DP IB Environmental Systems & Societies (ESS): HL

Your notes

7.1 Natural Resources Uses & Management

Contents

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Natural Capital & Natural Income

What is natural capital?

- **Natural resources** are the sources of energy and raw materials that society uses and consumes
- In other words, the term natural resources applies to anything that comes from nature that can be used to **benefit humans**
  - Examples include:
    - Sunlight is essential for photosynthesis, solar energy
    - Air: oxygen for breathing, wind energy
    - Water: drinking, irrigation, hydroelectric power
    - Land: soils, agriculture, construction, habitat for wildlife
    - Rocks: minerals, construction materials
    - Ecosystems: forests, wetlands and coral reefs
    - Living things: plants for food and medicine, animals for food and clothing
  - In the environmental sciences, these resources are sometimes referred to as **natural capital**
- **Definition**: natural capital is the **stock** of natural resources available on Earth
- **Types of natural capital**:
  - **Renewable resources** are resources that can be replenished naturally
    - **Examples**: forests (timber), fish populations
  - **Non-renewable resources** are resources that are finite and cannot be replenished
    - **Examples**: fossil fuels (coal, oil), minerals (gold, iron ore)
  - **Ecosystem services** are the benefits provided by ecosystems that support human life and economic activity
    - **Examples**: pollination of crops, water purification, carbon sequestration

What is natural income?

- **Definition**: natural income is the flow of **goods** and **services** produced by natural capital

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- **Examples of goods**:
  - **Fish**: harvested from oceans and rivers
  - **Timber**: harvested from forests for building and paper products
- **Examples of services**:
  - **Climate regulation**: forests reduce global warming by absorbing CO_2
  - **Flood prevention**: wetlands reducing flood risk by absorbing excess rainfall, or mangroves buffering against storm surges


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Sustainable natural income

- If these natural goods and services are carefully and **sustainably managed**, they can provide even more resources over time
  - This is referred to as **sustainable natural income**
  - For example:
    1. Trees are cut down for timber but forests are also re-planted or left to recover
    2. The rate of new tree growth is **greater** than the rate of timber production
    3. Timber production is a sustainable source of income that can be marketed and used to benefit humans
- In other words, natural income is the term used to describe the sustainable income produced by natural capital
  - Again, using the timber production example:
    - Our forests are the **natural capital**
    - The sustainable timber we can obtain from these forests is our **natural income**
- Non-renewable resources, such as fossil fuels, can be used to generate wealth but can only be used **once** and cannot be **sustainably managed**
  - Therefore, even if they can be considered as natural capital, non-renewable resources cannot produce sustainable natural income

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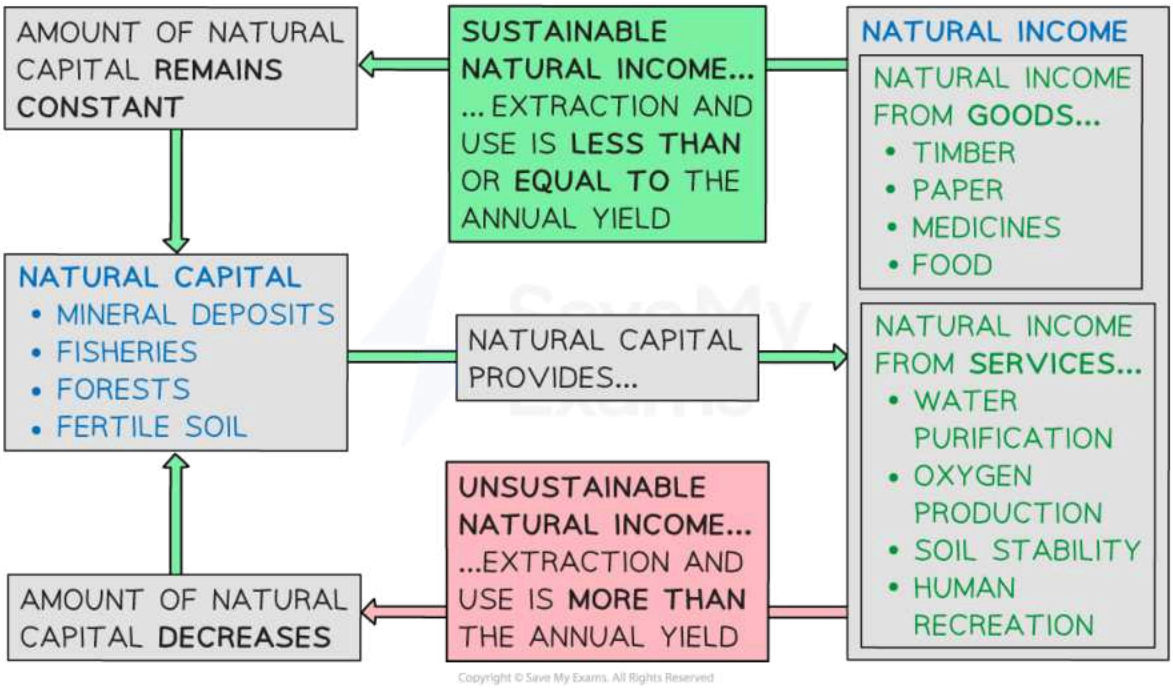

Natural capital can be used to generate natural income, but this can be done in a sustainable or unsustainable way

Perspectives on nature

- **Economic value**:
  - Viewing nature as natural capital highlights the economic value of resources
  - Encourages investment in their **preservation** and **sustainable use**
  - It helps policymakers and businesses recognise **financial benefits** of maintaining healthy ecosystems
- **Sustainable management**:
  - Emphasising natural capital and natural income encourages sustainable management practices
  - By valuing natural resources as capital, societies are more likely to **invest** in **conservation efforts**
    - Ensures a continuous flow of natural resources, such as clean water, air and fertile soil
- **Anthropocentrism**:
  - This perspective may imply that nature exists solely for human use and exploitation
    - This is an extreme anthropocentric view

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- It suggests that the environment's primary purpose is to serve human needs and economic interests
    - Leads to **over-exploitation** and **degradation** of natural resources
- **Intrinsic value**:
    - Some argue that this anthropocentric view reduces nature's intrinsic value
        - I.e. it ignores the inherent worth of ecosystems and species beyond their use to humans

Examiner Tips and Tricks

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!

