

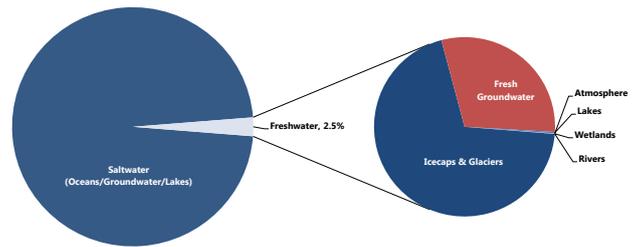
GROUNDWATER is the water stored in the pores and other openings in rocks below ground. It is a precious resource which must be safeguarded for the benefit of mankind.

1

Groundwater comprises 96% of all liquid fresh water on earth

Think of this groundwater stored beneath our feet as the savings in your bank, or the financial reserves of a nation.

Most (97%) of the world's water is sea water. Two-thirds of the freshwater, is ice. Groundwater comprises 96% of the freshwater which we can utilise.

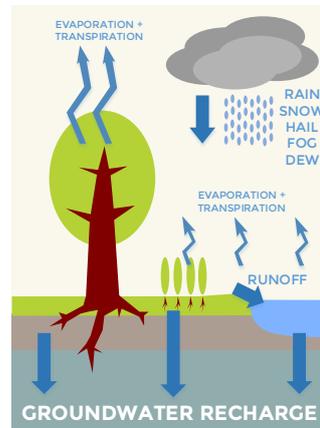


2

However, from a water resource point of view, what matters is how much natural replenishment, or recharge, takes place

Recharge rates vary from a few to hundreds of millimetres per year. In dry regions recharge ranges from zero to a few mm per year.

In humid regions recharge rates represent a higher proportion of rainfall.

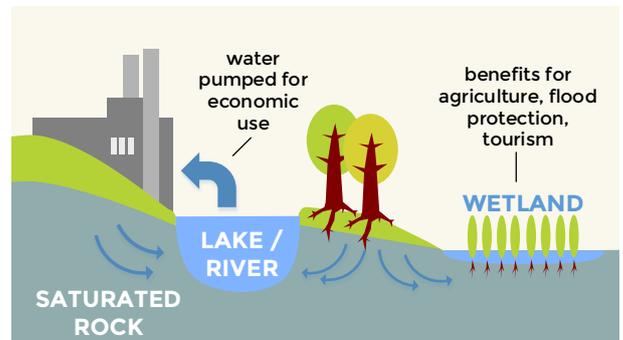


3

If no abstraction (pumping) takes place, then recharged water discharges naturally to swamps, streams and rivers

This natural outflow is important because it sustains springs and river flows in dry periods and supports wetland ecosystems (lakes and swamps) which are important to people and livestock.

Reliable river flows and lake levels are also critical for hydropower; cooling of thermal power plants; water transport and fisheries.

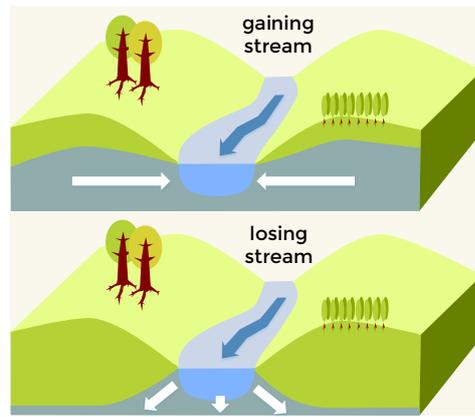


4

Water in streams, rivers and lakes and groundwater are closely connected

- Globally about 25% of the flow in rivers comes from groundwater
- Globally about 90% of groundwater recharge joins rivers

Rivers may be fed by groundwater, or they may feed groundwater. Whether a stream is gaining or losing depends on location and time of year.



5

Some of the groundwater recharge can be safely abstracted for human use

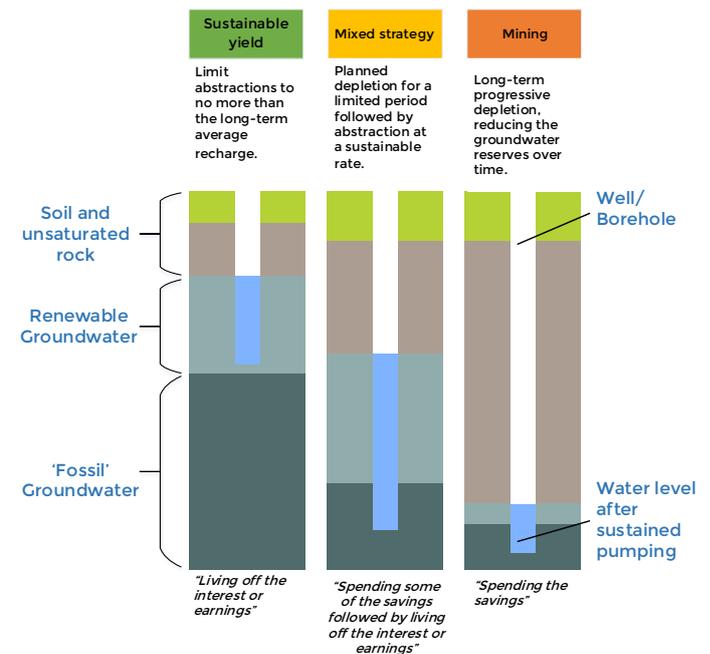
Even the smallest abstraction reduces the natural outflow by an equivalent amount, but a certain level of water abstraction may be judged to be acceptable

