



Nature's storage reservoir

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Salt water, in oceans, seas and in the ground, makes up 98% of the water on our planet. Of a total of 34 million cubic kilometres of vital freshwater, 88% is locked up in ice caps and glaciers. Water in rivers, lakes, reservoirs, soils and the atmosphere makes up only 0.6% of all freshwater, the largest store being beneath our feet in the form of groundwater which makes up nearly 12% of all fresh water. This water is contained in aquifers in cracks and spaces or pores between grains that make up the rocks. This water is part of the water cycle and is replenished, or recharged, by rainfall percolating through the soil into the aquifers. Groundwater moves slowly through the rocks to discharge at springs which maintain flow in rivers and streams or into the sea. Transit times in aquifers can range from a few days to years, decades and even millennia.

Some arid areas are dependent on groundwater not only for potable supply but also for irrigation. Understanding, quantifying and protecting groundwater is therefore of vital importance to sustainable development throughout the world. In England and Wales, around 30% of potable water is obtained from

Groundwater

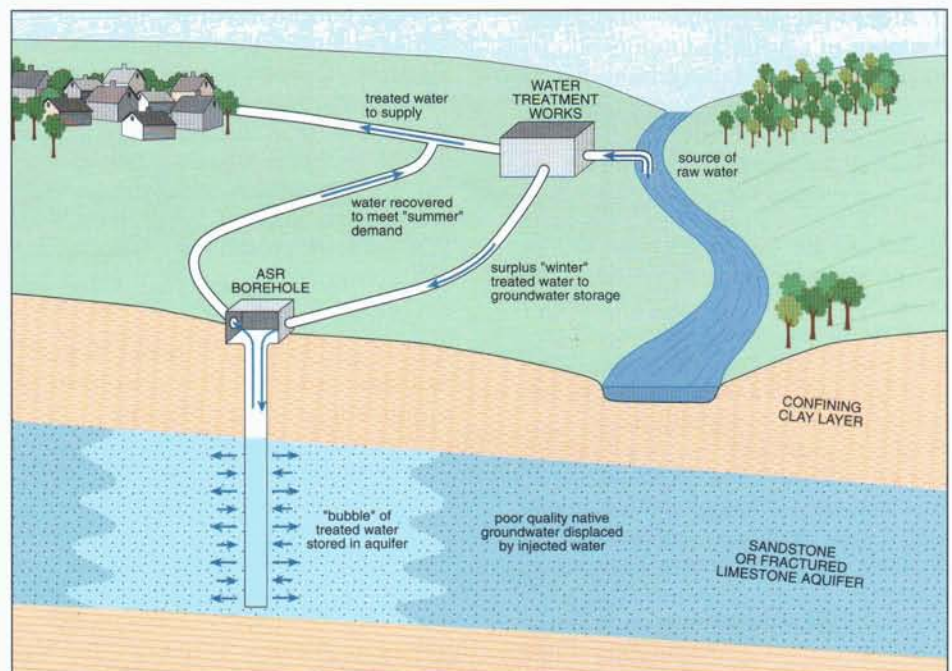
groundwater which is also the source of bottled water. Dependence on groundwater increases to over 70% towards the south-east where some cities are entirely dependent on groundwater.

The BGS is responsible for maintaining the British National Groundwater Archive with records going back to the middle of the last century.

Research undertaken by the BGS has included:

- determining the processes controlling the movement and degradation of nitrate and other pollutants in aquifers;
- quantifying the 'fossil' groundwater resources under the Libyan desert;
- understanding the hydrogeology of basement rocks and optimising the siting and use of hand-pump boreholes for rural communities in east Africa;
- investigating the impacts of large urban areas on groundwater resources and quality and developing strategies for the protection of groundwater from pollution.

As water resources become increasingly utilised and polluted they have to be managed and regulated using increasingly sophisticated methods. These methods need to be based on a sound knowledge of the processes controlling both quantity and quality. Artificial recharge of groundwater is a method of storing water underground in aquifers during times of surplus for use in times of shortage, usually on an annual cycle. The water can be encouraged to seep into the ground from specially constructed basins or can be injected into deeper aquifers via boreholes. The physical, chemical and biological processes involved need to be understood in order for the systems to work at optimum efficiency, often in conjunction with surface sources. A recent development being promoted in Britain by the BGS is the injection of treated fresh water into brackish or saline aquifers. The native groundwater is displaced by a 'bubble' of fresh water which is stored for use in times of drought. This method, named Aquifer Storage Recovery (ASR), is new to Britain and offers a means of storing large volumes water with minimum environmental impact.



Aquifer Storage Recovery. Treated water is injected into an aquifer to form a 'bubble' of fresh water for recovery in times of high demand.