, reflection, and spiritual experiences
Technological	The inspiration and utilisation of natural capital in technological advancements and innovations	Biomimicry is an example, where the design of a building is inspired by the cooling properties of termite mounds, leading to energy-efficient architecture

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- This highly diverse range of values associated with natural capital highlights the significance of **preserving** and **sustainably managing** these resources for the benefit of both present and future generations

Cartoon found on Mesoamerican Society for Biology and Conservation Belize

Flood protection provided by mangroves, or erosion prevention and climate regulation are examples of intangible services provided by forests

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The Dynamic Nature of Natural Capital

- The concept of natural capital is highly **dynamic,** as its classification and market value can vary **regionally** and **over time**
- **Cultural factors** influence the value assigned to certain natural resources
  - For example, cork forests in Portugal have been recognised as valuable natural capital due to their importance in the wine industry and the cultural heritage significance associated with this
- **Social factors** can influence the perceived value of natural capital
  - For example, in regions where uranium mining is seen as a threat to human health and the environment, uranium may be regarded as negative or harmful natural capital
- **Economic factors** play a significant role in determining the market value of natural capital
  - Resources like lithium, which are essential for battery production in the growing electric vehicle industry, have seen increased market value and demand
- **Environmental factors**, such as the physical scarcity or abundance of a resource, can influence its status as natural capital
  - In areas with significant lithium deposits, such as the lithium triangle in South America, lithium has become a valuable natural capital due to its critical role in energy storage
- **Technological advancements** can influence the value of natural capital
  - For example, flint - once an important resource used for hand tools - is now redundant as it was superseded by the development of metal extraction from ores
  - More recently, the increased demand for renewable energy sources has led to a higher market value for resources like lithium, which is used in rechargeable batteries for solar and wind energy systems
- **Political factors**, including regulations and policies, can shape the perception and market value of natural capital
  - Governments can impose restrictions or incentives that affect the extraction and use of certain resources, such as limiting uranium mining due to environmental concerns
- These examples highlight how the status and marketable value of natural capital can vary based on a range of factors, emphasising the dynamic nature of the concept and its dependence on cultural, social, economic, environmental, technological, and political influences