Fresh Solutions

Supplementary Materials

Groundwater Recharge

There's more water underground than there is in all of the above ground reservoirs and lakes, including the great lakes.[1] The water in groundwater aquifers comes from the slow seeping of rain and melted snow water down through cracks and pore spaces in rock and sand. It can take many years for an aquifer to build up a reserve of water. In some cases, water has been stored in underground aquifers for hundreds of thousands of years!

Groundwater reserves are being depleted rapidly in many places around the world, especially places that are experiencing drought, such as the state of California. One study estimates 20 percent of the world's aquifers are being over pumped, meaning water is being pumped out of them for agriculture and other uses faster than rain and snow melt can replenish this water.[2]

The natural replenishment of groundwater by rain and snow melt can be disrupted by cement roads, buildings, and parking lots—'impermeable surfaces'—that prevent water from seeping down into the ground. Recently, people have been taking advantage of the great storage capacity of aquifers by helping to put water back into them. This is called artificial groundwater recharge.

A common method for getting more water back underground uses shallow man-made ponds to collect water, called recharge ponds, which allow water to seep through soil and rocks to underground aquifers. These recharge ponds can also capture rain during big storms. A more energy intensive way to put water underground is called an injection well, which uses high-pressure pumps to push water back underground.

Storing water underground can reduce water losses through evaporation and can also replenish water needs for ecosystems and rivers that depend on groundwater. Groundwater recharge has also been found to be cheaper than expanding surface reservoirs by building dams.[3] Sometimes depleted coastal aquifers can be infiltrated with salt water. Since salt water is not good for either drinking or irrigating crops, recharging the aquifer is a way to prevent this from happening.

To learn about other solutions to global water issues, read more at **Fresh Solutions**.

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[1] USGS (2015)
[2] Mascarelli, A. (2012)
[3] Stanford University: Water in the West (December, 2014)

Weighing the Benefits and Drawbacks of Groundwater Recharge

For a complex problem, we need to evaluate how a solution fares across multiple dimensions:	Benefits	Drawbacks
Environmental Factors		
Social & Cultural Factors		
Economic Factors		

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Weighing the Benefits and Drawbacks of Groundwater Recharge

For a complex problem, we need to evaluate how a solution fares across multiple dimensions:	Benefits	Drawbacks
Environmental Factors	• Less water loss than surface storage. • Recharge prevents salt water intrusion. • Replenishes water needs for ground-water dependent ecosystems and rivers. • Recharge ponds can capture water from heavy storms.	• Energy is required to extract water from aquifers for human use after the water has been replenished.
Social & Cultural Factors	• Groundwater can be distributed across the state. • Recharge puts water back into aquifers where others can use it.	
Economic Factors	• Less expensive than desalination. • Cheaper than expanding surface dams and reservoirs.	• Upfront cost to build recharge ponds.

Additional Resources

Stanford University: Water in the West
UC Davis: Map identifies farmland with greatest potential for groundwater recharge
ENSIA: Groundwater wake-up

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