Ecosystem Services

- **Definition**: benefits provided by ecosystems that support life and human well-being
- Ecosystem services usually fall into one of four main categories:
    - Supporting services
    - Regulating services
    - Provisioning services
    - Cultural services

Ecosystem Service	Description	Examples
Supporting	Essential ecological processes for supporting life	Primary productivity (photosynthesis) Soil formation Cycling of nutrients (e.g. carbon cycle, nitrogen cycle)
Regulating	A diverse set of services that shape and stabilise ecosystems	Climate regulation Flood regulation


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		Water quality regulation Air quality regulation Erosion control Disease and pest control
Provisioning	The goods humans obtain from ecosystems	Food Fibres Fuel Fresh water Timber
Cultural	These services derive from humans interacting with nature in a culturally beneficial way	Recreation and tourism Education Health benefits Sense of place, national identity and cultural heritage Employment

Examples of Regulating Ecosystem Services

Ecosystem service	Description	Further information	Examples
Water replenishment	Natural process of replenishing water in aquifers, rivers and lakes	Provides clean drinking water Supports agriculture and industry	Mountain watersheds—snowmelt and rainfall replenish rivers and groundwater, e.g. glacial meltwater
Flood and erosion protection	Ecosystems absorb excess rainfall and prevent soil erosion	Wetlands and floodplains reduce flood risks Coastal mangroves and vegetation protect	Coastal Mangroves in Southeast Asia protect shorelines and support fisheries Forest tree root networks stabilise soil and prevent

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		against storm surges	erosion on hillsides
Pollution mitigation	Ecosystems help remove pollutants from the environment	Improves water quality in rivers and lakes	Reed bed buffer zones filter water, removing inorganic nutrients and pollutants Wetlands e.g. saltmarshes, absorb pollution
Carbon sequestration	Process of capturing and storing atmospheric carbon dioxide	Forests and oceans act as carbon sinks Reduces greenhouse gases, mitigating climate change	Tropical rainforests, e.g. Amazon rainforest is a major carbon sink, regulating global climate Seagrass meadows


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The Value of Natural Capital

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

Natural Capital Value Types

Value type	Description	Example
Aesthetic	Value from the beauty, visual appeal and enjoyment of natural landscapes and biodiversity	Appreciating a stunning sunset over a pristine beach Enjoying the vibrant colours of a diverse coral reef
Cultural	Value 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	Contribution to economic activities through provision of raw materials, fuels, food and other tangible products	Logging industry relying on forests for timber production Agriculture relying on fertile soils for crop cultivation
Environmental	Provision of essential ecosystem services that support the health and functioning of ecosystems	Wetlands purifying water by filtering pollutants Forests sequestering carbon dioxide and mitigating climate change

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Health	Supporting physical and mental health through clean air, water and natural spaces	Access to clean air and water and green spaces for exercise and relaxation contributes to overall health and well-being
Intrinsic	Inherent worth of natural capital, independent of its instrumental value to humans	Appreciating untouched wilderness as an essential and irreplaceable part of our planet
Social	Contribution to human well-being, including recreational spaces, opportunities for maintaining physical and mental health and fostering social cohesion	Parks, woodlands and beaches can provide spaces for people to connect with nature and strengthen social bonds
Spiritual	Spiritual significance and connection to nature, essential to some communities	Sacred mountains revered for their spiritual significance Other natural places where people seek solace, reflection and spiritual experiences
Technological	Inspiration and utilisation of natural capital in technological advancements and innovations	Biomimicry, e.g. 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 diverse range of values associated with natural capital highlights the importance of preserving and sustainably managing these resources
  - This is for the benefit of both **present** and **future** generations

The dynamic nature of natural capital

- The concept of natural capital is highly **dynamic**
  - This is because the value of natural capital can change **regionally** and **over time**
- **Cultural factors** can influence the value of certain natural resources
  - E.g. cork forests in Portugal have been recognised as valuable natural capital due to their importance in the wine industry
  - The cultural heritage associated with this is significant

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- **Social factors** can influence value of natural capital
  - E.g. in certain regions, uranium mining is seen as a threat to human health and the environment
  - As a result, uranium may be regarded as negative or harmful natural capital
- **Economic factors** play a significant role in determining the market value of natural capital
  - E.g. lithium, which is essential for battery production in the rapidly growing electric vehicle industry, has seen increased market value and demand
- **Environmental factors**, such as the physical scarcity or abundance of a resource, can influence its value
  - E.g. in areas with significant lithium deposits, such as the lithium triangle in South America, lithium has become highly valuable natural capital due to its critical role in batteries
  - Initially valued for industrial use, coal is now facing scrutiny due to environmental impacts
- **Technological factors**, such as **advancements** in technology, can influence the value of natural capital
  - For example, flint was once an important resource used for hand tools
  - It is now redundant, as it was replaced by the development of metal extraction from ores
- **Political factors**, including regulations and policies, can change the market value of natural capital
  - Governments can impose restrictions or incentives that affect the extraction and use of certain resources, e.g. limiting uranium mining due to environmental concerns


