

Water: India's Scarce Resource and the Challenges Ahead

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ABSTRACT

Every economy has a set of resources, which are limited and as economic resources usually are, is that it is scarce in nature. Scarcity is the basic problem of economics, where there are unlimited needs and wants of the people, but it is matched with finite resources (Daoud, 2010). The very nature of scarcity is that it is a problem of choice, as individuals have to allocate these scarce resources, here water, in a way that the opportunity cost is optimized, and the best option of production is chosen (Daoud, 2010). Water, a prized natural resource of India needs to be conserved, as pollution and wastage by household of the same, are depleting the scarce resource. Indian households waste approximately forty-five litres of water per day, as per the Indian Education Bureau.

Keywords: *Water conservation, Natural resources, Indian Economy, Water management*

I. INTRODUCTION

Human wants are never satisfied, as when a need is addressed, a complementary or a completely new need arises. There are essentially four factors of production that are identified in economics, namely land, labour, capital and enterprise (Zwane, 2012). Here we will consider land, and thereby water. Land, as a natural resource encompasses all land that is agricultural, non-agricultural and all resources which are under or above it. By this definition of land, we can understand that water is a resource which is part of land; and natural resources being gifts of nature (Kanner, 2015). Water, which is a free gift of nature may be under as ground water and aquifers and relief above, as rivers, lakes, and glaciers. Water is one of the most valuable natural resources, as it is essential for the survival of life form on earth. India, a country which is called home by more than 18 percent of the world population, has a meagre 4 percent of global water resources at its disposal (Ghoshal, 2019). India is heavily reliant on naturally occurring water sources for agriculture, with the majority of the population not dependent on irrigation, and rather on rainfall,

rivers, groundwater, aquifers and lakes (Liu, et al., 2015). However, the availability of freshwater for human consumption is not unlimited, and it is imperative to use this scarce resource wisely, without wastage (Liu, et al., 2015). Freshwater is threatened by not only overexploitation, but also by contamination as the rivers and lakes are frequently used as dumping grounds (Tripathi, 2018). This crisis of water scarcity is most visible in India as well as in other developing countries, who are yet to employ the best practices of water conservation and liquid waste disposal.

II. OBJECTIVE

The objective of the paper is to outline the scope of scarce resources. The paper will address the Indian water crisis, causes of the same and the step that are being undertaken, and additional steps that can be put in to place to control the water loss being face by the nation. Issues regarding water pollution and consequence of depletion of groundwater and aquifers will be addressed as well.

III. METHODOLOGY

The research paper is reliant on external secondary data research, and expand upon previous studies. The paper aims to determine the true challenges faced by India with respect to the quickly depleting scarce resource of water in the country. In order to do the above the research, the paper has explored various government statistics, institution wise statistics and published research work of a similar nature. Having done so, the paper brings to the forefront ways and means by which the Government of India is trying to stem the dissipation of water with various innovative techniques.

IV. WATER RESOURCES OF INDIA

The Indian landmass, the seventh largest country in the world, has foundations in the Indian Plate, which, in turn, is the Indo-Australian Plate's northern part, with a total area of 3,287,263 square kilometres (1,269,219 sq mi), and a coastline 7,516.6 km (4,671 mi) long (Dikshit, et al.,

2020). 14,500 km form the complex inland navigable waterways of India, of which twelve rivers form the major source of water, all of whom together accumulate a total catchment area exceeding 2,528,000 km² (976,000 sq mi) (Prasad, 2019). India has three prime watersheds, namely, the Himalaya and the Karakoram ranges, Vindhya and Satpura range in central India and Sahyadri or Western Ghats in western India, from which the majority of the Indian rivers take birth (Central Ground Water Board, 2019). One of the largest snow-fed river networks, the Himalayan river networks have a perpetual supply throughout the year, on the contrary, the Vindhya and Satpura range in central India and Sahyadri or Western Ghats in western India rely on the Indian monsoons to feed the water system dependent on them (Central Ground Water Board, 2019). The Indus, Jhelum, Chenab, Ravi, Beas, and Sutlej are pumped with water from the Himalaya (Tayal, 2019). Although the southwest monsoon rains are a source of great amount of rainfall in, thereby making the Brahmaputra and other rivers to distend their banks and enrich the numerous rice paddy farms, the flipside is that this annual distention causes tremendous devastation, as countless homes are washed away by floods or when the river changes its course due to siltation, eroding the merges finances and resources of the individuals who live at the banks of the river (Purkayastha, 2017). Wetlands too are a major source of water, and are home to a diverse ecosystem, with the same found in the cold expanse of the Ladakh region and also in the wet and humid climate of peninsular India (Balasubramanian, et al., 2013). According to Ramsar Convention on Wetlands of 1971, wetlands are defined as - "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres." (Nune, 2016). India also has a robust groundwater system, which stands as a source of water, which has low capital cost (Jha, 2009).

