

# Topic 9: Ecosystems and Material Cycles

Edexcel · GCSE Biology · Revision Notes  
Specification reference: 9.1–9.8

**Note:** Sections marked ★ HIGHER TIER ONLY are for Higher tier students only. Foundation tier students should focus on the unmarked sections.

## 9.1–9.3 Ecosystems and Interdependence

An ecosystem includes all organisms (community) and their non-living environment. Organisms interact through feeding relationships, competition and mutualism.

- **Biotic factors:** food availability, predators, disease, competition.
- **Abiotic factors:** temperature, light, pH, water, mineral ions.
- Predator-prey cycles: prey increases → predators increase → prey decreases → predators decrease.

Food chains show energy flow. Only ~10% of energy transfers between trophic levels. Pyramids of biomass are always pyramid-shaped.

### Key Terms

**Producer:** Organism that makes its own food through photosynthesis

**Consumer:** Organism that gets energy by eating other organisms

**Decomposer:** Organism that breaks down dead material (bacteria and fungi)

## 9.4–9.6 Material Cycles

**Carbon cycle:** CO<sub>2</sub> in atmosphere → fixed by photosynthesis → passed along food chain → returned by respiration, decomposition and combustion of fossil fuels.

**Water cycle:** Evaporation and transpiration → water vapour rises and condenses → precipitation → runoff → sea.

### Nitrogen cycle:

- N<sub>2</sub> in atmosphere fixed by nitrogen-fixing bacteria (in soil and root nodules of legumes) into ammonia.
- Nitrifying bacteria convert ammonia into nitrates.
- Plants absorb nitrates from soil.
- Animals eat plants; return nitrogen as waste (urea).
- Decomposers break down dead organisms; release ammonia.
- Denitrifying bacteria convert nitrates back into N<sub>2</sub>.

**Exam Tip:** In the nitrogen cycle, there are FOUR types of bacteria to know: nitrogen-fixing, nitrifying, decomposers and denitrifying.

## 9.7–9.8 Biodiversity and Human Impact

- Biodiversity is vital for ecosystem stability and provides food, medicines and raw materials.

- **Threats:** habitat destruction, deforestation, pollution, climate change, invasive species, overexploitation.
- **Deforestation:** destroys habitats, reduces biodiversity, releases CO<sub>2</sub>, reduces water cycling.
- **Global warming:** CO<sub>2</sub> and methane trap heat → rising temperatures, ice melt, rising sea levels, species migration/extinction.
- **Eutrophication:** fertiliser runoff → algal bloom → algae block light → plants die → decomposers respire → oxygen depleted → fish die.
- **Conservation:** nature reserves, breeding programmes, seed banks, international agreements, sustainable forestry, organic farming.

**Exam Tip:** Eutrophication is a chain reaction — make sure you can describe each step in order.