Helping India Increase its Fresh Water Availability: Focusing on Targeted Policies

IMAGE 1: POLLUTION CANALS THROUGH AGRICULTURE FIELDS. KANPUR, INDIA, 2014. PHOTO © MUSTAFAH ABDULAZIZ

KEY FINDINGS

Per capita freshwater available is continually decreasing for several decades.

Inefficient freshwater use severely damages the environment due to poor public authority water management

Current projects implemented are inept and have done little to improve a worsening situation

EXECUTIVE SUMMARY

India has already witnessed the severity of the impact of insufficient water in terms of damage to the economic development, health, ecosystems, and food production. This analysis was carried out using data based on the impact of human activity and climate change on the freshwater level. It was found that the current level and share of clean drinkable and freshwater available per citizen have been diminishing through time. Moreover, the water system is not functioning properly because of a lack of regulations, control, and finance. On top of that groundwater levels are worsening mostly due to excessive use. However, even though the actions of the Ministry of Jal Shakti have shown a visible positive impact on the Indian situation, most of current policies implemented by different organizations and institutions have yet not shown any positive impacts because of an out-of-breath bureaucracy and outnumber inefficient policies. Improving the water pipelines network and regulating the overexploitation of groundwater are some of the immediate environmental reform initiatives that are urging to be implemented. Overall, the local, national, and international authorities must considerably reform and improve the means already in place to control and manage their freshwater availability in order to provide a sufficient and equitable access to the population.

WHAT IS AT STAKE?

In India, 163 million people, or (12%) of the population do not have access to safe drinking water and struggle to access it daily (JMP, 2017). They have no alternative but to drink dirty water. In 2011, 130.600.000 people lived in areas where at least one pollutant was exceeding national safety standards and 20 million people lived where at least three pollutants exceeded safe limits (Shiao et al., 2015). They conjointly lack enough for laundry, cooking, cleansing, and producing enough food. As a result, they are weaker, this strongly impacts their health and education or professional life (JMP, 2017).

FOUNDATION SCIENCE: DISCUSSION & ANALYSIS

Level of freshwater available through time

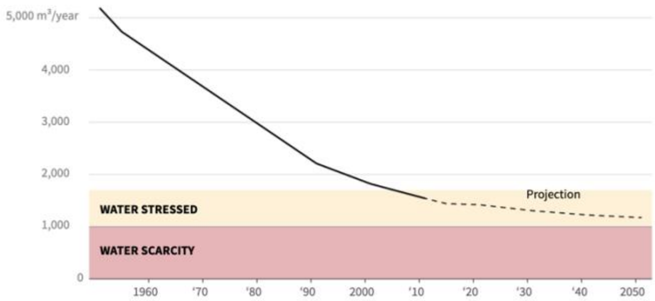


FIGURE 1: PER CAPITA WATER AVAILABILITY IN INDIA (M^3/YEAR) (GURMANBHATIA, 2019)

From 1950 (5.177 cubic meters of water) to 2011 (1.545 cubic meters of water) per capita water availability has decreased by 70.16% (Figure 1).

$$\frac{1.545 - 5.177}{1.545} \times 100 \approx 70.16\%$$

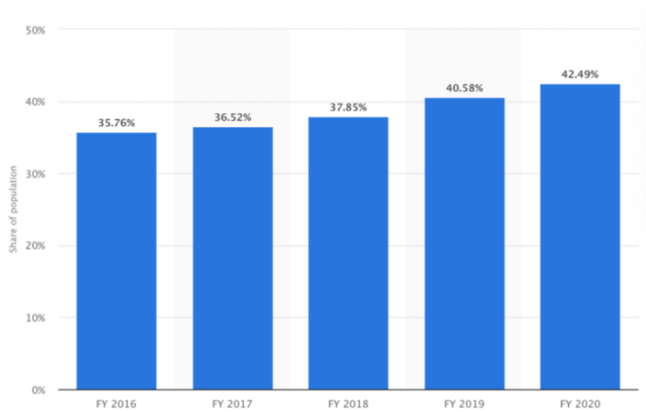
FIGURE 1: PERCENTAGE OF WATER AVAILABILITY PER CAPITA DECREASED

Per capita water availability in the country is reducing due to the continuous increase in population, there are only 1486 cubic meters of water available per person in 2021 (UMSI, 2019). Availability in the South Asian country is projected to sink below 1.300 by 2041 and therefore becoming a water-stressed region (Gurman Bhatia, 2019).

