

Pollution

Revision notes · The effects of sewage, fertiliser, eutrophication, plastics, methane and carbon dioxide on ecosystems and climate.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Pollution Spec 20.3

Sewage, fertiliser and eutrophication Spec 20.3.1, 20.3.4

Untreated sewage and **excess fertiliser** both contain nitrates and other ions. If they get into rivers and lakes, they harm aquatic ecosystems.

- **Untreated sewage** also contains microorganisms that cause disease and organic matter that decomposers break down using oxygen.
- **Excess fertiliser** is washed (leached) from fields by rain into streams and rivers.
- The extra ions cause water plants and algae to grow quickly. When they die, decomposers break them down and use up oxygen in the water, so fish and other aquatic organisms die.

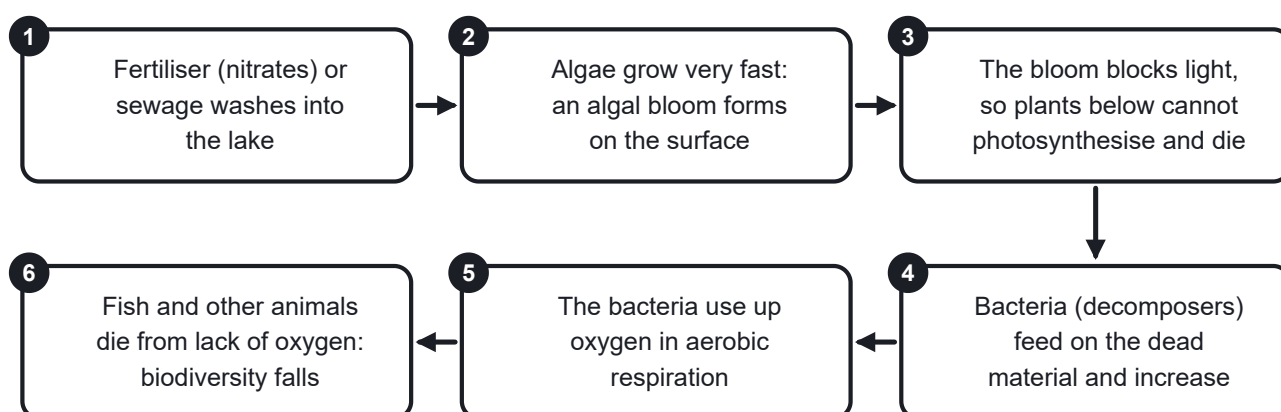
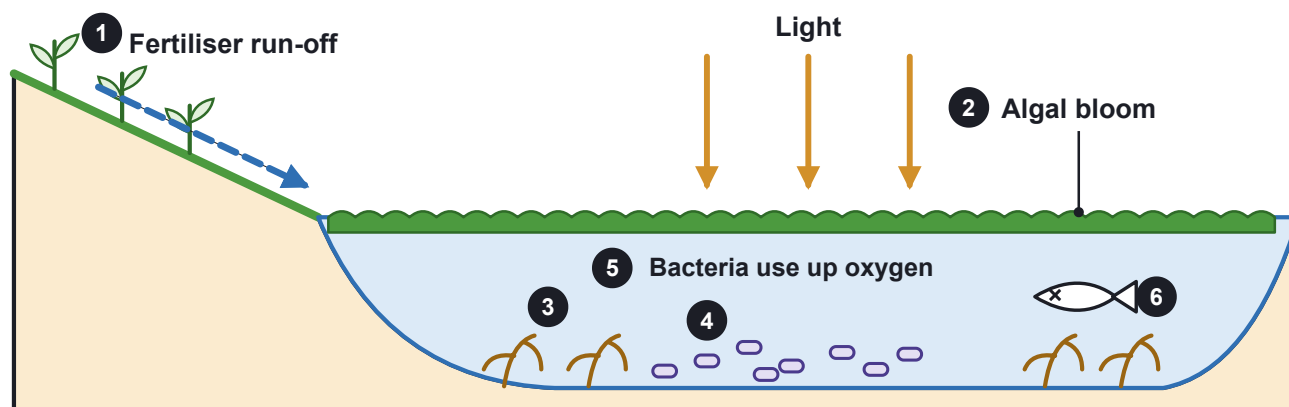
Supplement

Eutrophication

Supplement

1. Nitrate and other ions increase in availability in the water.
2. Producers (algae and water plants) grow faster, forming an algal bloom that blocks light.
3. Producers deeper in the water cannot photosynthesise and die; there is increased decomposition after their death.
4. Decomposers (bacteria) increase in number and carry out increased **aerobic respiration**.
5. The decomposers use up oxygen, so there is a reduction in **dissolved oxygen**.
6. Organisms that require dissolved oxygen, such as fish and insect larvae, die.

Supplement



Eutrophication: from fertiliser run-off to the death of fish.

