Recharging aquifers — a solution to water scarcity

We begin with hard-hitting food for thought: did you know that in India, over 90 per cent of the rural water supply, over 50 per cent of the urban water supply, and over 70 per cent of the agricultural water supply is sourced from aquifers? For those wondering: in layman terms, aquifers are porous and permeable layers of the earth that are capable of storing and transporting water. Now the hard-hitting part: India is the highest user of groundwater, even ahead of the US and China, consuming over 70 percent of groundwater. Keeping this in mind, did you know that only eight percent of India's rainwater is actually captured?!

One common reason for water over-exploitation is linked with the geometrical increase in population. The population is migrating toward cities and is, hence, not uniformly distributed. However, economic and social developments, triggered by rapid urbanisation where large hard and impervious surfaces are rampant, have led to lifestyle changes that impact water requirements and consumption patterns. That is the urban scenario.

In the case of villages: a few years back, ponds were vital water resources that were very efficient, as the same water was used time and again (multiple reuse). Unfortunately, these have now dried up or have been "converted" into wastewater collection pits, rendering them not only useless, but also as a breeding ground for diseases. In the absence of these water resources, water supply crunches are inevitable. Since the groundwater in villages has also become contaminated over time, villagers are left dependent on water supply sources away from the village.

Consider the agriculture scenario in India: water-intensive crops have always been preferred by farmers, as they are more remunerative. This is despite the fact that risk factors are high, such as dependency on water resources or rain, low productivity of the land, and other vulnerabilities. Societal and economic pressures add to the continuation of this trend. Another irony: India is an exporter of water-intensive crops/produce, while it imports pulses (among others). This means we are basically "exporting" water on one hand, while struggling with water scarcity on the other. Another factor that adds to these woes is India's political system, which responds to the needs of the farmers through generic, "mass-tailored" solutions (monetary support schemes to farmers) without considering the implications.

For example, the electricity supply in a few states is free of cost or highly subsidised for agriculture; some the implications of this are the continued cultivation of water-intensive crops and the extensive irrigation of land due to a ready and cheap supply of water, even depleting land and/or crop productivity many times due to the farmers' lack of knowledge about the judicious use of resources. As agriculture consumes more than 70 per cent of groundwater, this sector needs special attention. Broad solutions include the careful observation of water-usage patterns, understanding how the water consumed is "fed back" whenever and wherever possible, usage of better and efficient irrigation systems, and technologies such as hydroponics or aeroponics.

Now coming to the industrial sector, the usage of water is not very high comparatively. In addition, this sector boasts of being organised and productive, which means that it has an inherent potential to produce, recycle, and reuse its own water without loading the environment. Few success stories of industries in water-scarce areas are commonly heard. Not only have these industries created their own sources of water supply, but they have also shared this resource with neighboring communities. In drastic comparison are some industries located in water-sufficient areas that mine the groundwater, contaminating not only the water, but also the soil and the air. This is indeed food for thought, as there is a solution within the problem itself just waiting to be applied.

Let us now understand why water scarcity is progressing geometrically. As we keep exploiting

water resources, the need for a proportional recharge of the aquifer stands. If this does not happen, depletion is bound to get worse fast. This is simple to comprehend. As the depletion of aquifers occurs, the dry zone created above the water table deepens in direct proportion.

Now let us understand how water percolates down and recharges the aquifer through the layers of the soil: The earth’s crust comprises of layers of soil particles. When it rains, the top layers of soil are saturated with water, expelling air from the voids between the particles. If the water supply is continuously available, water will be transmitted to the underlying layers, saturating them too. However for this, the water supply has to be consistently available over a reasonably sustained period, in the absence of which the post-rain glare of the sun will dry the upper layers of the soil, resulting in water from the lower layers traveling to the upper layers via capillary action. This results in the subsequent drying up of underlying layers, so the aquifer does not get recharged and remains depleted.

Because of climate change, rainfalls (especially in semiarid regions) are becoming intense and short-spanned, causing the problem of recharging aquifers to worsen due to huge runoff (no recharge is possible due to low retention of rainwater on the soil and the resulting low rate of percolation). This indicates that we need to replace the "layer-by-layer saturation" for recharging the aquifer with a more sustained method: recharge through rainwater harvesting. This can be done easily by constructing recharge shafts/wells within geographic proximities in order to benefit the water levels locally, through harvesting, collecting, and recharging. We must minimise water drainage and direct water to the aquifer as soon as possible (especially in areas where there is less or no contamination of water). In urban areas, where land is scarce and precious, parks can be constructed a level below the ground or road level to allow the direct drainage of rainwater into a constructed aquifer recharge system.

There are solutions available for the tackle over-consumption of water. What is most important is the cost-effective, timely, and sustained implementation of such solutions to recharge the aquifer directly. Therein lies the key!

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This refers to the tendency to form friendships and other forms of interpersonal relationships with people we come across often in our daily lives.

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