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Resource Sustainability

Renewable natural capital

- **Renewable** natural capital includes natural resources that can be **replaced** or **regenerated** at a rate equal to or faster than they are being used
- **Living species and ecosystems**:
  - These include forests, wetlands, coral reefs and grasslands, which can **regenerate** through natural processes
  - These systems are able to do this as they harness solar energy and use photosynthesis to convert it into biomass
    - E.g. forests provide fuel wood for many communities and are harvested for timber
      - They have the capacity to regenerate through seed dispersal and natural growth
      - This allows new trees to **replace** the ones that have been **harvested**
    - Wetlands play a vital role in maintaining water quality, regulating floods and providing habitat for diverse species
      - They can self-sustain and regenerate, through natural processes like **sedimentation** and **nutrient cycling**
      - They can even regenerate after disturbances such as droughts or human activities like mining or construction
- **Non-living systems**:
  - These include renewable resources such as **groundwater** and the **ozone layer**
  - These can be replenished through natural processes
    - E.g. groundwater is recharged by **precipitation** and **infiltration**
      - This ensures that it can be sustainably used as a freshwater resource
    - The ozone layer can also regenerate itself naturally
      - This can occur if the emissions of ozone-depleting substances are significantly reduced
      - This allows the stratospheric ozone concentration to **recover** over time

Non-renewable natural capital

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- **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)
- **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
    - Uranium reserves are also not replenishable within human timescales
- **Soil**:
  - Soil is a renewable resource to some extent
  - However, it can become 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
    - **Urbanisation** and construction activities can result in the permanent loss of fertile soil
    - This effectively removes its ability to regenerate in these areas
- **Minerals**:
  - These include various **elements** and **metals** extracted from the Earth's crust
  - These are **finite** and cannot be replenished within human timescales
    - Rare-earth minerals used in electronics, e.g. lithium, have finite reserves
    - Precious metals, e.g. gold and silver, will have to be **recycled** or obtained from existing stockpiles once natural reserves have been completely extracted

Sustainable and unsustainable use of natural capital

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

Sustainable use of renewable natural capital

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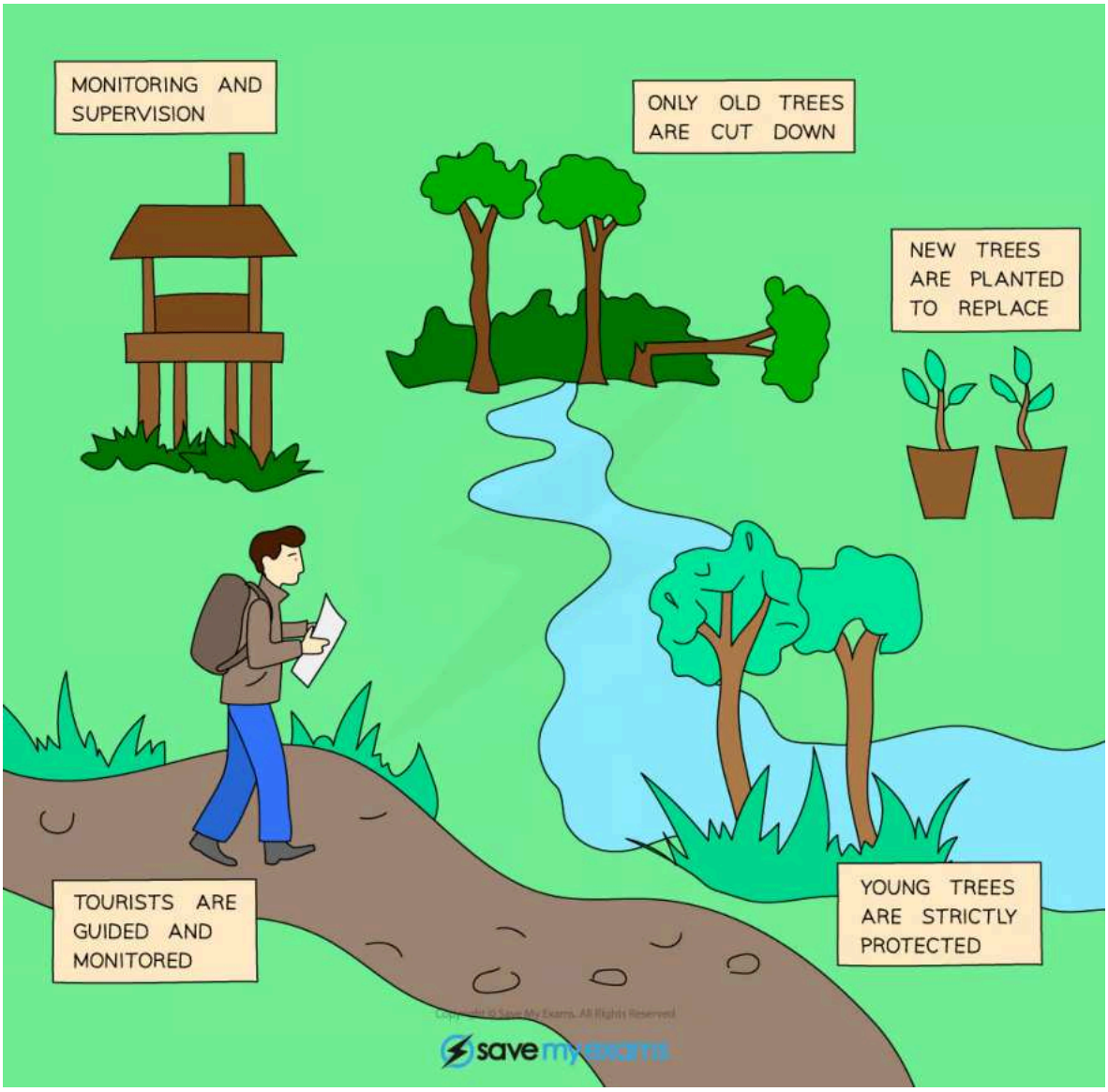
- **Forest management**:
  - Implementing sustainable forestry practices, e.g. selective logging, reforestation and maintaining biodiversity
  - This preserves the integrity of forest ecosystems
  - This ensures continued provision of timber, non-timber forest products and ecosystem services



Sustainable forestry

- **Fisheries management**:

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- Strategies can help maintain fish populations at sustainable levels
- This allows for continued fishing activities and the preservation of marine biodiversity
- These include:
  - Setting catch limits
  - Implementing seasonal fishing restrictions
  - Establishing marine protected areas

