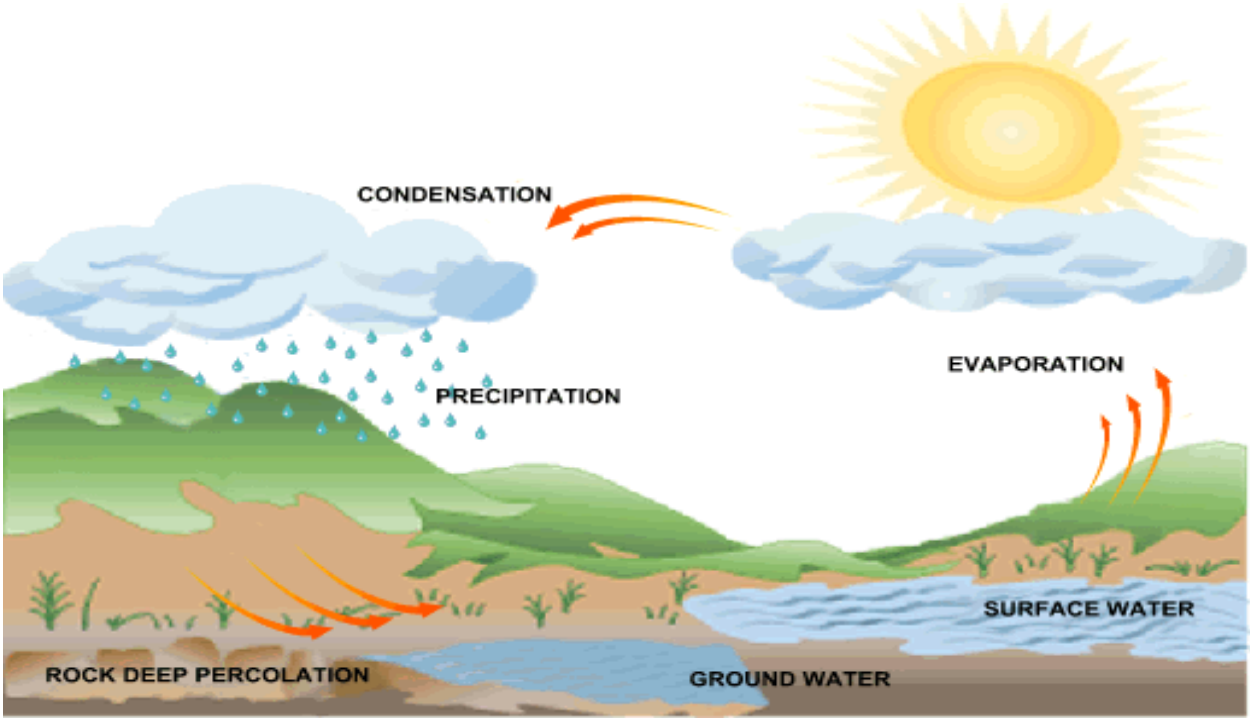
The Hydrological Cycle

The Hydrological Cycle
(also known as the water cycle) is the journey water takes as it circulates from the land to the sky and back again.

The sun's heat provides energy to evaporate water from the earth's surface (oceans, lakes, etc.). Plants also lose water to the air – this is called transpiration. The water vapour eventually condenses, forming tiny droplets in clouds.

When the clouds meet cool air over land, precipitation (rain, sleet, or snow) is triggered, and water returns to the land (or sea). Some of the precipitation soaks into the ground. Some of the underground water is trapped between rock or clay layers – this is called groundwater. But most of the water flows downhill as runoff (above ground or underground), eventually returning to the seas as slightly salty water.

This Information page provides an understanding of the hydrological cycle. It describes the principal stages of the cycle, with a brief description of each stage. A diagram gives a clear visual explanation. The links between the hydrological cycle and the duties of a water utility to supply clean water and dispose of dirty water are also explained.



What is the Hydrological Cycle?

The total amount of water on the earth and in its atmosphere does not change but the earth's water is always in movement. Oceans, rivers, clouds and rain, all of which contain water, are in a frequent state of change and the motion of rain and flowing rivers transfers water in a never-ending cycle. This circulation and conservation of earth's water as it circulates from the land to the sky and back again is called the 'hydrological cycle' or 'water cycle'.

How does the Hydrological Cycle work?

The stages of the cycle are:

- Evaporation
- Transport
- Condensation
- Precipitation
- Groundwater
- Run-off

Evaporation

Water is transferred from the surface to the atmosphere through *evaporation*, the process by which water changes from a liquid to a gas. The sun's heat provides energy to evaporate water from the earth's surface. Land, lakes, rivers and oceans send up a steady stream of water vapour and plants also lose water to the air (transpiration).

Approximately 80% of all evaporation is from the oceans, with the remaining 20% coming from inland water and vegetation.

Transport

The movement of water through the atmosphere, specifically from over the oceans to over land, is called *transport*. Some of the earth's moisture transport is visible as clouds, which themselves consist of ice crystals and/or tiny water droplets.

Clouds are propelled from one place to another by either the jet stream, surface-based circulations like land and sea breezes or other mechanisms. However, a typical cloud 1 km thick contains only enough water for a millimetre of rainfall, whereas the amount of moisture in the atmosphere is usually 10-50 times greater than this.

Most water is transported in the form of water vapour, which is actually the third most abundant gas in the atmosphere. Water vapour may be invisible to us, but not to satellites which are capable of collecting data about moisture patterns in the atmosphere.

Condensation

The transported water vapour eventually *condenses*, forming tiny droplets in clouds.

Precipitation

The primary mechanism for transporting water from the atmosphere to the surface of the earth is*precipitation*.

When the clouds meet cool air over land, precipitation, in the form of rain, sleet or snow, is triggered and water returns to the land (or sea). A proportion of atmospheric precipitation evaporates.

Groundwater

Some of the precipitation soaks into the ground and this is the main source of the formation of the waters found on land – rivers, lakes, groundwater and glaciers.

Some of the underground water is trapped between rock or clay layers – this is called *groundwater*. Water that infiltrates the soil flows downward until it encounters impermeable rock and then travels laterally. The locations where water moves laterally are called ‘aquifers’. Groundwater returns to the surface through these *aquifers*, which empty into lakes, rivers and the oceans.

Under special circumstances, groundwater can even flow upward in artesian wells. The flow of groundwater is much slower than run-off with speeds usually measured in centimetres per day, metres per year or even centimetres per year.

Run-off

Most of the water which returns to land flows downhill as *run-off*. Some of it penetrates and charges groundwater while the rest, as river flow, returns to the oceans where it evaporates. As the amount of groundwater increases or decreases, the water table rises or falls accordingly. When the entire area below the ground is saturated, flooding occurs because all subsequent precipitation is forced to remain on the surface.

Different surfaces hold different amounts of water and absorb water at different rates. As a surface becomes less permeable, an increasing amount of water remains on the surface, creating a greater potential for flooding. Flooding is very common during winter and early spring because frozen ground has no permeability, causing most rainwater and meltwater to become run-off.

Source: https://civilsolution.wordpress.com/category/civil-engineering/page/5/