# Water Crises: India's Major and Serious Challenge by 2030

After two consecutive years of weak monsoons, 330 million people - a quarter of the country's population - are affected by a severe drought. With nearly 50 per cent of India grappling with drought-like conditions, the situation has been particularly grim this year in western and southern states even Uttar-Pradesh that received below average rainfall. As per Niti Aayog reports in 2018, 21 major cities (Delhi, Bengaluru, Chennai, Hyderabad and others) are racing to reach zero groundwater levels by 2020, affecting access for 100 million people.

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The Composite Water Management Index (CWMI) report states that by 2030, the country's water demand is projected to be twice the available supply, implying severe water scarcity for hundreds of millions of people and an eventual six per cent loss in the country's GDP. As on today, 12 per cent of India's population is already living the 'Day Zero' scenario that happened due to excessive groundwater pumping, an inefficient and wasteful water management system and years of deficient rains. Further, the report predicted that 21 Indian cities will run out of the ground water(which is the main source of water in most Indian cities) by 2020, nearly 40% of population will have absolutely no access to drinking water by 2030 and 6% of India's GDP would be lost by 2050 due to water crisis. Just one year after the release of this report, the Government has announced an ambitious target of providing piped clean drinking water to all rural households by 2024. Although a worthy goal, it is unclear how the government proposes to achieve this formidable target under the current circumstances.

The ministry has set a tough target at a time when hundreds of millions don't have access to clean water. Aiming at laying huge pipeline networks for water supply means that yet again, we are giving more preference to infrastructure. Also, the biggest questions are: i).What will happen if there is no water to supply? and ii). What will happen to all the wastewater that gets generated?

This indicates that there is a clear disconnect between water, society and economy. Currently, we are interested in laying large networks, constructing huge storage dams, fetching water from 150 kilometers and above, which involves a huge carbon footprint. We are valuing land more than water, neglecting our local water bodies, which have either gone dry or encroached. Also, in many Indian cities, water is not properly distributed. Some areas of mega cities like Delhi and Mumbai are privileged to get more that than the standard municipal water norm of 150 litres per capita per day (lpcd) while other areas get 40-50 lpcd.

The World Health Organization (WHO) states that an individual requires around 25 litres of water daily for meeting his/her basic hygiene and food needs. The rest is used for non-potable purposes like mopping and cleaning. This indicates that for most of the non-potable uses, a quality lower than drinking water is required. Thus, for economic efficiency and environmental sustainability, water must be treated and supplied according to usage. To top this, are issues of leakage losses, water pricing and metering of water. Lack of proper maintenance of existing infrastructure causes further losses of almost 40 per cent of piped water in urban areas.

### *1.0 Why this water scarcity arose?*

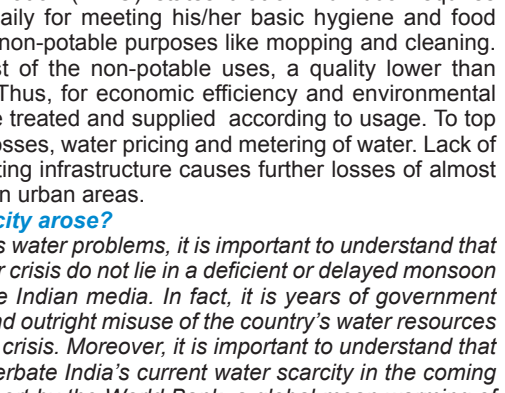
*In order to address India's water problems, it is important to understand that the roots of the current water crisis do not lie in a deficient or delayed monsoon as is being made out by the Indian media. In fact, it is years of government neglect, wrong incentives and outright misuse of the country's water resources which has led to the current crisis. Moreover, it is important to understand that climate change would exacerbate India's current water scarcity in the coming decades. According to a report by the World Bank, a global mean warming of 2°C above pre-industrial levels, the mismatch between water demand and supply will increase dramatically and will have serious implications on India's food security. Although, the country has witnessed a dramatic increase in water demand for all uses: agricultural, industrial, and domestic, agricultural irrigation accounts for 90% of India's freshwater withdrawals. Therefore, any serious effort towards water management in the country should focus on the management of agricultural irrigation in India. India's annual agricultural water withdrawal is the highest in the world followed by China and the United States (Table 1). Further, the table shows that China, which has a larger area equipped for irrigation (69 million hectares) than India (67 million hectares), withdraws much less water for agricultural purposes. This is clearly inefficient and off course unsustainable.*

Table 1: Countries with the largest agricultural water withdrawals

| Country | Agricultural Water Withdrawals (billion $m^3$) | Total Water Withdrawals (billion $m^3$) | Share of Agricultural Water Withdrawal in Total Water Withdrawal (%) | Area Equipped For Irrigation (m ha) |
|---|---|---|---|---|
| India | 688 | 761 | 90 | 67 |
| China | 358 | 554 | 65 | 69 |
| United States | 175 | 486 | 40 | 26 |
| Pakistan | 172 | 184 | 94 | 20 |
| Indonesia | 93 | 113 | 82 | 7 |

**Source:** World Bank (2018)

### 2.0 Some of the Water Scarcity Solution Devices



In India around 83% of available fresh water is used for agriculture. Rainfall being the primary source of fresh water, the concept behind conserving water is to harvest it when it falls and wherever it falls. The importance of storing rainwater through different techniques can be understood by an example of the desert city of Jaisalmer in Rajasthan which is water self-sufficient despite experiencing meager rainfall as against Cherrapunji, which is blessed with the highest rainfall in the world, but still faces water shortage due to lack of water conservation methods.

