Chapter 18: Biodiversity and ecosystems

Knowledge organiser

Biodiversity

Biodiversity is the variety of all the different species of organisms (plant, animal, and microorganism) on Earth, or within a specific ecosystem.

High biodiversity ensures the stability of an ecosystem, because it reduces the dependence of one species on another in the ecosystem for food or habitat maintenance.

The future of the human species depends on us maintaining a good level of biodiversity. Many human activities, such as **deforestation**, are reducing biodiversity, but only recently have measures been taken to try to prevent this.

Global warming

Levels of carbon dioxide and methane in the atmosphere are increasing due to human activity, contributing to global warming and climate change. Global warming is the gradual increase in the average temperature of the Earth.

This scientific consensus is based on systematic reviews of thousands of peer-reviewed publications.

Global warming has resulted in

- large-scale habitat change and reduction, causing decreases in biodiversity
- extreme weather and sea level changes
- migration of species to different parts of the world, affecting ecosystems
- threats to the security and availability of food.

Waste management

Rapid growth of the human population and increases in the standard of living mean humans are using more resources and producing more waste.

Waste and chemical materials need to be properly handled in order to reduce the amount of **pollution** they cause. Pollution kills plants and animals, and can accumulate in food chains, reducing biodiversity.

Pollution can occur

- in water, from sewage, fertiliser run-off, or toxic chemicals (e.g., from factories)
- in air, from smoke and acidic gases
- on land, from landfill and toxic chemicals.

Land use

Rapid population growth has led to humans using much more land for building, quarrying, farming, and dumping waste. This reduces the area in which animals can live and can further destroy habitats through pollution.

For example, the destruction of **peat bogs** (areas of partially decayed vegetation) to produce garden compost has decreased the amount of this important habitat, and the biodiversity it supports. The decay or burning of peat for energy also releases carbon dioxide into the atmosphere, contributing to **global warming**.

Deforestation

Large-scale deforestation in tropical areas has been carried out to provide land for cattle and rice fields, and to grow crops for **biofuels**.

This has resulted in

- large amounts of carbon dioxide being released into the atmosphere due to burning of trees
- extinctions and reductions in biodiversity as habitats are destroyed
- climate changes, as trees absorb carbon dioxide and release water vapour.

Farming techniques

Sustainable methods of food production need to be developed if we are going to feed the Earth's human population.

Intensive farming techniques make food production more efficient by restricting energy transfer from food animals to their environment.

This can be done by:

- limiting the movement of the animals
- controlling the temperature of their surroundings.

In order to also maximise yield from animals and crops, farmers also:

- feed animals high-protein foods to increase growth
- give animals antibiotics to prevent or treat disease
- regularly use fertilisers, herbicides, and pesticides on crops.

Sustainable fisheries

Fish stocks in the oceans are declining. It is important to maintain fish stocks to ensure breeding continues, or certain species may disappear altogether in some areas.

To avoid this happening, net sizes (bigger holes to stop young fish being caught) and fishing quotas (how many fish can be caught) are controlled in many places.

Food security

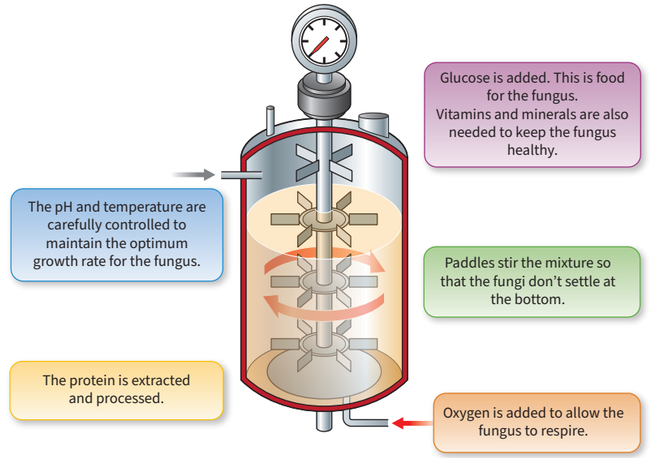
Food security is having enough food to feed a population.

Biological factors threatening human food security include:

- rapid population growth and increasing birth rate in some countries
- changing diets in developed countries, requiring scarce food resources to be transported globally
- new pests and pathogens impacting farming of vast amounts of crops
- environmental changes, such as drought, affecting food production
- increasing cost of agricultural inputs, like fertilisers
- conflicts in some parts of the world, which affect the availability of water or food.

The role of biotechnology

Scientists can use new technologies to solve the problem around food production for a growing population. The fungus *Fusarium* is used to make mycoprotein, a protein-rich alternative to meat. *Fusarium* is cultured in aerobic conditions in fermenters.



Advantages of intensive farming	Disadvantages of intensive farming
• high yield and quicker growth of crops and animals • efficient use of food, with less waste produced • can meet demand for food from a rapidly increasing population	• increased risk of antibiotic-resistant bacteria strains • pesticides and herbicides may kill beneficial organisms and reduce biodiversity • ethical issues about animal welfare and quality of life • large carbon dioxide and methane emissions

Key terms

Make sure you can write a definition for these key terms.

biodiversity *biofuel* *deforestation* *food security*
global warming *intensive farming* *peat bog* *pollution*

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Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	B18 questions	Answers
1	What is biodiversity?	the variety of all the different species of organisms on Earth, or within an ecosystem
2	What is the advantage of high biodiversity?	ensures stability of ecosystems by reducing the dependence of one species on another
3	How are humans trying to maintain biodiversity?	• breeding programmes • protection of rare habitats • reintroduction of hedgerows • reduction of deforestation and carbon dioxide emissions • recycling resources
4	Why are more resources being used, and more waste produced, by humans?	rapid growth in human population, and increase in the standard of living
5	Where does pollution occur?	water, air, and land
6	How are humans reducing the land available for other organisms?	building, quarrying, farming, and dumping waste
7	What are the negative impacts of the destruction of peat bogs?	• reduces amount of available habitat, causing decreases in biodiversity • burning or decay of peat releases carbon dioxide into the atmosphere
8	Why have humans carried out large-scale deforestation in tropical areas?	• provide land for cattle and rice fields • grow crops for biofuels
9	What is food security?	having enough food to feed a population
10	What are the biological factors threatening human food security?	• rapid population growth and increasing birth rate • new pests and pathogens • changing diets in developed countries • environmental changes • conflicts • costs of agricultural inputs
11	How can the efficiency of food production in farming be increased?	• limit movement of animals • control temperature of surroundings • feed animals high-protein foods • give animals antibiotics • regularly use fertilisers, herbicides, and pesticides
12	What gases are increasing in atmospheric levels and contributing to global warming?	carbon dioxide and methane
13	How can fish stocks be maintained at a sustainable level?	controlling net sizes and introducing fishing quotas
14	How is biotechnology used to maintain the growing human population?	• large quantities of microorganisms cultured for food, such as mycoprotein from *Fusarium* • GM bacteria producing treatments like human insulin • GM crops providing higher yields or improved nutritional values

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