Human Impact on the Environment
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Contents

- Population pressures
- Air pollution
- Water pollution
- Land pollution
- Summary activities
How does human activity affect the environment?
Population growth

There are about 6.6 billion people in the world and over 95 million babies are born per year – that is an average of three babies per second!

Has the rate of population growth always been the same?
The human population is said to be growing exponentially. This means that the larger the population, the faster it grows.

An increase in average life expectancy is largely responsible for the rapid increase in population. Why do people live longer than they did hundreds of years ago?

- better healthcare (hospitals, medicines, vaccines)
- more and better food
- cleaner water
- better sanitation

The biggest increase in population is in developing nations, rather than developed nations. Why do you think is the case?
The changing population

How is the world's population changing?

(population (billions))

(year)

1750 1800 1850 1900 1950 2000 2050 2100 2150
Computer models can be used to make predictions about population growth by using assumptions about birth rate.

Most analysts assume that birth rates will fall within the next 50 years. Why do you think this might happen?

- decreased fertility
- lack of resources
- disease
- war

How important do you think predictions about climate change and unsustainable development are in the analysts’ calculations?
Using resources and producing pollution

- Buildings, farms, quarries and dumps
- Use more raw materials
- Use more land
- More people
- Use more energy
- Minerals
- Fossil fuels
- Produce more waste and pollution
- Pesticides and herbicides
- Sewage, fertilizer and toxic waste
- CO₂, SO₂, CO and smoke
What are pollutants?

One of the biggest problems of a rising population is an increase in pollution.

A pollutant is a substance that contaminates air, water or land. Some pollution is caused by natural events such as volcanic eruptions, but the majority is caused by human actions. Pollutants are either:

- **non-degradable** (e.g. the pesticide DDT) – these decompose extremely slowly, allowing them to accumulate to toxic levels as they are passed along food chains.

- **biodegradable** (e.g. sewage) – these are usually only damaging when added to the environment more quickly than they can decompose.
What are indicator species?

**Indicator species** are organisms whose presence or absence provides information on the environmental conditions in a specific area.

Lichen is commonly used as an indicator species because it is sensitive to sulfur dioxide.

What type of pollution could be present in areas where there is not much lichen?
Human Impact on the Environment

Contents

- Population pressures
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- Water pollution
- Land pollution
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Human activity produces two main types of air pollutant:

- **noxious gases** – These include carbon dioxide ($\text{CO}_2$), sulfur dioxide ($\text{SO}_2$) and nitrogen oxides ($\text{NO}_x$).

- **particulates** – These are tiny particles suspended in air (e.g. smoke) and which are usually produced by the combustion of fossil fuels.

Air pollution has been a major problem since the Industrial Revolution of the late 18\textsuperscript{th} Century, and has been made worse by humans’ reliance on burning fossil fuels for energy.

Air pollution, global warming, acid rain, damage to the ozone layer and smog. Each of these has serious implications for the environment and human health.
One of the greatest threats caused by air pollution is **global warming**. Global warming is caused by a build-up of greenhouses gases, which leads to an increase in the Earth’s temperature.

A **greenhouse gas** is an atmospheric gas that absorbs infrared light.

Key greenhouses gases include:
- carbon dioxide (CO$_2$)
- methane (CH$_4$)
- water vapour (H$_2$O)
- nitrous oxide (N$_2$O)
What is the greenhouse effect?

The greenhouse effect has a major impact on the temperature of Earth.

Click "play" to find out how the greenhouse effect works.
What is the trend in atmospheric levels of carbon dioxide?

- CO₂ concentration (ppm)
  - 400
  - 300
  - 200
  - 100
  - 0

- Year:
  - 1960
  - 1965
  - 1970
  - 1975
  - 1980
  - 1985
  - 1990
  - 1995
  - 2000
Carbon dioxide levels

Carbon dioxide is one of the most important greenhouse gases because atmospheric concentrations have risen dramatically over the past century. Why do you think this is?

Burning fossil fuels, deforestation and flooding land for the construction of hydroelectric dams have all contributed to rising levels of carbon dioxide.

How many examples of burning fossil fuels can you think of? Are there any alternatives?
What is the carbon sink?

Before the industrial revolution, carbon dioxide levels were usually kept in check by the **carbon sink** – forests and oceans that capture and store carbon.

- **forests** – All green plants absorb carbon dioxide as part of photosynthesis. The absorbed carbon is only released back into the atmosphere when the plant dies and rots, or is burned.