### 2.1 Traditional Devices to Overcome Water Scarcity

Katta: It is a temporary structure made by binding mud and loose stones available locally. Built across small streams and rivers, this stone bund slows the flow of water, and stores a large amount (depending upon its height) during the dry months. The collected water gradually seeps into ground and increase

the water level of nearby wells. In coastal areas, they also minimize the flow of fresh water into the sea. It is a cost effective and simple method, used widely in rural areas. Series of stone bunds built one behind the other have proved to be more effective than modern concrete dams in some villages, as these local structures can be easily repaired by farmers themselves. Although they require many skilled laborers during construction, the cost is mostly shared by all the villagers as it is a common structure. However, with more people opting for personal borewells and handpumps, the water level in open wells has gone down severely, taking a toll on marginal villages. Thus, rejuvenating these community Kattas can go a long way in sustainable water management.

**Sand Bores:** It provide a safe alternative for farm irrigation without affecting groundwater. This technique uses the concept of extracting water retained by sand particles. Sand particles act as great water filters by retaining the salt content at bottom and gushing pure water out. White sand is believed to yield water clean enough for drinking too. Sand deposits (as high as 15-30 feet) left along banks of rivers is dug using a manual soil cutter. Casing PVC pipes is inserted to act as filter and an electric or diesel motor is used to pump sweet water out. The entire set-up costs around INR 5,000-7,000 and requires less maintenance when sand deposits are fine and clean. The sand bore technique has been used in Karnataka since decades. The only drawback is that it can only be practiced in coastal areas or in areas with high sand deposits.

**Madaks/ Johads/ Pemghara:** These water soak pits called as Madakas in Karnataka, Pemghara in Odisha and Johads in Rajasthan, are one of the oldest systems used to conserve and recharge ground water. Constructed on an area with naturally high elevation on three sides, soil is excavated to create a storage area and used to create a wall on fourth side to hold water. Johads collect monsoon water, which slowly seeps in to recharge groundwater and maintain soil moisture. Sometimes, many Johads are interconnected with a gulley or deep channels with a single outlet in a river or stream nearby to prevent structural damage. This cost-efficient and simple structure requires annual maintenance of de-silting and cleaning the storage area of weed growth. Water from Johads is still been widely used by farmers to irrigate fields in many parts of India. In fact, the arid state of Rajasthan has seen a drastic improvement in water conservation due to the efforts of Rajendra Singh of Tarun Bharat Sangh to revive Johads. What needs to be done today is revival of old Johads, many of which have fallen into disrepair due to growth of weed plants and dumping of waste.

**Bawdi/Jhalara:** These step-wells are grand structures of high archaeological significance constructed since ancient times, mainly in honor of kings and queens. They are typically square shaped step-wells with beautiful arches, motifs and sometimes rooms on sides. Apart from storing water for basic needs, they at times also served for water sports.

Located away from residential areas, the water quality in these Bawdis is considered to be good for consumption. The typical lifespan of Jhalaras is around 20-30 years. Built with large investment of money and numerous skilled laborers, these magnificent structures today stand discarded by society.

**Bamboo Drip Irrigation:** Innovated by tribes of north eastern states, this technique economically uses water during dry seasons. It is practiced in hilly areas where construction of ground channels is not possible due to sloppy and stony terrain. This arrangement taps spring water to irrigate fields. A network of channels made by bamboo pipes of various diameters (to control flow), allows downward flow of water by gravity. An efficient system can reduce around 20 liters of inflow water running over kms to 20-80 drops per minute in agricultural fields. Construction material such as bamboo and fiber is locally available. It is cost effective requiring less maintenance and only 1-2 labourers, who use tools to create a network of bamboo pipes to irrigate one hectare of land in 15 days. The system lasts for around three years after which the wood rots and decomposes to become nutrient-rich soil. It has been replicated in urban areas too, where water stored on roof top tanks is flown through bamboo channels to irrigate fields and back gardens. Main advantage of the system is that it does not pollute like plastic counterparts and is very economical and simple to construct.

Rooftop Rain Water Harvesting: All of us who directly consume water are the most important stakeholders in managing water. While many of us urbanites use or waste a lot of water, we rarely make an effort to conserve it. Fortunately, the rainwater harvesting method has provided a solution that can be practiced easily in every household. It is a simple model where the roof acting as a catchment for rainfall, which after flowing through a series of filters and pipes is stored in ground-level containers for direct use or recharged into ground water. Given below is a simple formula to calculate the water that can be collected from your rooftop.