V. CURRENT SCENARIO AND CHALLENGES AHEAD

As per the Composite Water Management Index report, released on 14th June 2018, it is evident that the demand of water will far exceed the supply of water by 2050, causing a severe water crisis, pushing the already bleak situation to the brink (Kant, 2018). The situation is dire, as on an average, greater than forty percent of the annual surface water is consumed per annum. Such a

situation leads countless people, almost 820 million individual across the 12 prime river basins, to die as they consume contaminated water or have no access to water in itself; it's estimated that these poor conditions will further worsen as we move towards 2050 (NITI Aayog, 2019). NITI Aayog has called for "immediate action" as growing scarcity of water puts food security of the nation at risk, given that large agricultural producers are struggling to manage their water resources effectively (NITI Aayog, 2019).

5.1 UNEVEN DISTRIBUTION AND POOR QUALITY OF WATER

Certain regions have surplus amounts of water for their need while others face perennial droughts for most of the year. For instance, Drought is a recurrent phenomenon in Andhra Pradesh where no district is entirely free of droughts. Rajasthan is one of the most drought-prone areas of India. At the same time, many rivers of India are trans-boundary, leading to further water related conflicts, as opposing States claim the water body. This problem is repeated seen in the water related dispute of India, the prime example being the years long conflict between Tamil Nadu and Karnataka regarding the ownership of the Kaveri river (Pearce, 2006). This problem began when in 1927 Karnataka built the Krishnaraja Sagar Dam, and as a counter Tamil Nadu built the Mettur Dam in the 1930s. Both States have encouraged their respective farmers to make irrigation networks and increase the production of cash crops, which are highly reliant on water (Pearce, 2006). This has led to a bitter dispute between the two states as both need the Kaveri river's resources, but Karnataka being the upstream state, pulls the strings and is a dominant position in this feud (Pearce, 2006). But the main point to note is that the Kaveri river, in turn depends on the annual rainfall for replenishing its waters (Datta, 2020). The quality of the available drinking water is so bad, that individuals that consume it are at risk of poisoning and are susceptible to water borne diseases. India comes in at 120, out of 122 nations surveyed for water quality, an alarming figure, with upwards of 163 million individuals, and more than 4 crore in rural parts of the nation, deprived of clean and potable water (Datta, 2020).

5.2 DEPENDENCE ON RAINFALL

India receives the majority of precipitation in the monsoons, lasting for 3-4 months. The Indian agricultural sector is very essential for the economy, as the same accounts for approximately 14% of the economy, and providing employment to

millions (Lee, 2019). The Indian economy is reliant on the monsoons for watering the crops, as it's also the cheapest method; thereby being the lifeblood of Indian agriculture, with more than 55% of arable land at the mercy of rainfall (FE Online, 2018). Union Ministry of Water Resources says, "India receives an average rainfall of about 1170mm which corresponds to an annual precipitation of about 4000 BCM(Billion Cubic Metre) including snowfall... nearly 75% of this i.e., 3000 BCM occurs during the monsoon season confined to 3 to 4 month (June to September) in a year"(FE Online, 2018). When rainfall is delayed, or abysmally low, the food production of the economy is severely hampered, leading to sky-rocketing prices and the ensuing inflation, which further strains the stressed economic resources of the nation(Engelke, 2017). This unpredictability of the monsoons wreaks havoc in the lives of the farmers of India, who have to repeatedly deal with droughts, food shortages, mounting debt, and at times over-produced stocks, which can have devastating pecuniary consequences, and personal consequences, as many resort to suicide (Kaushal, 2015). The farmer suicides are higher in areas which tend to receive lesser average rainfall than other states of the country. Daily wage labourers are the worst affected, as when the finances of the farmers dwindle, the first people laid off from work are the daily wage workers; suicides by daily wage workers has increased in the recent times, standing at nearly 22.4% of all suicides in 2018 (Padmanabhan & Dantewadia, 2020).

