

Chapter 12: The Earth's resources 1

Knowledge organiser

Natural and synthetic resources

We use the Earth's resources to provide us with warmth, fuel, shelter, food, and transport.

- Natural resources are used for food, timber, clothing, and fuels.
- Synthetic resources are made by scientists. They can replace or supplement natural resources.

When choosing and synthesising resources, it is important to consider **sustainable development**. This is development that meets the needs of current generations without compromising the ability of future generations to meet their own needs.

Finite and renewable resources

Some resources are **finite**. This means that they will eventually run out.

Fossil fuels are an example of a finite resource. They take so long to form that we use them faster than they are naturally formed.

Resources that will not run out are called **renewable** resources.

Wood is an example of a renewable resource. Trees can be grown to replace any that are cut down for wood.

Potable water

Water is a vital resource for life. **Potable** water is water that is safe to drink. However, most water on Earth is not potable.

| Type of water | What it has in it |
|--|--|
| pure water | just water molecules and nothing else |
| potable water | water molecules, low levels of salts, safe levels of harmful microbes |
| salty water (sea water) | water molecules, dangerously high levels of salt, can have high levels of harmful microbes |
| fresh water (from rivers, lakes, or underground) | water molecules, low levels of salt, often has harmful microbes at high levels |

Fresh water

In the UK, potable water is produced from rain water that collects in lakes and rivers. To produce potable water:

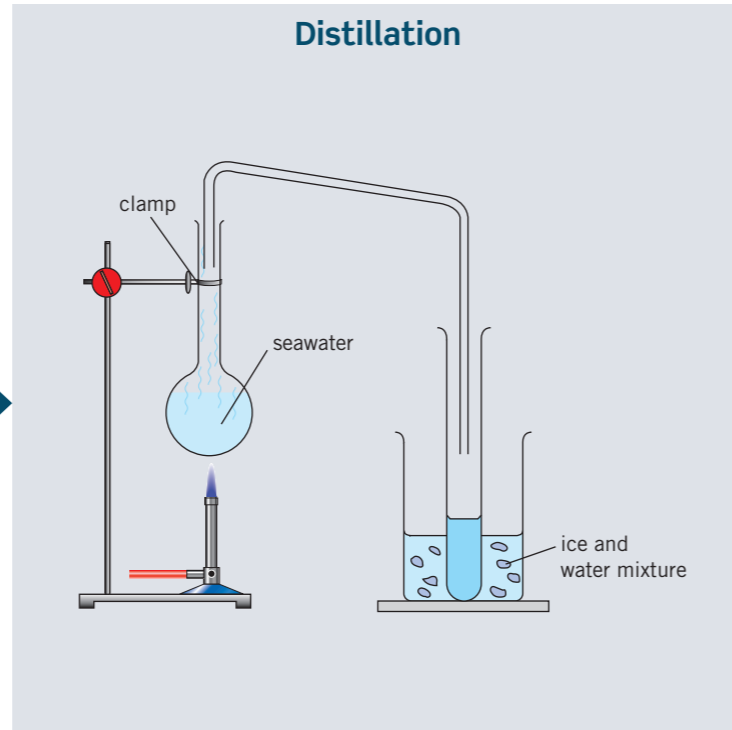
- 1 Choose an appropriate source of fresh water.
- 2 Pass the water through filters to remove large objects.
- 3 **Sterilise** the water to kill any microbes using ozone, chlorine, or UV light.

Salty water

Some countries do not have lots of fresh water available. **Desalination** is the process to turn saltwater into potable water. This requires a lot of energy and can be done by:

- distillation
- reverse osmosis

Reverse osmosis involves using membranes to separate the salts dissolved in the water. The water needs to be pressurised and the salty water corrodes the pumps. As such, it is an expensive process.



Waste water

Human activities produce lots of waste water as sewage, agricultural waste, and industrial waste.

- **Sewage** and agricultural waste contain organic matter and harmful microbes.
- Industrial waste contains organic matter and harmful chemicals.

These need to be removed before the water can be put back into the environment.

Treating sewage water

screening and grit removal

The sewage passes through a metal grid that filters out large objects.

sedimentation

The sewage is left so that solid sediments settle out of the water. The sediments sink to the bottom of the tank. The liquid sits above the sediment.

Treating sludge

sewage sludge

This sediment is called **sludge**. Sludge contains organic matter, water, dissolved compounds, and small solid particles.

anaerobic treatment

Bacteria are added to digest the organic matter. These bacteria break down the matter anaerobically – with a limited supply of oxygen.

biogas

The anaerobic digestion of sludge produces biogas. Biogas is a mixture of methane, carbon dioxide and hydrogen sulfide. It can be used as fuel.

remaining sludge used as fuel

The remaining sludge can be dried out and can also be burnt as a fuel.

Treating effluent

effluent

The remaining liquid is called **effluent**. This effluent has no solid matter visible, but still contains some matter and harmful microorganisms.

aerobic treatment

Bacteria are added to the effluent. These bacteria feed on organic matter and the harmful microorganisms in the effluent. The bacteria break down the matter by aerobic respiration – oxygen needs to be present.

bacteria removed

The bacteria are allowed to settle out of the water.

discharged back to rivers

The water is now safe enough to be released back into the environment.

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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.

C12 questions

Answers

| | | | |
|----|---|----------------|--|
| 1 | What do we use the Earth's resources for? | Put paper here | warmth, shelter, food, fuel, transport |
| 2 | What are some examples of natural resources? | Put paper here | cotton, wool, timber |
| 3 | What are some examples of synthetic resources? | Put paper here | plastic, polyester, acrylic |
| 4 | What is a finite resource? | Put paper here | a resource that will eventually run out |
| 5 | What is sustainable development? | Put paper here | development that meets the needs of current generations without compromising the ability of future generations to meet their own needs |
| 6 | What are the four main types of water? | Put paper here | pure water, salt water, fresh water, potable water |
| 7 | What is potable water? | Put paper here | water that is safe to drink |
| 8 | In the UK, how is potable water extracted from fresh water? | Put paper here | filtration and sterilisation |
| 9 | What is sterilisation? | Put paper here | killing microbes |
| 10 | What are three examples of sterilising agents? | Put paper here | chlorine gas, UV light, and ozone |
| 11 | How can potable water be produced from salt water? | Put paper here | desalination |
| 12 | How can desalination be carried out? | Put paper here | distillation or reverse osmosis |
| 13 | What are the three main types of waste water? | Put paper here | sewage, agricultural waste, industrial waste |
| 14 | What can waste water contain? | Put paper here | organic matter, harmful microbes, harmful chemicals |
| 15 | What is the first step in processing waste water? | Put paper here | screening and grit removal |
| 16 | What is sedimentation? | Put paper here | separating the waste water into sludge and effluent |
| 17 | How is sludge treated? | Put paper here | anaerobic respiration |
| 18 | How is effluent treated? | Put paper here | aerobic respiration |
| 19 | What is phytomining? | Put paper here | using plants to extract copper |
| 20 | What is bioleaching? | Put paper here | using bacteria to extract copper |
| 21 | What is a life cycle assessment? | Put paper here | a way of assessing the energy costs and environmental effect of a product across its lifetime |
| 22 | What are the four stages of a life cycle assessment? | Put paper here | <ul style="list-style-type: none">• extracting and processing raw materials• manufacturing and packaging• use and operation during its lifetime• disposal at the end of its useful life |
| 23 | How can we reduce the amount of new materials manufactured? | Put paper here | by reducing, reusing, or recycling products |
| 24 | In what ways can materials that are not recycled be disposed? | Put paper here | landfill or incineration |