- **oceans** – Carbon dioxide dissolves in sea water, depending on the temperature and pressure. Tiny marine animals called **phytoplankton** extract carbon from the carbon dioxide to make their skeletons and shells.
Do these processes release or absorb carbon dioxide?

- Burning fossil fuels: release
- Deforestation: release
- Respiration: release
- Photosynthesis: absorb

Solve
What is acid rain?

Acid rain can cause a lot of damage to the environment.

Click "play" to find out about the causes and effects of acid rain.
The **ozone layer** is a protective part of the atmosphere that absorbs some of the Sun’s damaging ultraviolet (UV) rays.

Damage to the ozone layer means that more UV rays reach Earth, increasing the risk of skin cancer.

The ozone layer is damaged by chemicals called **chlorofluorocarbons** (CFCs), which contain the elements carbon, hydrogen, chlorine and fluorine.

CFCs are used in fridges and freezers, aerosol sprays and packaging materials such as polystyrene. The production and use of CFCs is now banned in many countries and could be worldwide in a few years.
What is smog?

**Smog** is a mixture of air pollutants and particulates that is sometimes found in the lower levels of the atmosphere. It has a distinctive brownish haze.

Smog can reach dangerous levels in built-up areas, causing irritation to the eyes and lungs.

A large part of smog is ground-level ozone, a highly toxic gas.

Ozone is formed when nitrogen oxides and hydrocarbons react with oxygen, in a reaction catalyzed by sunlight.
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Sewage, industrial waste, oil, pesticides and fertilizers all pollute water.

Fertilizers and sewage can easily be washed into rivers, streams and lakes. The nutrients, phosphates and nitrates in these substances cause **eutrophication**.

Eutrophication is the accumulation of nutrients in water, which causes excessive algal growth. This leads to a reduction in oxygen levels and the death of aquatic life.
What is eutrophication?

Eutrophication is a serious problem caused by water pollution.

Click "play" to find out more.
What is the order of stages in eutrophication?

1. Fish and invertebrates die from lack of oxygen
2. Plants below the surface of the water die
3. Fertilizers and liquid nutrients wash into the water
4. Oxygen levels drop as microbes feed on dead plants
5. Algae starts to grow rapidly, blocking out the light
Human Impact on the Environment

Contents

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Land pollution

Land and soil can be polluted by two main types of substance:

- **solid waste** – such as plastic, metal, paper and other man-made substances
- **chemicals** – such as herbicides and pesticides, crude oil and waste from industrial processes.

Land pollution often leads to water pollution, as chemicals are washed into rivers and lakes.
How much waste?

Every year, billions of tonnes of paper, plastics, synthetic materials, metal and wood are thrown away.

On average, each UK household produces over 1 tonne of rubbish each year.

How could you estimate the amount of rubbish you throw away each year?
What are the options?

What methods are there for disposing of waste materials?

- **Landfill** is the cheapest solution, but sites quickly become full and the waste contaminates the surrounding air, soil and water.

- **Incinerating** waste reduces volume, but often produces toxic chemicals.

- **Recycling** materials allows them to be useful again, and reduces the need to use more raw materials.

- **Composting** uses natural biological processes to decompose organic materials, but cannot be used to dispose of non-biodegradable waste.
What is the best solution?

The best way to deal with waste is to produce less of it!

It takes 100 kg of resources to make 10 kg of shopping, and most of that ends up in the bin.

If products were redesigned to be biodegradable or easier to recycle, the amount of waste and disposal costs would be significantly reduced.

How could you reduce the amount of waste you produce?
Recycling rates

How much do methods of waste disposal vary between countries?

- Recycled
- Compost
- Incineration
- Landfill

Countries: Greece, UK, Italy, France, Austria, Denmark
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- **biodiversity** – The number of different species within a specific habitat.

- **chlorofluorocarbon** – A chemical that damages the ozone layer.

- **eutrophication** – Over-enrichment of water with nutrients, causing excessive algal growth and reduced oxygen levels.

- **global warming** – The rise in the Earth’s temperature caused by an increase in greenhouse gases from human activity.

- **greenhouse gas** – A gas that traps the Sun’s infrared radiation in the Earth’s atmosphere.
• **indicator species** – An organism whose presence or absence provides information on environmental conditions.

• **ozone** – A gas that is toxic at ground level but which forms a protective layer higher in the Earth’s atmosphere.

• **particulate** – A type of pollution consisting of tiny particles, such as smoke.

• **pollutant** – A substance that contaminates air, water or land.

• **smog** – A hazardous type of air pollution containing ozone and particulates.
How quickly can you unscramble anagrams of words about

human impact on the environment?

start
Can you make an impact on this quiz about human impact on the environment?

start