RECHARGING DRY WELLS

Nicol-André Berdellé of TS Prototype Creation on a new rainwater management solution for arid regions, which reactivates dry wells for use as cisterns and Aquifer Storage & Recovery units (ASR).

FALLING GROUNDWATER TABLES ARE A worldwide phenomenon, an invisible ebbing of the most elementary fossil resource we use. While the economy is dependent on hydrocarbons that feed its huge energy needs, life in essence depends on water. Plummeting groundwater resources are more than a challenge to the economy, the financial system or high standard of living. They represent the foundation of our achievements, with deep implications on the future of civilisation.

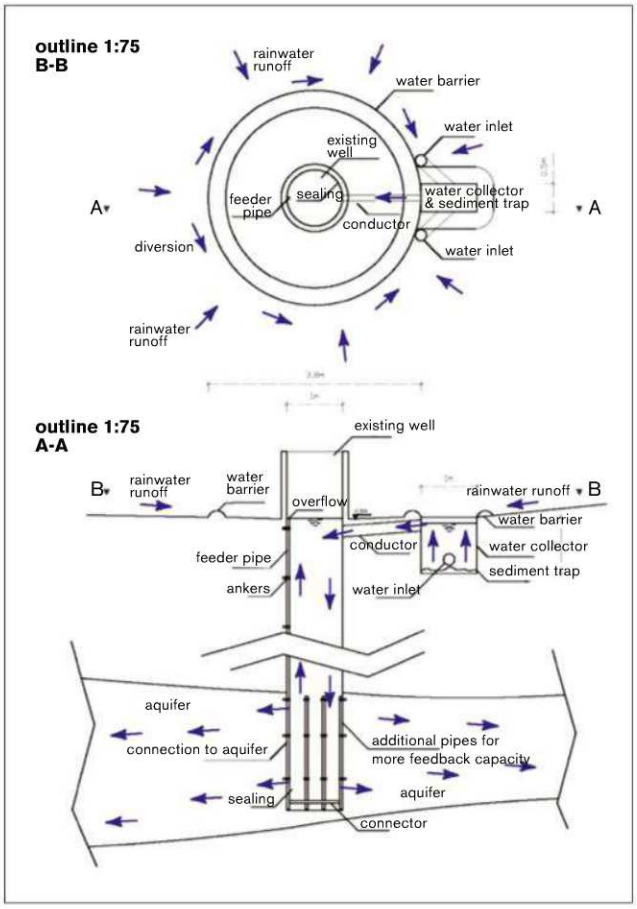
Once a working system of food provisioning becomes established and effective in a civilisation, the additional branches of its economy starts developing. But as fossil water-based agriculture dies down, the Arab region could be looking at a future scenario which makes energy crisis a trivial topic.

Despite the blue revolution, overall water demand is increasing much more rapidly than what all water conservation, re-use and desalination efforts can make up for. Water tables are still falling in the Middle East at the rate of several metres every year.

Potent option

However, there is a potent and deployable solution, which can stop and even reverse the trend of falling ground water levels. In between rainwater management and aquifer recharge, this option utilises existing wells that have run dry. It was originally designed by TS Prototype Creation as a developmental aid project for Niger, as an engineering challenge to create the most cost-effective solution for rainwater management possible by reactivating dry wells as cisterns and Aquifer Storage & Recovery units (ASR). It relies in the fact that traditional wells at the bottom of watersheds can be filled without any need for pumping. The entire area around the well could be modified and serve as a funnel to collect the short but intense rainfalls that occur in the Middle East, with drainage ditches speeding up the flow.

Simple structures on the surface slow down water and keep back surface sediments, thus helping collect clean water. The excess water is drawn from top of the filled cistern well and introduced back into the natural aquifer. This solution works well because the geological aquifer, in most cases, will lead



The entire area around the well could serve as a funnel to collect the the rainfall

the water back to the bottom of the well. If the water was introduced from anywhere else, the chances are that it will vanish in subterranean canals.

This solution is a self-sufficient and sustainable reclamation utility, and does not require significant maintenance. It could be compared to a palm oasis because a large surface area receives a rainwater management system, the difference being that water is stored securely underground and the system is fully up and operational from the first rain event on. Furthermore, the Recharge Well (RW) shows a positive Material-Input Per-Service-Unit (MIPS). The RW is not a quick profit solution; it is a stable process to recreate Life Support Systems (LSS). This is the foundation of our economy and a pre-requisite for financial profit.

Injection wells

Injection wells aren't new, but retrofitting and activating a barren, open well, and utilising it as a cistern and filtrating the runoff water for aquifer recharge is. Even the practice of recharging aquifers is hardly found anywhere in the world, barring a few examples like the one in Bengaluru (formerly Bangalore) in India and a strategic water reserve being built in Abu Dhabi.

Injection wells are also used to deposit treated wastewater or hazardous effluent from factories. The US Environmental Protection Agency (EPA) classifies injection wells into five groups, depending on the type of waste to be disposed in them. The same is reproduced below as follows:

- Class 1: Receives industrial, commercial, or municipal waste fluids injected beneath the lowermost formation containing an underground source of drinking water (USDW) within 1/4 mile of where the well was drilled. Class 1 wells are prohibited in Washington State.
- Class 2: Receives fluids that are brought to the surface as part of oil or natural gas exploration, recovery or production.
- Class 3: Used for mineral extraction. 2 basic types: solution mining and in-situ leaching for minerals. Class 3 wells are prohibited in Washington State.
- Class 4: Receives radioactive or hazardous waste injected into or above underground sources of drinking water. Class 4 wells are prohibited in WA State except for Class IV wells used at an approved Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA) facility that re-injects treated ground water into the same formation.
- Class 5: All other injection practices not included in the other classes. Class 5 injection wells, the most common injection well in our state, are generally shallow wells used to discharge fluids into or above a ground water aquifer. In many cases, these aquifers are shallow, unconfined or surficial. Large on-site septic systems, serving 20 people or more per day or having a capacity of 3,500 gallons per day, are considered Class 5 wells.

The wider neighbourhood of RW hosts various practices and techniques of groundwater or aquifer recharge through surface percolation or injection . At the seventh International Symposium on Managed Aquifer Recharge in Abu Dhabi last year, the main topic was the costly injection technology. In contrast, the unique advantage of RWs is not recharging or storage but as an option of harvesting huge amounts of rain, otherwise lost. A major difference between recharge by percolation and RWs is the amount of evaporation on the water surface, which is dramatically higher if the rainwater is not directed underground.

Another difference is the quality of water. RWs provide clean drinking water in the cistern after the rain event. Only after the well shaft is full, the excess water will percolate into the aquifer at the sides. Recharge Wells are about drinking water, the most important type of water. The quantity and quality of water in a Recharge Well is layered out for highest security and purity in drinking water utilities.

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