- **Renewable energy**:
  - Harnessing renewable energy sources such as solar, wind and hydroelectric power
  - This helps reduce reliance on fossil fuels and minimises environmental impacts, providing a sustainable energy alternative


Your notes

Unsustainable use of renewable natural capital

- **Deforestation**:
  - Examples of unsustainable use include:
    - Unsustainable logging practices
    - Large-scale conversion of forests for agriculture or infrastructure development
  - Clearing forests at a rate faster than their regeneration can contribute to:
    - Habitat loss
    - Soil erosion and desertification
    - Climate change

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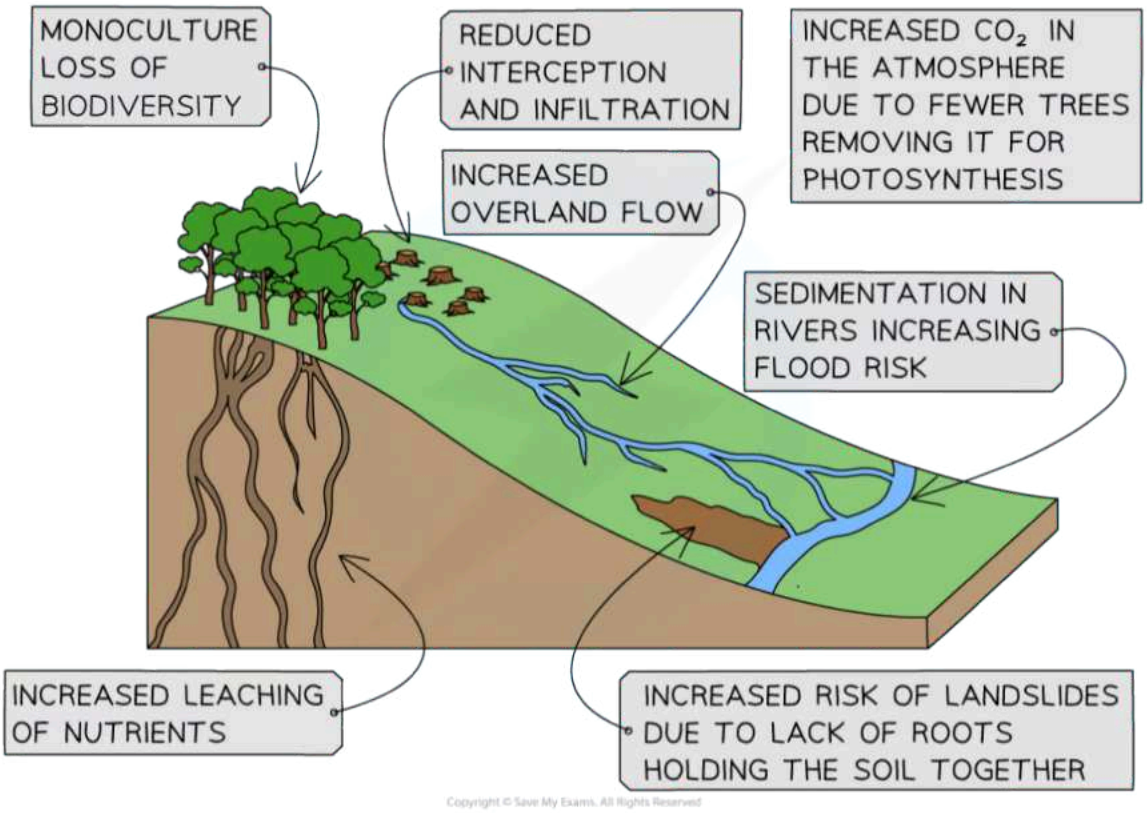

Environmental impacts of deforestation

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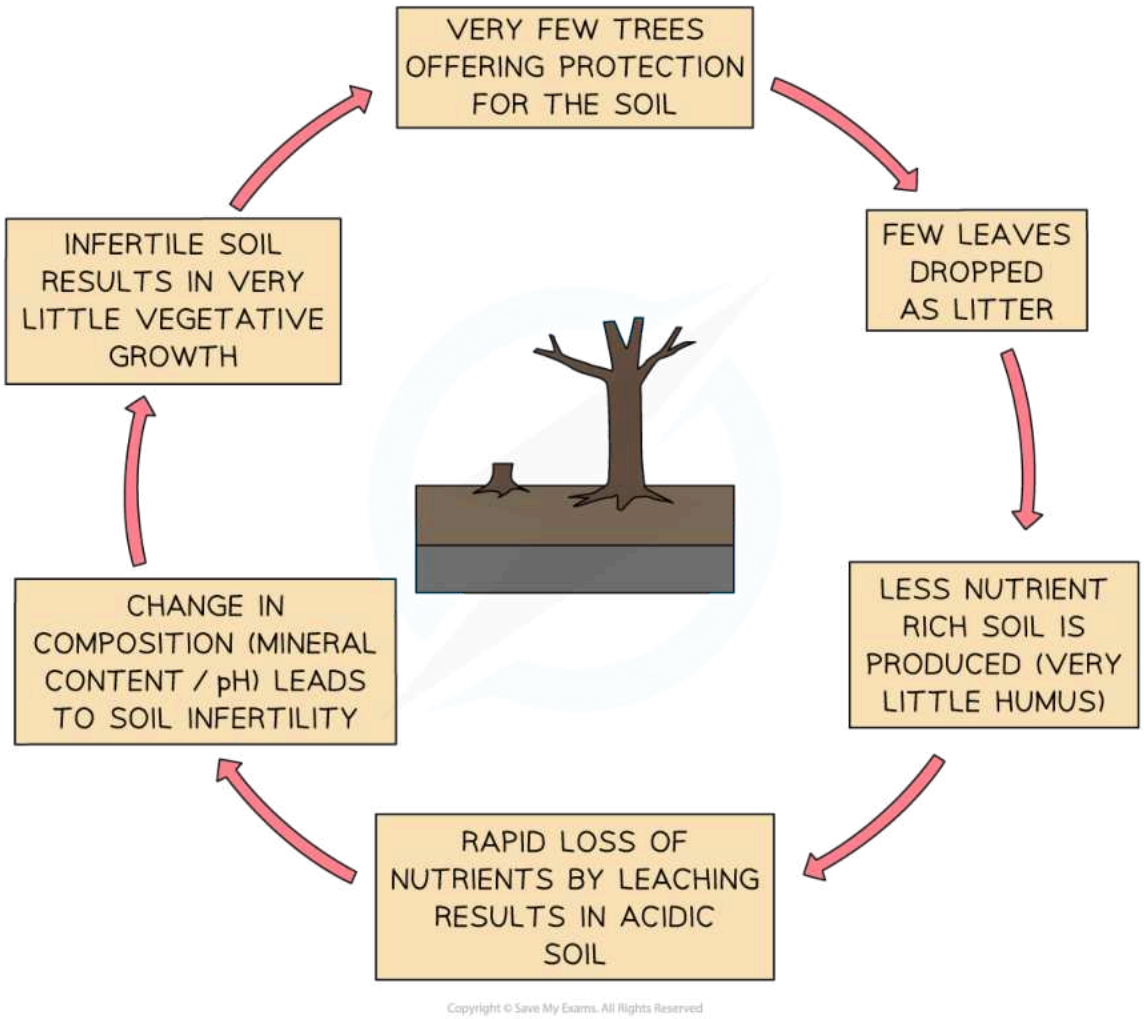

