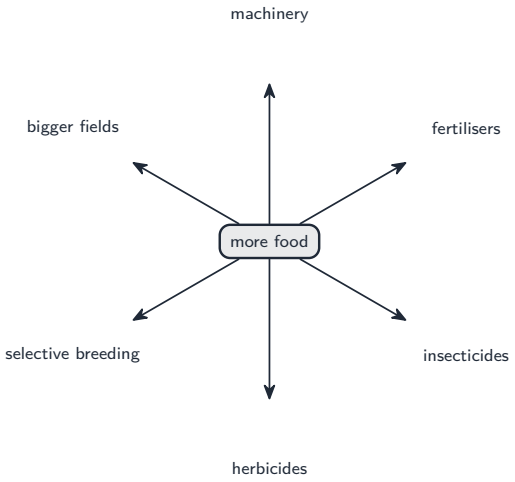
Human influences on ecosystems

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.

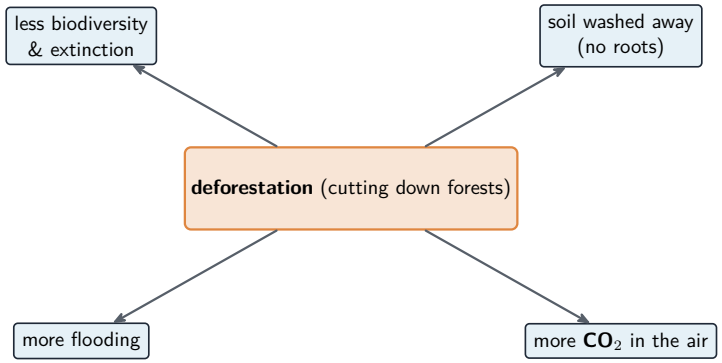
Biodiversity is the number of different **species** 物种 living in an area. Humans destroy **habitats** 栖息地 (the places where organisms live) by:

- 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_2

Pollution

Plastic pollution is a major human impact on ecosystems.

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.

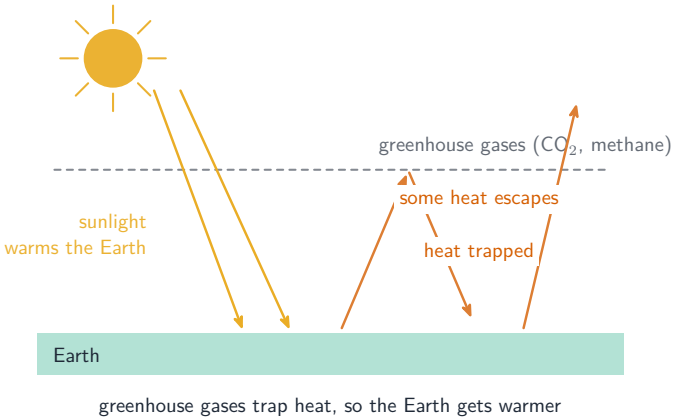
Eutrophication: extra fertiliser makes algae bloom, then the water loses its oxygen and fish die

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.

The giant panda was once endangered; protected habitats and captive-breeding programmes have helped its numbers recover

(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.