1. Ecosystems at different scales

- Ecosystems are places where living (biotic) and non-living (abiotic) parts interact.
- **Hedgerows** are an example of a small UK ecosystem (see separate flashcard).
- The parts of an ecosystem are all connected: change one thing (for example, remove a predator) and it affects the others.
- Nutrient cycling means that nutrients (like nitrogen) move between living things and the soil.
- There are also large, global ecosystems (biomes) such as tropical rainforests and tundra, each with their own characteristics.

2. Small-scale UK ecosystem: Hedgerow

- A hedgerow is a small UK ecosystem made up of shrubs, trees, grasses, insects, birds and small mammals.
- **Producers** include grasses, wildflowers and hawthorn or blackberry bushes. They make their own food using sunlight.
- **Consumers** feed on these plants: caterpillars, beetles, mice and rabbits. **Predators** like owls, foxes and birds of prey feed on the smaller animals.
- **Decomposers** such as fungi and worms break down dead leaves and animals, returning nutrients to the soil.
- All parts are connected through **food chains and food webs**.
- Changes such as removing a hedge, cutting it too often, or losing a species (e.g., insects) can affect the whole ecosystem.

3. Tropical rainforest ecosystems

- Tropical rainforests are hot, wet forests located near the Equator.
- They have huge biodiversity (range of species) with over 50% of the world's species.
- They have a series of layers, **forest floor**, **undercanopy**, **canopy** (where most of the life lives) and **emergents**.
- Plants and animals in rainforests adapt to different light levels, moisture, and soil conditions.
- Trees have buttress roots to stop them falling over. This is needed as they compete for light due to high biodiversity.

4. Causes of deforestation in tropical rainforests

- Deforestation happens when large areas of rainforest are cut down or burned.
- Causes include: subsistence farming (local people clear land for crops), commercial farming, logging, road building, mining, energy development, and population growth.
- The biggest cause in the Amazon is for cattle farms.
- These activities give economic benefits (jobs, income), but they also harm the environment.

3. Tropical rainforest ecosystems		**1. Ecosystems at different scales**
4. Causes of deforestation in tropical rainforests		**2. Small-scale UK ecosystem example: Hedgerow**

5. Impacts of deforestation

- **Economic impacts:** Deforestation can create jobs in logging, farming and mining.
- **Environmental impacts:** Removing trees causes soil erosion, reduces rainfall, and increases the risk of landslides.
- **Climate impacts:** Cutting trees releases carbon dioxide, contributing to global warming.
- **Biodiversity loss:** Many species lose their habitat when forests are removed. These plants and animals could hold cures for diseases we don't know about yet.

6. Managing tropical rainforests sustainably

- **Selective logging and replanting** (only taking some trees and replacing them, used in Sarawak in Malaysia).
- **Conservation and Education** (Swiss perfume company Givaudan protects 150,000ha of Venezuela to protect the tonka beans).
- **Ecotourism** - tourists pay to see the forest without destroying it, providing income to local communities. Local guides and log cabins in the forest. Biggest source of income in Costa Rica.
- **International agreements** (like the Forest Stewardship Council) help protect rainforests by restricting sale of illegal rainforest wood.
- **Debt Reduction** allows countries like Peru to reduce their debt to the USA by $25million in exchange for protecting part of their rainforest.

7. Cold environments (Polar and Tundra)

- Cold environments are places near the poles or high mountains, where it is very cold most of the year.
- These areas have permafrost (permanently frozen ground), thin soils, and plants and animals adapted to low temperatures.
- Polar areas have ice over them at all times, Tundra areas are round the edges (where people can live).
- Animals like polar bears, reindeer or arctic foxes survive by having thick fur or fat. Polar bears are camouflaged so they can hunt seals, and have big paws for swimming.
- Bearberry plants grow low to the ground to avoid the wind and have furry stems to keep in the heat.

8. Opportunities in cold environments (Svalbard)

- Svalbard has valuable **Mineral resources**, especially coal — which has long been its main industry.
- The coal is used to produce **Energy** in the only coal-fired power station left in Norway.
- **Tourism** is growing fast: almost 70,000 visit now each year.
- **Fishing** is increasing: there are 150 species of fish in the Barents sea, including Atlantic cod.
- These activities offer jobs and income for the people living in such a remote place.

7. Cold environments (Polar and Tundra)		**5. Impacts of deforestation**
8. Opportunities in cold environments (Svalbard)		**6. Managing tropical rainforests sustainably**

9. Challenges in cold environments (Svalbard) ● **Extreme temperature:** Winter temperatures can drop below **-20°C**, making life, transport, and work very hard. ● **Inaccessibility:** Svalbard is remote; the main airport is in Longyearbyen, and sea travel is limited by ice. Supplies are expensive and infrequent. ● **Provision of buildings and infrastructure:** Permafrost makes building difficult. Roads, houses, and utilities need special insulation and maintenance, increasing costs. ● These challenges make living and working in Svalbard difficult and limit population growth.		
10. Protecting cold environments ● **Use of technology:** Special insulated buildings, pipelines, and monitoring equipment help reduce environmental damage and make life possible in extreme cold. ● **Role of governments:** Countries make laws to limit mining, oil extraction, and pollution, e.g., the **Alaskan Oil Pipeline** is carefully managed to protect tundra and wildlife. ● **International agreements:** The **Antarctic Treaty** protects Antarctica from mining and military activity, keeping the environment safe. ● **Conservation groups:** Organisations manage protected areas like the **Western Arctic Wildlife Reserve**, helping conserve habitats and species. ● These strategies make cold environments more sustainable while allowing people to use resources carefully.		

		9. Challenges in cold environments (Svalbard)
		10. Protecting cold environments