Effects of deforestation on the nutrient cycle

- **Overfishing**:
  - Excessive fishing beyond the natural reproduction rate of fish populations can:
    - Depleted fish stocks
    - Disrupt marine ecosystems
    - Impact the livelihoods of fishing communities
- **Water extraction**:
  - Excessive withdrawal of groundwater from aquifers can result in:

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- Freshwater depletion
- Saltwater intrusion
- Long-term water scarcity

- When water is used beyond its natural replenishment rate, it becomes unsustainable


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Resource Security & Choices

Resource security

- Resource security is the ability of societies to ensure long-term availability of sufficient natural resources to meet demand
  - Key natural resources include water, food, energy and raw materials

Importance of resource security

- Ensures stable supply to meet current and future needs
- Prevents resource conflicts
- Supports sustainable development

Case Study

Resource security in contrasting societies

Example 1: Food security in the United States

- The US is a high-income country with advanced agricultural technology
- Factors contributing to food security:
  - **Economic:** high investment in agricultural research and development
  - **Technological:** use of GMOs and advanced irrigation systems
  - **Political:** government subsidies and support for farmers
  - **Environmental:** diverse climate allows a variety of crops

Example 2: Water security in Ethiopia

- Ethiopia is a low-income country with challenges in water accessibility
- Factors affecting water security:
  - **Economic:** limited funds for water infrastructure
  - **Geographical:** arid regions with irregular rainfall
  - **Political:** dependency on upstream countries for water sources
  - **Technological:** lack of advanced water purification and distribution systems

Factors affecting resource choices

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- Various factors influence how societies choose to use natural resources
  - These factors include economic, sociocultural, political, environmental, geographical, technological and historical considerations
- Economic factors:
  - **Cost and availability:** resources that are cheaper and readily available are preferred
  - **Market demand:** high demand for certain resources drives their usage
- Sociocultural factors:
  - **Cultural preferences:** traditional foods and materials influence resource choices
  - **Population growth:** increased population raises resource demand
- Political factors:
  - **Government policies:** regulations and subsidies affect resource use
  - **International relations:** trade agreements and conflicts influence resource access
- Environmental factors:
  - **Sustainability:** focus on using resources that do not harm the environment
  - **Climate change:** affects the availability and viability of certain resources
- Geographical factors:
  - **Resource distribution:** proximity to natural resources affects their use
  - **Natural disasters:** areas with more frequent disasters may have limited resource choices
- Technological factors:
  - **Innovation:** advances in technology can create new resources, enable resource extraction or improve resource use efficiency
  - **Infrastructure:** availability of technology and infrastructure influences resource use
- Historical factors:
  - **Historical usage:** long-term use of certain resources can establish dependency
  - **Colonial history:** past exploitation can affect current resource availability and control

Case Study

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Local resource choices

Example: Water conservation in Australia

- Australia has focused on water conservation due to its arid climate and frequent droughts
- Factors influencing this choice:
  - **Economic:** efficient water use reduces costs for agriculture and urban areas
  - **Political:** government initiatives promote water-saving measures and infrastructure
  - **Environmental:** conservation efforts aim to protect water ecosystems and ensure sustainable water supply
  - **Technological:** advances in irrigation technology and water recycling improve water efficiency and availability


Your notes

Impact of international agreements on resource choices

- International agreements, like the Paris Agreement, aim to reduce greenhouse gas (GHG) emissions
- Different countries have set varied dates for achieving carbon neutrality (also know as net zero)
  - These targets are crucial for meeting global climate goals
  - They influence the resource choices of countries
- **Net zero emissions goals:**
  - Encourage use of renewable energy over fossil fuels
  - Promote sustainable agricultural practices to reduce carbon footprint
  - Influence local and national policies to align with global sustainability targets

Case Study

Changing resource choices

Example 1: Renewable energy in Germany

- Germany aims to reach net zero greenhouse gas emissions by 2045
- This goal is part of their wider efforts to combat climate change and transition towards a more sustainable energy system
- As a result, Germany is prioritising renewable energy, especially wind and solar
- Factors influencing this choice:
  - **Economic:** investment in renewable infrastructure creates jobs and reduces energy import costs

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- **Political:** government policies and subsidies support renewable energy
- **Environmental:** reducing reliance on coal and nuclear power to lower carbon emissions
- **Technological:** advanced technology makes renewable energy more efficient and reliable

Example 2: Electric vehicles in Norway

- Norway has prioritised the adoption of electric vehicles (EVs) to achieve its carbon neutrality goals and align with international climate agreements
- This is directly impacting its choices regarding natural resource use
- Factors influencing this choice:
  - **Economic:** significant incentives and tax exemptions for EV buyers reduce overall costs and encourage adoption, reducing the country's reliance on fossil fuels
  - **Political:** strong government support and policies favour EV infrastructure, such as widespread charging stations, encouraging a shift from oil and gas to renewable energy sources
  - **Environmental:** transitioning to EVs helps reduce greenhouse gas emissions, contributing to Norway's net zero targets
  - **Technological:** advancements in EV technology, including battery life and charging speed, make EVs more practical and attractive

Examiner Tips and Tricks

Focus on understanding how various factors might influence resource choices across different countries, especially if they are different parts of the world or are at different stages of development.