5.3 OVER-EXPLOITATION OF GROUNDWATER

The Indian people are the largest consumers of groundwater in the world, which is an alarming statistic, as this resource is fast depleting, with the consumption being more than 230 cubic kilometres of groundwater per annum (The World Bank, 2012). The groundwater of India is being exhausted at an alarming rate, with a decline of more than 61% in the groundwater levels from 2007 till 2017 (Datta, 2020). When the ground water is consumed sustainably, it has a chance to be replenished when the rains arrive. However, more and more groundwater is being extracted by mining, which does not allow the groundwater to recharge, thereby leaving that area unusable for the future (Datta, 2020). Ground water is further impacted by pollution. There is arsenic contamination due to large scale industrialisation and dumping of effluents, and arsenic being a carcinogen, can lead to related diseases such as skin disorders, skin cancers, internal cancers

(bladder, kidney, and lung), diseases of the blood vessels of the legs and feet, possibly diabetes, increased blood pressure, and reproductive disorders (Shankar, et al., 2014). Groundwater helps to counteract against unpredictable rainfall, which is characteristic of Indian monsoons; but if we over-exploit groundwater, what buffer do we have to water crisis? This will have grave consequences for the sustainability of agriculture, food security and livelihoods for the Indian population, which too, is one of the highest in the world. Ground water collects rainwater, but with climate change making weather patterns unpredictable and more extreme, it is more difficult for groundwater to be replenished, and hence it is imperative to conserve it (Ghoshal, 2019).

VI. STEPS UNDERTAKEN TO ADDRESS WATER SHORTAGE

The Government of India has undertaken numerous steps and projects to address the water crisis that India faces. The Government of Maharashtra and the World Bank together manage The Maharashtra Water Sector Improvement Project, with an aim to manage the water resource of the State sustainably and improve irrigation facilities and capacity of Maharashtra, with the objective to reduce the high rural poverty of the State (Haskoning, 2010). The Ganga river basin, the life line for countless individuals, also extending to parts of Nepal, China and Bangladesh, accounts for approximately 26 percent of the Indian landmass and 30 percent of its water resources(The Energy and Resources Institute, 2019). The aim of the initiative is to rejuvenate the quality of the Ganga, so that not only is the biodiversity of the river restored, but also raising awareness to stop dumping industrial pollutants and rubbish into the rivers. There are steps that common people can do to conserve water, and these do not require extensive financial investment, such as shutting off running water in households, collecting rainwater to clean utensils and farming. Rainwater harvesting is essential in the effort to conserve and renew the amount of water resource the country has, in order to cater to its rising population, and rapid urbanisation that is pushing up the water demand against a fast evaporating supply, even though there is repeated flooding during monsoons (Standing Committee on Urban Development, 2019). State governments can strengthen catchment areas for collecting and reusing rainwater. The West Bengal Accelerated Development of Minor Irrigation Project for India, a World Bank Group project, aims to help small farmers to better utilize the water resources at their disposal, and to also

employ the use of irrigation systems, increase the agricultural production of the region and also advance rural livelihood of the people involved in agriculture, horticulture and fisheries (The World Bank, 2011).

VII. CONCLUSION

It is crucial to take steps to conserve our scarce water resource, and every household and community, over and above the government, has to become involved the protection of water resources; this will give people greater ownership over the water projects, including watershed development, soil and water conservation and rainwater harvesting (Sivanappan, 2006). Wherever it is possible, we should reuse and recycle waste waters in order to reduce the pressure on fresh water, with a conservationist mindset when dealing with the water resource of the nation (Agarwal & Agarwal, 2006). There needs to be active supply management by way of conserving the water resource, development of treated water plants, and locating new sources of water, and active demand management which will entail educating the masses about reducing usage of water for wasteful activities as increasing population is stressing the already depleted water resource (Boberg, 2005). Efficient water management has to be put into place by the government and the people of the country, to effectively manage the dire situation of physical water scarcity that is plaguing India.

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