Supplement

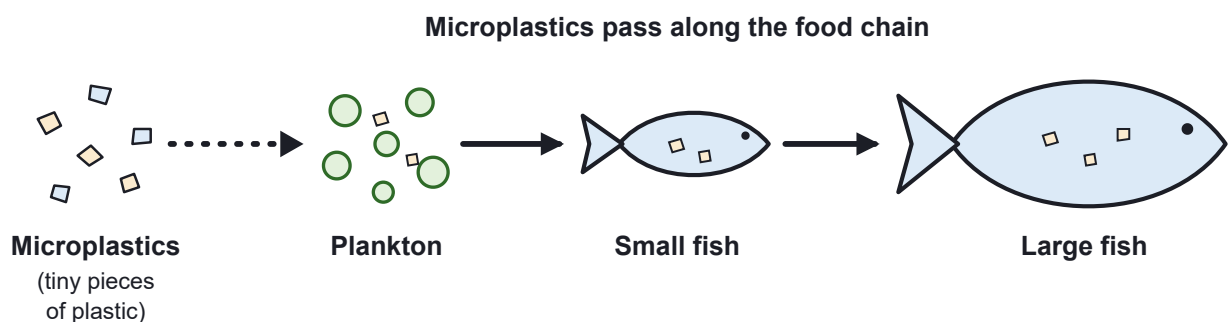
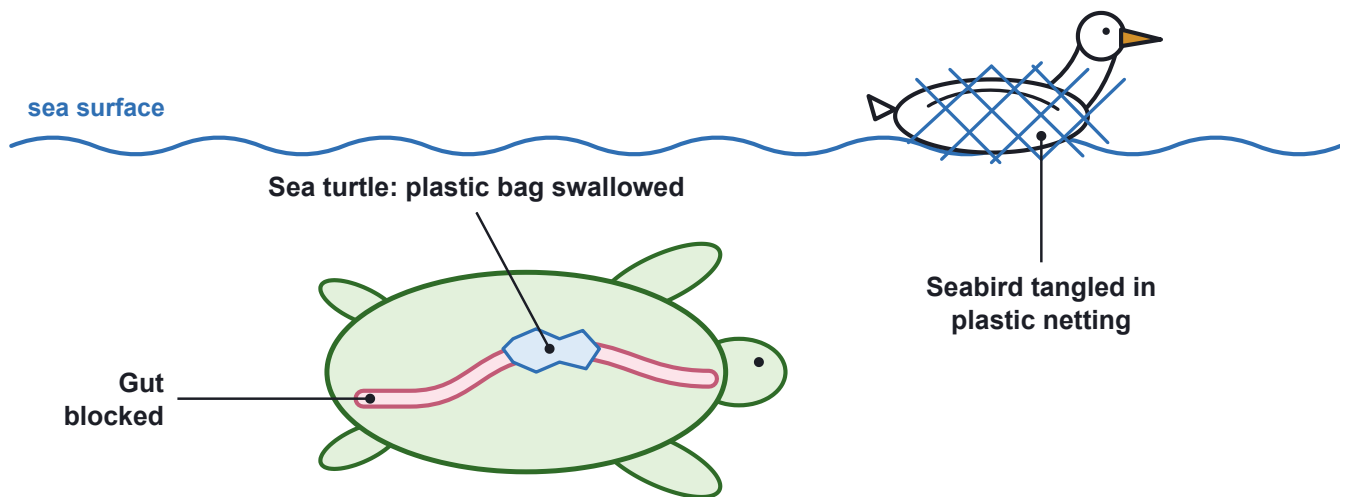
Exam tip: Do not say the algae 'use up the oxygen'. It is the decomposers' aerobic respiration, after the producers die, that lowers dissolved oxygen.

Non-biodegradable plastics Spec 20.3.2

Plastics are **non-biodegradable**: microorganisms cannot break them down, so they stay in the environment for a very long time. Plastics are widely used for packaging and are often thrown away carelessly.

Effects of non-biodegradable plastics

Ecosystem	Effects
Aquatic (rivers, seas)	Animals such as turtles, seabirds and fish swallow plastic, which can block their digestive system so they starve; animals become tangled in plastic and drown or cannot move; plastic breaks into tiny pieces that enter food chains
Terrestrial (land)	Plastic waste in landfill takes up space and does not rot; animals eat plastic or become trapped in it; plastic can build up in soil and may release harmful chemicals; plastic waste can block drains and watercourses



Plastic **blocks the gut**, **entangles** animals and enters **food chains** as microplastics.

Exam tip: Always link the plastic to a specific harm: 'blocks the gut' or 'entangles the animal', not just 'it harms animals'.