You don't need to memorise the case studies given here, but be prepared to discuss real-world examples that demonstrate how resource security differs between nations and why certain factors influence resource choices.


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Use of Natural Capital (HL)

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Management & Intervention Strategies for Use of Natural Capital

- **Natural capital** refers to the world's **natural resources** and **ecosystems**, as well as the **services** they provide
- Sustainable management of natural capital is crucial for balancing human needs with environmental conservation

Government management of natural capital

National action plans

- Governments develop action plans to meet **Sustainable Development Goals (SDGs)**:
  - For example, the UK's 25-Year Environment Plan (published in 2018) includes actions to:
    - Improve air quality
    - Restore habitats
    - Reduce waste
  - India's National Action Plan on Climate Change (NAPCC) focuses on renewable energy and water conservation

Government interventions

Reducing or stopping use of natural capital

- Strategies include **taxes**, **fines**, and **legislation** to limit unsustainable practices:
  - **Carbon taxes** increase the cost of fossil fuels to reduce their use
  - **Emission restrictions** encourage industries to lower greenhouse gas outputs
    - e.g. the EU Emissions Trading Scheme (EU ETS

Encouraging sustainable use of natural capital

- Governments promote alternatives to traditional resource use through:
  - **Subsidies**:
    - Subsidising **renewable energy** sources like solar and wind power

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- Financial support and incentives for **sustainable farming practices**

- **Legislation**:
  - Laws banning single-use plastics
  - Requiring green building standards, e.g. LEED certification
- **Publicity campaigns**:
  - Awareness campaigns, e.g. UK's "Love Food, Hate Waste" initiative
- **Research and education**:
  - Investment in innovative technologies like:
    - **Carbon-storing concrete** that absorbs CO_2 during production
    - **Recyclable wind turbines** that can be recycled when parts become old and need replacing, reducing waste
    - **Biological ammonia production**, replacing the energy-intensive Haber process

Your notes

The role of NGOs, local communities, and social movements

Campaigns and advocacy

- NGOs and social movements **raise awareness** and **drive societal change**
  - **Greenpeace** campaigns against deforestation and overfishing
  - **Extinction Rebellion** and **Just Stop Oil** highlight climate change urgency through peaceful protests

Local community actions

- Communities can introduce small-scale sustainable practices, such as:
  - Recycling programmes that reduce waste and conserve materials
  - Urban gardening initiatives that enhance green spaces and local food production

Social media influence

- Social media platforms **amplify messages** and **mobilise public action**
  - Viral campaigns can encourage individual responsibility, e.g. #PlasticFreeChallenge

Examiner Tips and Tricks

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To get top marks on some questions about natural capital, you need to be ready to give specific examples of successful management strategies. You could use some of the examples provided here or do some of your own research!


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SDGs & Sustainable Resource Management

- The **Sustainable Development Goals (SDGs)** are a set of 17 goals adopted by the **United Nations** in 2015
  - They aim to balance environmental, social, and economic sustainability
  - These goals apply to all member countries and require global partnership
- SDGs relevant to natural resource management include:
  - **Goal 6: Clean Water and Sanitation**
    - Promotes sustainable water use and equitable access
  - **Goal 7: Affordable and Clean Energy**
    - Focuses on renewable energy and energy efficiency
  - **Goal 12: Responsible Consumption and Production**
    - Encourages sustainable resource use and waste reduction
  - **Goal 13: Climate Action**
    - Aims to reduce greenhouse gas emissions and mitigate climate change
  - **Goal 15: Life on Land**
    - Supports conservation and sustainable use of terrestrial ecosystems

Sustainable resource management

Water management

- Sustainable water use is critical for human and ecosystem health
  - Examples include:
    - Water recycling
    - Rainwater harvesting
    - Improving irrigation systems

Energy management

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- Shifting from fossil fuels to renewable energy reduces environmental degradation
  - Includes solar, wind, hydro, and geothermal energy sources


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Waste management

- Responsible consumption and production aim to **minimise waste** and **maximise recycling**
  - Encourages circular economy practices where waste is reused as raw material

Forest and land conservation

- Sustainable forestry and land use prevent soil degradation and biodiversity loss
  - Examples include:
    - Afforestation
    - Rewilding
    - Sustainable agriculture

Examiner Tips and Tricks

Although **detailed knowledge** of each sustainable development goal is **not required**, you should be able to link on or two of the goals to specific resource management examples. **SDG 12** is probably the most relevant goal that links to sustainable resource management.

