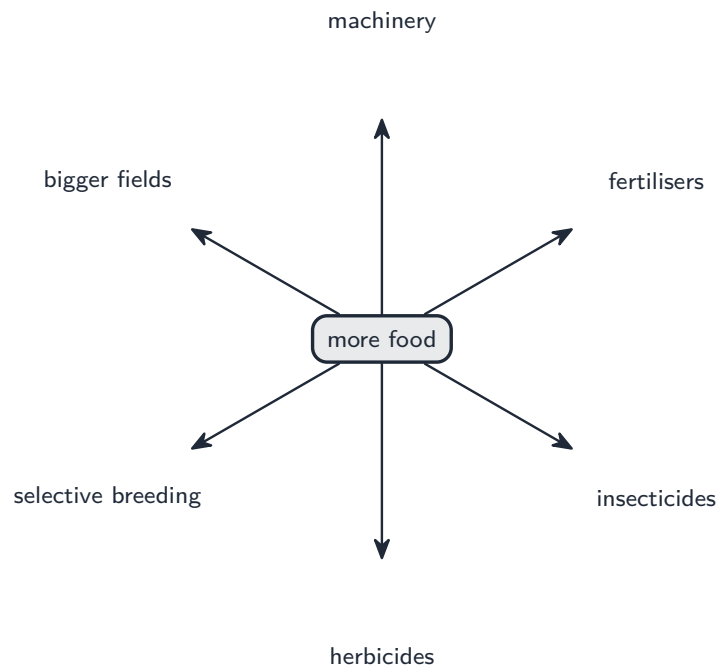


Human influences on ecosystems

IGCSE Biology

Increasing food supply

To grow more food, humans use:



Ways farmers increase food production

- **agricultural machinery** to farm larger areas of land quickly.
- chemical **fertilisers** 化肥 to improve **yields** 产量.
- **insecticides** 杀虫剂 to kill insect pests.
- **herbicides** 除草剂 to kill **weeds** 杂草 that compete with the crops.
- **selective breeding** 选择育种 to improve **crop plants** 农作物 and **livestock** 牲畜.

A **monoculture** 单一栽培 (growing one crop over a large area) gives a big, easy harvest, but one pest or disease can destroy the whole crop, and it lowers **biodiversity** 生物多样性. Intensive livestock farming (many animals in a small space) gives cheap meat, but raises worries about animal welfare and the spread of disease.

Habitat destruction



Clearing forest destroys habitats and reduces biodiversity.

Image: Radomianin, CC BY-SA 4.0 (commons.wikimedia.org)

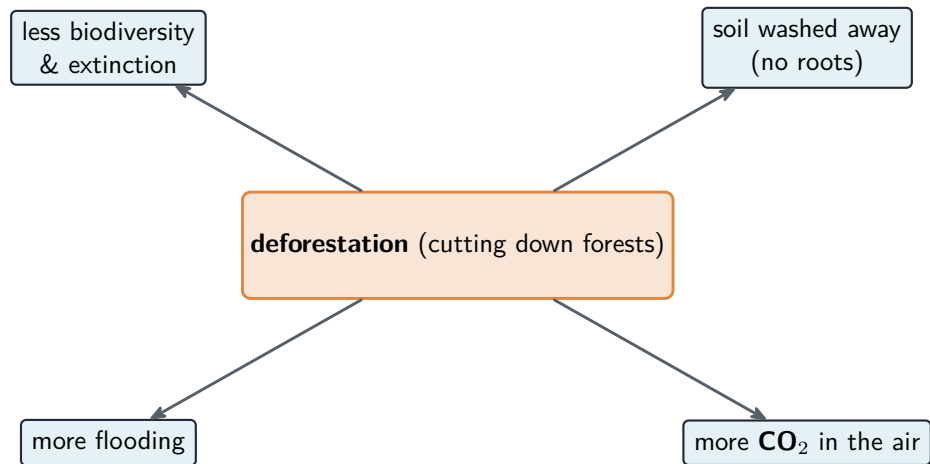
Biodiversity is the number of different **species** 物种 living in an area. Humans destroy **habitats** 栖息地 (the places where organisms live) by:

- clearing land for housing, crops and livestock.
- extracting natural **resources** 资源, such as by mining.
- **pollution** 污染 of fresh water and the sea.

By changing **food webs** 食物网 and **food chains** 食物链, humans harm habitats.

Deforestation 森林砍伐 (cutting down forests) is a major example. It causes:

- lower biodiversity and the **extinction** 灭绝 of species.
- loss of soil (no roots to hold it, so it washes away).
- more flooding.
- more **carbon dioxide** 二氧化碳 in the air, because there are fewer trees to take it in.



Deforestation lowers biodiversity, washes away soil, causes flooding and adds CO

Pollution



Plastic pollution is a major human impact on ecosystems.

Image: Marek Ślusarczyk (Tupungato) Photo portfolio, CC BY 3.0 (commons.wikimedia.org)

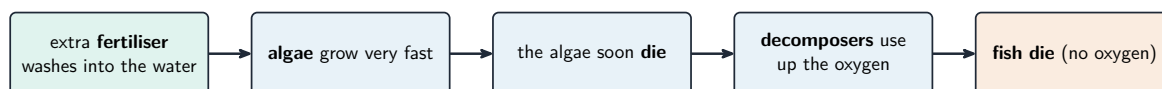
Water pollution

Untreated **sewage** 污水 and excess fertiliser washed into rivers and lakes damage water **ecosystems** 生态系统.

