AQA Geography A-level

3.1.6: Ecosystems Under Stress

Essential Notes

Ecosystems and Sustainability

Biodiversity can be defined as a **large variety** of both **plant** and **animal** life, creating a **diverse** environment. A biodiverse environment is considered **favourable** as it provides **resources** for both humans and the ecosystem.

Biodiversity can be split in to:

- **Genetic Diversity:** **Variety** within species **populations**, **chromosomes** and **nucleotides**.
- **Species Diversity:** Considers **kingdoms, phyla, families, individuals** and **genera**. Linked to species richness and number.
- **Ecosystem Diversity:** **Biomes**, **bioregions**, landscapes, niches and habitats are involved.

Globally, biodiversity richness is greatest in the **Southern Hemisphere.** Australia is dry but has **rainforest habitats** and **endemic species**.

Endemic species are those which are **specifically adapted to a particular environment**. For example, the **Canna Mouse** is an endemic species adapted to the **British Isles** environment.

Generally, **animal biodiversity** is greater when **plant diversity is high** as there are more **niches** (the 'role' of a certain species in the ecosystem) for organisms to fill.

The **top five countries** in the Biodiversity Index are in or around the Equator and Tropics. **Tropical rainforests cover 7% of the planet** and have over ½ the earth's species. These areas are the most diverse with the greatest number of plant species, supporting insects, birds and mammals.

Biodiversity and Humans

Biodiversity **hotspots** are areas which have a **rich biodiversity** but are threatened with **destruction**, usually from **human activities** such as **farming** and **deforestation**.

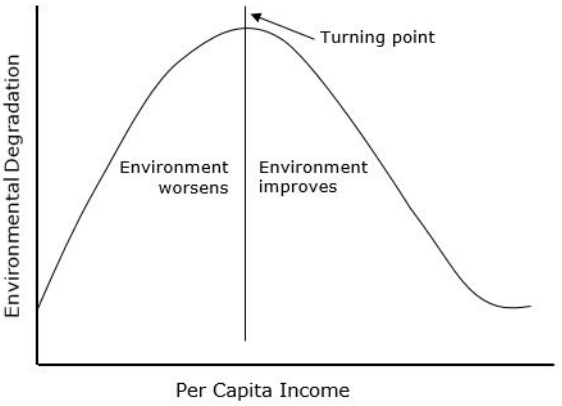
Hotspots contain **huge numbers of species**, a large percentage being **endemic**. Examples include **The Atlantic Forest** and **Fynbos in South Africa**.

Biodiversity has **direct values**, **indirect values** and **regulating services**. Biodiversity provides **food, fuel and medicine** along with assisting in **soil formation**, **food chains**, **nutrient cycling** and **environmental stability**.

However, biodiversity is declining globally due to **hunting**, **industrial pollution**, **poor conservation**, **poor farming techniques** and **disturbance**. This will greatly impact **human wellbeing**, **ecosystem processes** and **energy flows**.

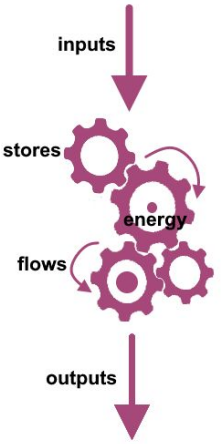
Human population and economy growth becomes problematic as it can **potentially destroy biodiversity** which is unsustainable.

Nonetheless, according to **Kuznets curve**, as **economic development increases**, environment management **improves**. Perhaps this is why developed nations such as the UK are more conscious about their **environmental impacts** (for example there are regulations on carbon emissions, taxations etc.). As global growth continues to occur, more nations will become wealthier; thus becoming **more aware of their environmental footprints**.



Ecosystems and Processes

An **ecosystem** is a **system** which includes **living** (e.g. plants) and **non-living** (e.g. soil) **components**. It has **inputs** (such as solar energy), **outputs** (such as nutrients) **trophic levels, food chains and food webs**.



Biomass is the term given to the total **quantity or weight** of an **organism** in a given **area or volume**.
Primary production is the **rate** at which all the **plants in an ecosystem** produce chemical energy. **Net primary production** is the **useful chemical energy produced**.

Nutrient Cycling

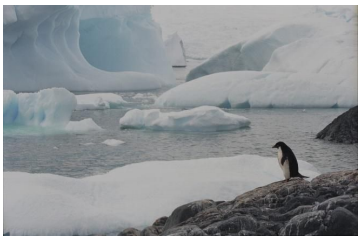
Nutrient Cycling is just one **process** happening in an ecosystem:

- Energy moves in a **linear pattern** whilst nutrients are recycled - decomposing organisms **give minerals back to living matter**.
- Nutrient cycling is **faster in warmer climates** of the Tropics whilst **nitrate fertilisers** increase nutrients.
- When **vegetation is removed**, it is harder for species to move back as **soil nutrients are gone**. The soil is also **vulnerable to erosion** if nutrients are missing.

