

WATER RESOURCES

This factsheet was written for primary school students aged 9-11 years. A factsheet for teachers and a general audience is also available on the website:

www.geolsoc.org.uk/factsheets



Left:
Akosombo dam, Ghana
(© ZSM, Wikimedia Commons)

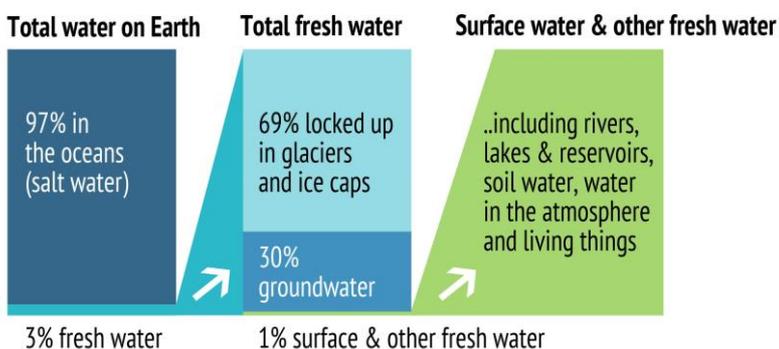
Fresh water is needed for every part of our lives, from drinking water to farming and manufacturing. Access to clean water is becoming increasingly difficult for millions of people around the world. With a growing population and changing climate, discovering new supplies and managing water carefully is more important than ever.

Where is water found on Earth?

Although much of the world's surface is covered with water, only 3% of this is fresh water, and only about a third of fresh water is liquid. Some of this is **surface water** in rivers, lakes and reservoirs, but most is **groundwater**, or water filling cracks and gaps in underground rocks. Both are part of the **water cycle**, as rain soaks down into the ground to become groundwater or flows over the surface as surface water.

For one in three people, groundwater is the only source of water. Groundwater can be extracted using **wells** or **boreholes**, and sometimes flows out naturally at the surface as **springs**.

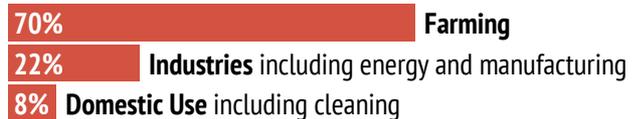
The diagram below shows where Earth's water is found.



Adapted from diagram © USGS / Wikimedia Commons

How do we use water?

Humans use the Earth's fresh water for three main purposes:



The main use varies dramatically in different parts of the world. For example, in North America and Europe, about half of all fresh water is used by industry. In Asia 85% of water resources are used in farming.

DID YOU KNOW?

- About 9% of the Earth's population, or **650 million** people, lack access to safe drinking water.
- Some countries cope with shortages of freshwater by removing the salt from seawater (**desalination**), for example in desert areas like the Middle East. Even the United Kingdom has a desalination plant. The Beckton plant in East London can produce 150 million litres of freshwater a day in times of severe drought.

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Exploring for groundwater

Groundwater scientists called **hydrogeologists** can find groundwater in all sorts of areas, including beneath deserts. Rocks containing groundwater which can be extracted are known as **aquifers**. Some rocks make better aquifers than others, and finding them isn't as simple as just digging a well. Hydrogeologists use a range of different information and scientific methods to understand and predict groundwater.



Drilling a groundwater borehole in Ethiopia
(© UNICEF Ethiopia 2016 / Ayene / Flickr)

Exploration methods

Aerial photographs and maps



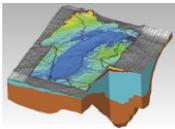
Hydrogeologists study aerial and satellite photos together with maps of rivers, land height and underground rocks. This helps find areas where rainwater flows into an aquifer (**catchment areas**) and rocks that could store groundwater.

Boreholes



The only way to test whether the groundwater can be used is to drill holes in the ground called **boreholes** and try to pump water out. This tells us if the rocks have enough suitable gaps and cracks to hold water. We can also take samples of water to test water quality.

Computer modelling



Once they know something about the groundwater in an area, hydrogeologists use computer software to simulate how it might behave. This helps predict things like the best borehole locations, how much water can be used and if there is a risk of pollution.

Image credits: Top © NASA, Middle © Daderot / Wikimedia, Bottom © USGS

Groundwater recharge and fossil groundwater

Groundwater levels change over time. To make sure the groundwater doesn't dry up, hydrogeologists use information on the climate, water cycle and geology to estimate how quickly the aquifer fills up with water after rain, (the **recharge rate**). Recharge can take anything from days to many years. In some areas the groundwater was recharged thousands of years ago, when the climate was wetter. We call this **fossil groundwater**, and once that groundwater is used up, it will not be replaced. In these areas groundwater is viewed as a **non-renewable resource**.

Water scarcity around the world

Many parts of the world suffer from **water stress**, which means that there is not enough water in an area to meet the needs of the people living there. Large parts of the world, such as central Africa and parts of Latin America and Southern Asia, also suffer from **economic water scarcity**. This means that there is not enough money or equipment to extract water in an area.

Poor access to safe water is rarely due to just a lack of rainfall. Drought may temporarily reduce the area's water resources, but long-term water stress or scarcity is usually related to other issues.

For example:



- The population may increase rapidly so more people need water
- Water is not managed carefully, or there is not enough exploration for new resources
- There might be a lack of money or facilities to extract the water
- The water supplies could be polluted, for example if sewage is not treated
- Climate change leads to dry areas becoming even drier

The world's largest aquifer

Groundwater aquifers can be truly huge. The world's largest aquifer is the **Great Artesian Basin** in Australia. It covers 1.7 million square kilometres, equivalent to about a quarter of the entire country and 7 times the area of the UK.



The Great Artesian Basin, Australia
(© Tentotwo, Wikimedia Commons)

The Great Artesian Basin is also the deepest aquifer in the world. The groundwater is held in layers of sandstone up to 3km deep in places. In other places the same rocks are at the surface, and the water flows out at springs.



Spring in Wabma Kadarbu Conservation Park, Australia (© Tandrew22, Wikimedia)

The aquifer is the only source of fresh water for the majority of inland Australia. Because so many people depend on it, groundwater pollution and using too much groundwater can cause problems.

FIND OUT MORE...

- **Learn more about aquifers, groundwater flooding and where UK water comes from:**
www.geolsoc.org.uk/factsheets