(Supplement) Excess fertiliser causes **eutrophication** 富营养化:

1. the fertiliser adds **nitrate ions** 硝酸根离子 and other ions to the water.
2. **producers** 生产者 such as algae grow very fast.

3. they soon die, and **decomposition** 分解 increases.
4. **decomposers** 分解者 use up the **oxygen** 氧气 in **aerobic respiration** 有氧呼吸.
5. the dissolved oxygen falls, so fish and other organisms die.



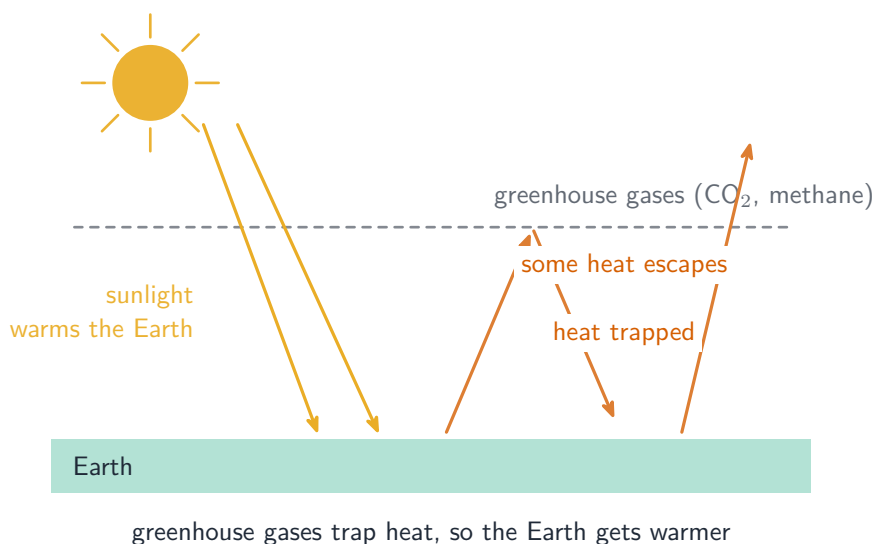
Eutrophication: extra fertiliser makes algae bloom, then the water loses its oxygen and fish die

Worked example. A farmer spreads fertiliser on a field; weeks later the fish in a nearby river die. Put the steps in order and explain. Rain washes **nitrate ions** off the field into the river. The extra nitrate makes algae grow very fast and cover the surface. The algae block the light, so the plants below die. **Decomposers** multiply as they feed on the dead algae and plants, and their **aerobic respiration** uses up the oxygen dissolved in the water. With too little oxygen left, the fish die. The fish are **not** poisoned by the fertiliser - they suffocate, and it is the decomposers that actually remove the oxygen.

Plastics and air pollution

Non-biodegradable 不可降解 **plastics** 塑料 do not rot away. They build up in the sea and on land, harming wildlife — animals may eat them or get trapped.

Methane 甲烷 and carbon dioxide are greenhouse gases. Too much of them strengthens the **greenhouse effect** 温室效应 (the enhanced greenhouse effect), which causes **climate change** 气候变化.



Greenhouse gases trap heat leaving the Earth, so the Earth gets warmer

Conservation

Sustainable resources

A **sustainable** 可持续 resource is produced as fast as it is used up, so it never runs out. Forests and **fish** 鱼类 stocks can both be managed in this way.

(**Supplement**) Forests are **conserved** 保护 by education, protected areas, **quotas** 配额 (limits on how much is taken) and replanting. Fish stocks are conserved by **closed seasons** 禁渔期, protected areas, controlled net mesh sizes (so young fish can escape), quotas and monitoring.

Saving endangered species

A species becomes **endangered** 濒危 or extinct when its numbers fall, because of climate change, habitat destruction, **hunting** 狩猎, **overharvesting** 过度捕捞, pollution and **introduced species** 外来物种.

Endangered species can be saved by:

- monitoring and protecting the species and its habitat.
- education.
- **captive breeding** 圈养繁殖 programmes, which breed animals in zoos. (**Supplement**) These may use **artificial insemination** 人工授精 (AI) or **in vitro fertilisation** 体外受精 (IVF).
- **seed banks** 种子库, which store seeds safely.

(**Supplement**) We conserve nature to keep up biodiversity, reduce extinction, protect ecosystems, and keep ecosystem functions going —such as recycling nutrients and providing food, **drugs** 药物, fuel and useful **genes** 基因. If a population becomes too small, it loses **genetic variation** 变异, which makes it harder for the species to survive future change.

Exam tips

- More food: machinery, fertilisers, insecticides, herbicides, selective breeding. Monocultures and intensive farming each have advantages and disadvantages.
- Deforestation: less biodiversity, extinction, soil loss, flooding, more carbon dioxide.
- Eutrophication (**Supplement**): fertiliser → more producers → more decomposers → less dissolved oxygen → organisms die.
- Greenhouse gases (carbon dioxide, methane) → enhanced greenhouse effect → climate change.
- Conservation: sustainable use, protected areas, quotas, captive breeding and seed banks. Small populations lose genetic variation.