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Environmental Impact Assessments (EIAs)

- An Environmental Impact Assessment (EIA) is a systematic process for evaluating the potential **environmental**, **social** and **economic impacts** and **sustainability** of a proposed **development project**
- The purpose of an EIA is to:
  - Identify and evaluate the potential impacts of the project on the environment
  - Develop **strategies** to **mitigate** or avoid those impacts
- EIAs are used to:
  - Inform decision-making by government agencies, developers, and other stakeholders
  - Ensure **sustainable resource management** in development projects

Steps in EIAs

- The EIA process typically involves the following steps:

1. **Scoping:**
   - Defining the scope of the EIA
   - Identifying the key issues to be addressed
2. **Baseline studies:**
   - Collecting data on the **existing environment**
   - The purpose of a baseline study is to understand the physical and biological environment **before** the project begins
   - This ensures the project can be monitored **throughout** and **after** the development
   - A number of **variables** should be measured as part of the baseline study, including:
     - **Habitat type** and **abundance**: the total area of each habitat type should be recorded
     - **Species list**: the number of species (flora and fauna) present should be noted
     - **Species diversity**: the abundance of each species should be estimated and the diversity of the community should be calculated
     - List of **endangered species** present
     - **Land use**: the type of land use and its coverage should be assessed

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- **Hydrology**: the hydrological conditions in terms of volume, discharge, flows, and water quality should be evaluated
- **Human population**: the current population should be assessed
- **Soil**: the quality, fertility, and pH of the soil should be examined

3. **Impact assessment:**
   - Evaluating the potential impacts of the project on the environment, including both **direct** and **indirect** impacts
4. **Mitigation measures:**
   - Developing strategies to mitigate or avoid the potential environmental impacts of the project
5. **Public consultation:**
   - Engaging with stakeholders and the public to gather feedback and input on the proposed project and the EIA
6. **Review and approval:**
   - Reviewing and approving the EIA by relevant authorities, such as government agencies or regulatory bodies
7. **Audits and continued monitoring after project completion**


Your notes

Projects requiring EIAs

- 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

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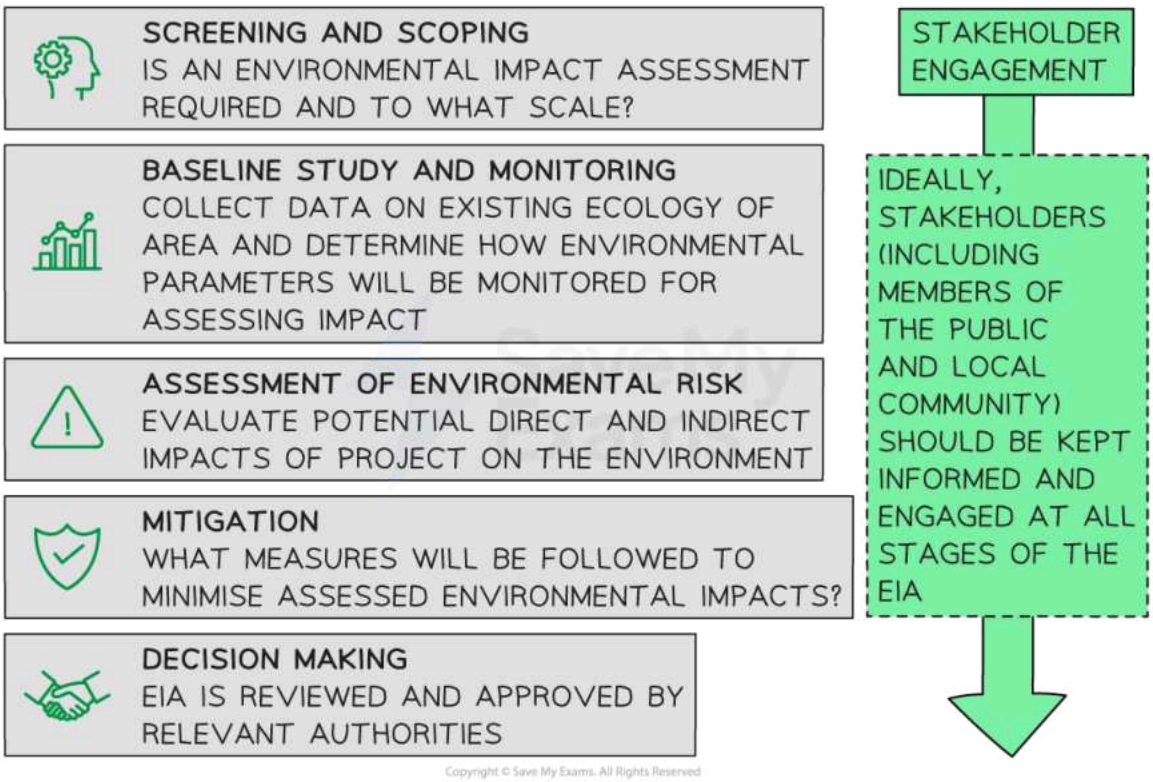

The main stages of an Environmental Impact Assessment (EIA)

Your notes

Variations in EIA Guidelines

- EIA guidelines differ between countries and regions based on factors such as **legislation**, **environmental priorities**, **economic development** and **availability of resources**

Key differences in EIA guidelines

- **Regulatory frameworks:**
  - Some countries enforce **strict legal requirements** (e.g. the European Union's EIA Directive)
  - Others may rely on **voluntary** or **less detailed frameworks**, especially in developing nations
- **Scope of assessment:**
  - **Wider scopes** include **social**, **cultural**, and **economic** impacts (in addition to environmental impacts)
  - In contrast, some EIA guidelines may only require a **narrow focus,** e.g. on ecological parameters
- **Public involvement:**

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- Guidelines vary in requiring **stakeholder consultations**
- For example , the Aarhus Convention (Europe) ensures public access to EIA information and participation
- In China, EIAs are required by law but are often criticised for limited public involvement

- **Mitigation strategies:**
  - Guidelines often require **detailed plans** to reduce harmful impacts
  - However, standards for these mitigation plans **vary widely** across countries and regions


Your notes

Public Involvement in EIAs

- Involving stakeholders ensures **transparency** and **fairness** in decision-making
- Local communities can provide **valuable insights** about potential environmental and social impacts
- Engaging the public **builds trust** and increases the likelihood of local people **accepting** a development project

Methods of public participation

- **Public hearings:**
  - Stakeholders attend meetings to express **concerns** or **support**
- **Consultation periods:**
  - Authorities invite written feedback during specific phases of the EIA process
- **Access to documents:**
  - Publishing EIA reports online or in public offices allows interested members of the public to access the relevant information