**Tech Specs Table:** An area of 1,000 square feet with 1 inch of rainfall is estimated to yield 550 gallons of water. For an existing building, the cost of water harvesting systems can range from Rs 10,000 to Rs 30,000. Designs have been formulated for both pukka and kutcha houses to make it a household activity. In a running model, the stored water has been widely used for irrigation, domestic usage as well as animals. D&D Ecotech services, Jalprapat drillers, water harvesters and NirmalJal are some of the reliable service providers of this technology. For new buildings (with more than 100 sq meter area), rainwater harvesting has been made mandatory by few state governments like Delhi, Haryana, Uttar Pradesh and Himachal Pradesh.

**Ferro-cement Tanks:** This is a low cost alternative for expensive water harvesting containers made of masonry, plastic and RCC. It has proved highly effective in high rainfall regions where large amount of water need to stored in clean form. These tanks requiring materials like sand, cement, mild steel bar and galvanized iron wire mesh, can be easily constructed by semi skilled labours. It's light in weight and can be moulded into any shape required. It is believed to last for around 25 years with little maintenance. Picture alongside shows a ferro-cement tank under construction.

### 2.2 Innovative Devices to Mitigate Water Scarcity Problems

Joy Pumps: Ever imagined filling up an overhead tank by just kids playing around? This innovation was designed to mitigate water scarcity problems in villages with no clean surface water source, no electricity and poor monetary capacity. Attached below a merry-go-round wheel or a see-saw, is an arrangement similar to a conventional hand pump. As children ride on these wheels, groundwater is drawn and tank (around 8-10 meters above ground) is filled. It can also be used to pump water from bore wells and large storage tankers. It can be installed even at far off places and has easy maintenance. It is basically a community structure and can be set up in schools, parks, villages and relief camps. It has been used in developing countries like India and Africa. Span pumps pvt limited, a Pune based company is designing such pumps in India.

**Cycle Run Water Pumps:** A saver of time and cost of electricity and fuel, this technology utilizes human power generated by pedalling a bicycle to lift water from streams, ponds, canals and wells. When the cycle is pedalled, it creates an up and down motion of pistons which pressurizes water flow to outlet. A portable model which can be installed on site has also been developed. Designed for small scale farmers who don't have capacity to afford costly diesel run motors, this arrangement can bring a flow of 100 litres per minute. The complete unit made of cast iron and aluminum costs from rupees 2500 to 7000. These pumps have also supported women, kids and old people who at times found operating hand pumps in bend position a strenuous task. Some models have replaced bicycle by steppers, making pumping water a healthy and fun activity. In India, it was conceptualized by poor farmer from a village of West Bengal, Nasiruddin Gayen in 1980s. Xylam water solutions, a Vadodra based company is also designing and selling this innovation. If made applicable in urban areas, this concept can do wonders in making people realize importance of water and lose some calories too.

**Water Wheel:** This innovation comes from a foreign visitor who was inspired by women from villages of Rajasthan, who carried round earthen matkas on their heads for long distances in hot weather. This invention has made carrying water not only an effortless but fun activity. It is a round wheel shaped storage tanker with an attached handle on top to provide painless mobility. It has already become popular in villages of Gujarat, Madhya Pradesh and Rajasthan. Designed to reduce the drudgery and save time of working women, water wheel can store upto 10 to 50 litres of water in hygienic conditions. It's designed for lasting on rough terrains and made from high quality plastic. It's affordable too costing around 2000 rupees. It was innovated by a US based social entrepreneur, Cynthia Koeing under an organisation called Wello.

Many of us who live in big cities enjoy a carefree lifestyle with 24 hours of running taps, swimming pools and decorative fountains. Rapid urbanization and water pollution has widened the supply and demand gap, putting enormous pressure on the quality of surface and groundwater bodies. Like tanks and canals, wells were also traditionally used for irrigating agricultural land. Some wells provided water for a single crop, though there were many more which provided water for two crops in a year.

- In 2006, more than one lakh wells still have the capacity to provide water for three crops. About 2, 70,000 wells are less than eight meters deep. It was, therefore, recommended that the government should dig another 6, 00,000 wells to irrigate an additional area of 6,50,000 hectares.

- In urban area where we have created concrete jungles; for living multistories residential building and open area are also paved with blocks. Roads are also constructed either with concrete and bituminous top, sides for pedestrian are also covered with concrete blocks., These type of construction left no place for water bodies , tanks open space for natural recharging during raining season.

- I would strongly suggest for creating ponds / water bodies in every colony along with greeneries and its parks should also be created with water bodies with roof top having landscaping for greeneries. Colony roads containing with side channels must lead to the said park water bodies and its overflow should be connected to bigger Nali for disposal. Such water bodies will get recharged during rain fall and water table level of the colony will improve. Since clean water is destined to become one of the rarest commodities soon, thus the general public is to be educated about the significance of storing, recycling and reusing water. This will also help to achieve the government announced ambitious target of providing piped clean drinking water to all rural households by 2024.

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