6

Deciding how much groundwater is exploitable depends on many factors. Three main options exist:

1. Sustainable yield
2. Mixed strategy
3. Mining

Borehole/aquifer cross-section:



7

In some cases recharge does not occur at the present day, and so any abstraction is effectively 'mining' groundwater

In very dry regions with no active recharge a decision may be taken to mine groundwater, but, as is the case with oil or gas, once the water is used it will not be replenished.

Irrigation in Libya using mined groundwater



[Photo credit Daily Alternative May 14th, 2013 www.dailyalternative.co.uk/how-gaddafis-great-man-made-river-project-became-part-of-the-water-wars]

8

More people use groundwater for drinking than use rain water or surface water

About half the population of Africa and Asia use groundwater directly from springs, wells and boreholes, while an unknown additional number served by piped systems enjoy groundwater use.

[Source: UNICEF/WHO, JMP, 2015 www.wssinfo.org/]

9

In rural areas groundwater is often the cheapest source of safe drinking water

The capital cost of a borehole and handpump is about USD40 per person (say USD1.50 per person per year).

The recurrent costs are about USD4.50 per person per year.

The total is about USD6.00 per person per year.

Piped schemes cost about twice as much.

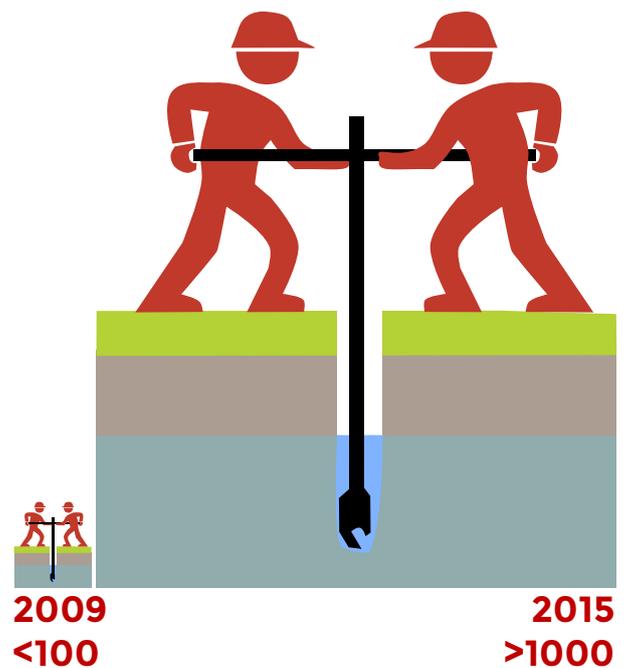
[Source: [WASHCost Working Paper 8, 2013](#), IRCwash.org]

10

In urban areas many people use shallow ground-water despite the fact that it is very vulnerable to pollution

The high cost of connection to piped water services makes it more attractive to use a private well despite the poor water quality

NUMBER OF MANUAL DRILLING FIRMS IN LAGOS, NIGERIA



[Source: Danert, K, Adekile, D and Gesti Canuto, J (2014) Manually Drilled Boreholes: Providing water in Nigeria's Megacity of Lagos and Beyond, Skat Foundation <http://www.rural-water-supply.net/en/resources/details/618>]

1

UNDERSTAND AND MANAGE GROUNDWATER RISKS

Groundwater is coming under increasing threat from mankind. These threats include those leading to excessive rates of decline or to rapidly rising groundwater level, those due to pollution, and the impacts of population growth urbanisation and climate change.

New research, however, is developing new knowledge and ways to manage these risks. Find out more about the UPGro: Unlocking the Potential of Groundwater for the Poor: upgro.org

2

GROUNDWATER NEEDS GOOD GOVERNANCE

Because groundwater is hidden from sight, it needs special care and management. This requires laws and their enforcement, enhanced monitoring and understanding, strong institutions, and the necessary policies and investments. In 2015, many of the main international agencies concerned with groundwater and its use joined together and published a vision, framework for action, and diagnostic approach for groundwater governance: www.groundwatergovernance.org