Methane, carbon dioxide and climate change Spec 20.3.3

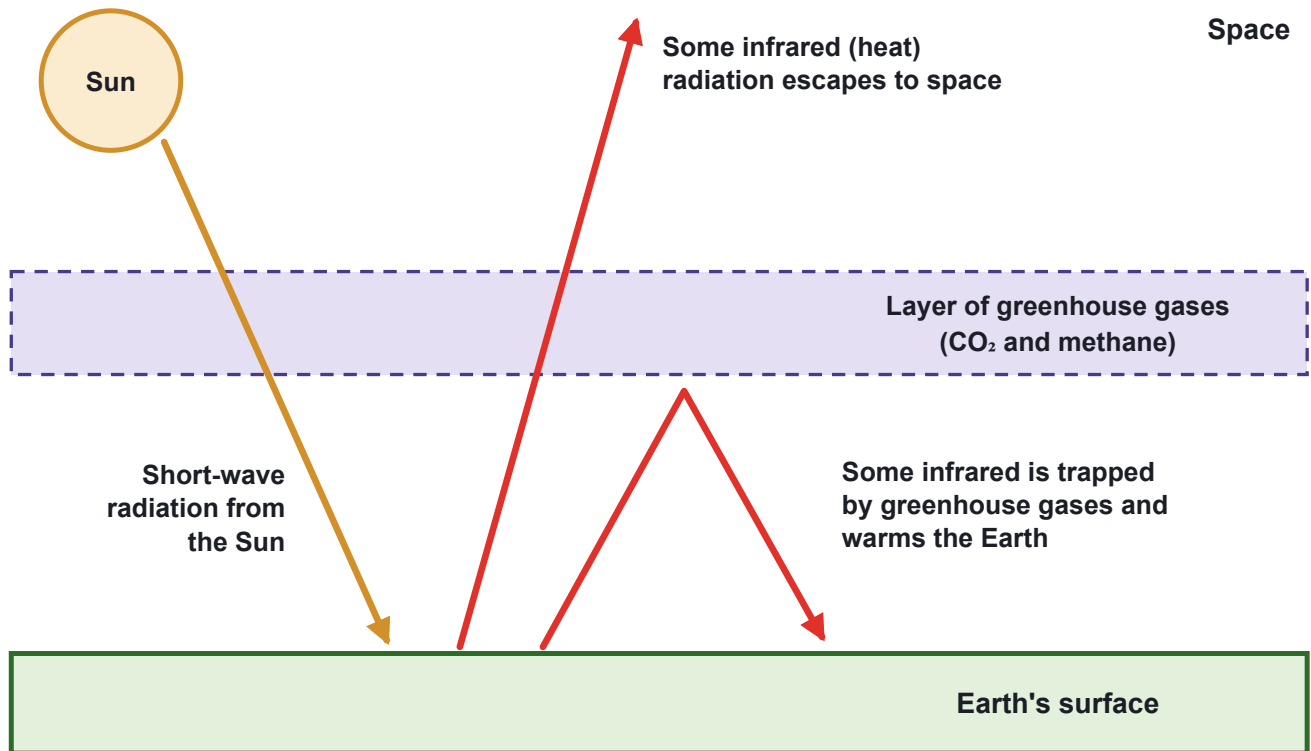
Sources of methane and carbon dioxide

Gas	Sources
Carbon dioxide	Burning fossil fuels (in vehicles, power stations and homes); burning forests; respiration of decomposers when trees decay
Methane	Cattle and other livestock (from digestion); rice paddy fields; decomposition of waste in landfill sites

The enhanced greenhouse effect

- Short-wave radiation from the Sun passes through the atmosphere and warms the Earth's surface.
- The Earth re-radiates this energy as infrared (heat) radiation.
- Greenhouse gases** such as carbon dioxide and methane trap some of this infrared radiation in the atmosphere, which keeps the Earth warm. This is the natural greenhouse effect.
- Human activities have increased the concentrations of carbon dioxide and methane, so more heat is trapped. This is the **enhanced greenhouse effect**.

The average temperature of the Earth rises (global warming). This leads to **climate change**. Effects include melting ice caps and rising sea level, changes to rainfall and weather, and loss of habitats, so some species may become endangered or extinct.



Greenhouse gases such as carbon dioxide and methane trap infrared radiation. More of these gases traps more heat.

Common mistake: The greenhouse effect is not caused by a hole in the ozone layer. These are separate issues.

Quick check

1. Why does excess fertiliser harm rivers and lakes?
2. Why do non-biodegradable plastics last so long?
3. Name two sources of methane.
4. What is the enhanced greenhouse effect?

Quick check answers

Pollution

- 1 . Nitrates cause rapid growth of algae and water plants, which can lead to eutrophication and the death of other organisms.
- 2 . Microorganisms cannot break them down.
- 3 . Cattle (livestock); rice paddy fields; landfill sites.
- 4 . Extra heat trapped in the atmosphere because human activity has raised carbon dioxide and methane levels.