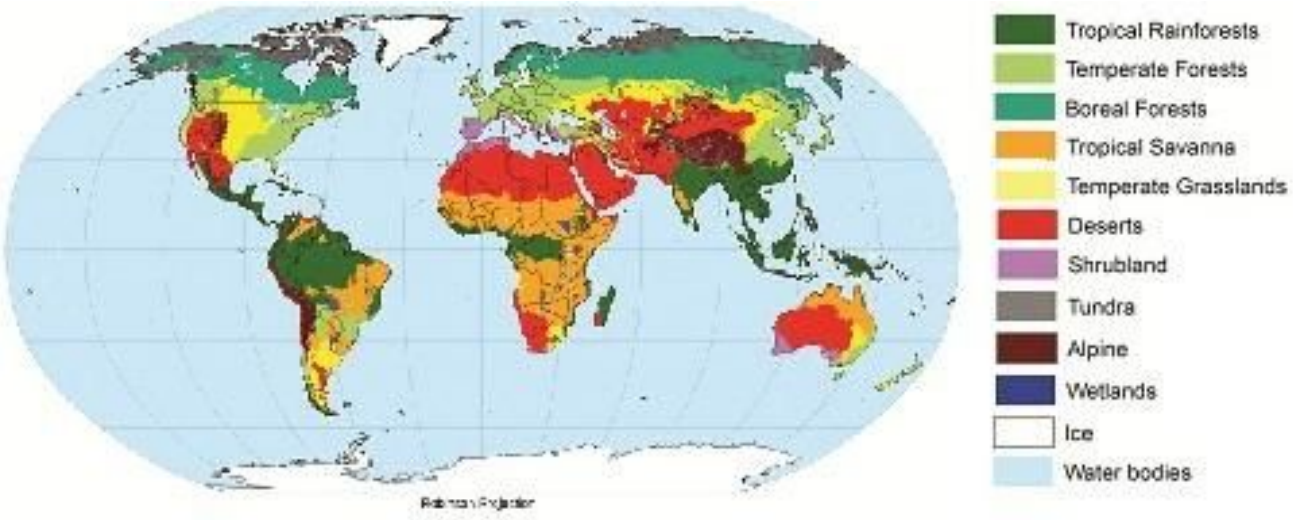
Changing Ecosystems

Factors influencing the changing of ecosystems include:

- **Climate Change:** **Sea level rise** and **species migration** will mean they are unable to **adapt to changing environments**. Climate change is both **anthropogenic and natural**.
- **Habitat Destruction:** Linked to **human overpopulation** and economy growth, leading to **deforestation** and a reduction in **biodiversity**.
- **Habitat Fragmentation:** Small pockets of natural systems **isolated** around human activity.
- **Overexploitation:** Illegal and institutional systems that exploit **unsustainably** and use resources without replacing.
- **Alien Species:** Introduced to where they have few predators, can **out-compete** indigenous species.
- **Pollution:** Leads to **acid rain** due to fertiliser use and contamination.
- **Disease:** Higher population densities will mean that there is a **quicker spread of disease**. Less food to maintain health.



Biomes



A biome is a **large naturally occurring community** of **flora and fauna** occupying a major habitat, such as a **forest** or **tundra**. They are identified according to their climate, relief, geology, soils and vegetation.

Biomes are identified with **patterns of ecological succession** and **climax vegetation**. The global map of biomes shows the British Isles as a zone of Temperate Deciduous Forest. These types of biomes contain trees that lose their leaves and are found across Europe and the USA, having mild and wet weather with a temperate maritime climate. Deciduous trees are thus favoured by the UK's moist maritime climate.

Different biomes have different characteristics:

- **Tropical Forests:** These are found **near the equator** in Central and South America, parts of Africa and Asia. They are **hot and humid** and contain almost half of all the world's species. The trees are mainly **hardwood** and the climate is **equatorial**.
- **Savannah:** These tropical **grasslands** are **hot and dry**, dominated by **grass, scrub and trees**. They feature two seasons, dry and rainy, and are found in central Africa, northern Australia and central South America.
- **Desert:** This is the **driest** and **hottest biome**. The world's largest desert is the **Sahara**.
- **Mediterranean:** Climates here are neither **too hot nor cold**. They are found around the Mediterranean Sea, near Cape Town in South Africa and in Australia.

Marine Ecosystems

Coral reef systems provide diversity, shoreline protection, food (from fishing), medicine, decoration, construction and provide habitats.
South East Asia has **30%** of the world's coral reefs and 700/1000 coral species.
Coral reefs are found in **shallow seas** with temperatures of 18°C. They are killed is there is too much sediment from the land.
Coral systems require **salt water** and **waves** to oxygenate. It is illegal to trade corals internationally.
Human activity is **destroying coral systems** due to pollution, onshore development, desalination, tourism, fishing and coral reefs being removed.
Additionally, **plastic sediments** (from bags and packaging) poison coral reefs systems by suffocating them. This is expected to worse in the future as human development grows.