Benefits of public involvement

- **Improves decision-making:**
  - Local knowledge can identify overlooked risks (e.g. impacts on rare or endemic species)
- **Reduces conflict:**
  - Early involvement can prevent disputes
  - This saves time and resources
- **Promotes accountability:**
  - Public oversight of the process encourages compliance with regulations

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Challenges of public involvement


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- **Limited access:**
  - In some regions, communities may lack information about EIA processes or reports
  - This may be due to less strict EIA frameworks in certain countries
- **Unequal representation:**
  - Marginalised groups may not have the resources or platforms to participate effectively in the EIA process
- **Conflicts of interest:**
  - Developers may resist changes suggested by the public due to **cost concerns**

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Unsustainable Use of Renewable Resources (HL)

Your notes

Unsustainable Resource Extraction

- Even if a given resource is **renewable**, the way it is **extracted**, **harvested**, **transported** and **processed** may be **unsustainable**
  - Resource extraction is unsustainable when it:
    - Damages ecosystems
    - Depletes resources faster than they regenerate
    - Harms communities and economies
- **Key activities involved**:
  - Extraction or harvesting (e.g. mining, logging)
  - Transportation (e.g. emissions from shipping)
  - Processing (e.g. industrial pollution, energy consumption)

Examples of unsustainable resource extraction

Timber harvesting

- **Problems**:
  - Deforestation reduces biodiversity and disrupts carbon storage
  - Clear-cutting damages soil, leading to erosion and desertification
  - Illegal logging undermines sustainable forestry practices
- **Example**:
  - The Amazon rainforest suffers from large-scale deforestation for agriculture and timber
  - Indonesia faces habitat loss for species like the orangutan due to logging and palm oil plantations

Overfishing

- **Problems**:
  - Fish stocks are depleted faster than they can recover
  - Destructive fishing methods (e.g. trawling) damage marine habitats
  - Bycatch (catching non-target species) disrupts food webs

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- **Example**:
  - Cod overfishing in the North Atlantic led to the collapse of fisheries in the 1990s
  - The Great Barrier Reef on the north-east coast of Australia suffers from pressures due to unsustainable fishing and coral damage


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Mining

- **Problems**:
  - Habitat destruction and pollution from toxic mining waste
  - High energy consumption contributes to greenhouse gas emissions
  - Displacement of local communities
- **Example**:
  - The Congo experiences environmental degradation and human rights issues due to cobalt mining for electronics

Hydropower development

- **Problems**:
  - Dams disrupt river ecosystems and fish migration
  - Flooding upstream affects habitats and displaces communities
- **Example**:
  - The Three Gorges Dam in China displaced over a million people and caused widespread habitat loss

Examiner Tips and Tricks

Renewable does not always mean sustainable. You need to be able to **differentiate** between these two concepts. For example, a renewable resource can still be unsustainably managed (e.g. overfishing).

Excessive Consumption

- Excessive consumption refers to using resources **faster than they can regenerate**
  - This leads to environmental degradation and resource depletion
- **Key issue**: economic interests often promote **short-term gains**

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- Economies often focus on high production and consumption rates without considering **long-term sustainability**

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Impacts of excessive consumption

- Impacts include:
  - **Resource depletion**
    - Finite resources like fossil fuels, minerals, and freshwater are consumed unsustainably
  - **Environmental degradation**
    - Excessive production creates waste, polluting air, water, and soil
  - **Loss of biodiversity**
    - Overconsumption of resources like fish and timber destroys habitats
  - **Climate change**
    - High levels of consumption and production drive greenhouse gas emissions

Case Study

Whaling as an example of excessive consumption

- Whaling is a clear example of how excessive resource consumption can lead to severe environmental, ecological, and economic consequences

Historical context

- **Industrial-scale whaling**:
  - Began in the 19th century, driven by demand for whale oil, which was used for lighting, lubrication, and soap
- **Species impacted**:
  - Blue whales, humpbacks, and sperm whales were hunted to **near extinction**
- **Peak exploitation**:
  - By the mid-20th century, technological advancements in whaling ships and harpoons allowed for **unsustainable levels of hunting**

Environmental impacts

- **Population collapse**:
  - Overhunting caused dramatic declines in whale populations

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- **Ecosystem imbalance**:
  - Whales play a key role in marine ecosystems:
    - Their faeces fertilise ocean waters, promoting the growth of phytoplankton, which absorbs carbon dioxide
    - Whale population decline disrupts food chains, affecting other marine species

Socioeconomic impacts

- **Collapse of whaling economies**:
  - Communities reliant on whaling e.g. Japan and Norway, faced economic difficulties when populations became too depleted to sustain hunting
- **Global bans and conservation**:
  - The 1986 moratorium by the International Whaling Commission (IWC) **banned commercial whaling**
  - However, loopholes for "scientific research" and "cultural hunting" are still exploited

Current challenges

- **Illegal whaling**:
  - Some countries, like Japan, Iceland, and Norway, continue whaling under **controversial exemptions**
- **Threats from other human activities**:
  - Climate change and ocean pollution now threaten whale recovery
  - Collisions with ships and entanglement in fishing gear are additional pressures

Sustainable solutions

- **Ecotourism**:
  - Whale-watching industries, like those in Australia and Canada, offer **sustainable economic alternatives**
- **International cooperation**:
  - Organisations such as the IWC and NGOs like Greenpeace work to protect whales through monitoring and activism
- **Marine conservation zones**:
  - Establishing protected areas allows whale populations to recover


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Economic drivers of excessive consumption

Short-term economic gains

- **Focus on profit**: industries prioritise immediate economic benefits over sustainability

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- E.g. fast fashion promotes cheap, disposable clothing, creating waste and overusing resources

Advertising and consumer culture

- **Encourages demand**: media and advertising promote consumption as a lifestyle, encouraging overuse
  - E.g. marketing campaigns for new smartphones and seasonal trends encourage resource-intensive production


Your notes

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