Annually drinking water available per citizen

In 2017, less than 50% of the population had access to safely managed drinking water (JMP, 2017).

FIGURE 2: SHARE OF THE RURAL POPULATION HAVING ACCESS TO SAFE DRINKING WATER IN INDIA FROM THE FINANCIAL YEAR 2016 TO 2020 (JAGANMOHAN, 2020)



In 2020, 42.49% of the rural population of India had access to safe drinking water through a network of pipelines water supply. Thanks to the enlargement of this network the accessibility of freshwater has gradually improved in the last few years.

Repartition of the freshwater by activity

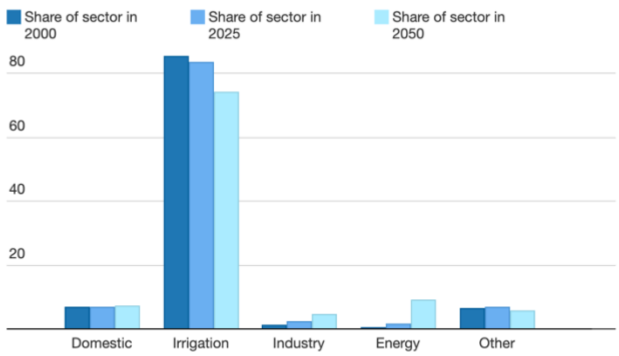


FIGURE 3: PREVIOUS AND FUTURE SHARE OF WATER BY SECTOR (UNION MINISTER OF STATE OF INDIA, 2019)

Approximately 85% of the total freshwater available goes to agriculture for irrigation (Figure 3). And 60% of the irrigated land in India is supported by groundwater supplies (Chindarkar and Grafton, 2019). Most of the freshwater available in India is divided through 9,000 km-long water supply lines (ASSOCHAM and EY, 2019). Reports and analysis revealed that 35% to 40% of the total annual freshwater available in India is wasted due to leakages in the network because of unauthorized connections and lack of overhaul and repair. Therefore, India should be able to drastically increase its level of available freshwater.

Climate change impact

Moreover, India is severely impacted by climate change. In 2019 India was the seventh most affected country by climate change (Figure 4).

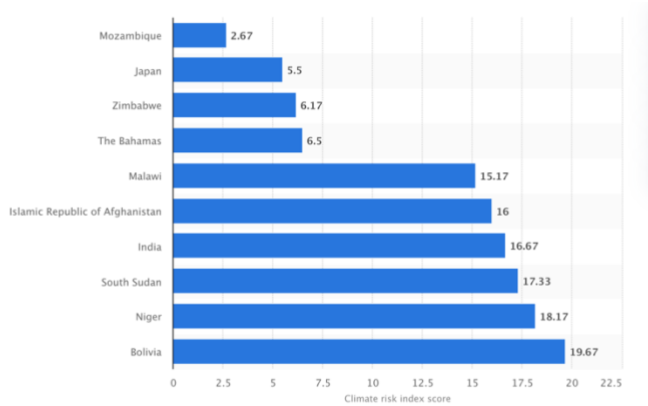


FIGURE 4: CLIMATE RISK INDEX OF THE MOST AFFECTED COUNTRIES IN 2019 (ECKSTEIN, KÜNZEL AND SCHÄFER, 2021)

The country is annually affected by the monsoon season normally lasting from June to September (Mohapatra et al., 2021). However, in 2019, the monsoon lasted a month longer than usual, the 110% excess of rain caused $ 10 billion in damages, a record since 1994 (Eckstein, Künzel and Schäfer, 2021). In addition, with a total of eight tropical cyclones, the year 2019 was one of the most active cyclonic seasons ever recorded. On top of that climatologists found that since the 1970s parts of South Asia have already become drier with stronger and long lasted droughts (PICIRCA, 2013).

Despite a lack of development of irrigation systems in India, pumped groundwater remains the main source of irrigation in the country (Dangar, Asoka, and Mishra, 2021). In the years 1960-1970, the green revolution contributed to the increase of food production in India thanks to the development of irrigation based on the extraction of groundwater (Sannigrahi et al., 2021).

However, the intensive pumping of groundwater in India has now become one of the most important challenges for food, water, and environmental security as it is disturbing India's hydrological cycle (Dangar, Asoka, and Mishra, 2021). More than 50% of India's groundwater levels are severely water-stressed (Figure 5). Extreme use of groundwater resources can have serious concerns, such as seismic activities, deterioration of the ecological environment, and therefore destabilizes access to water and food (Salik Javaid, Khalid, and Zeshan Khalid, 2020).

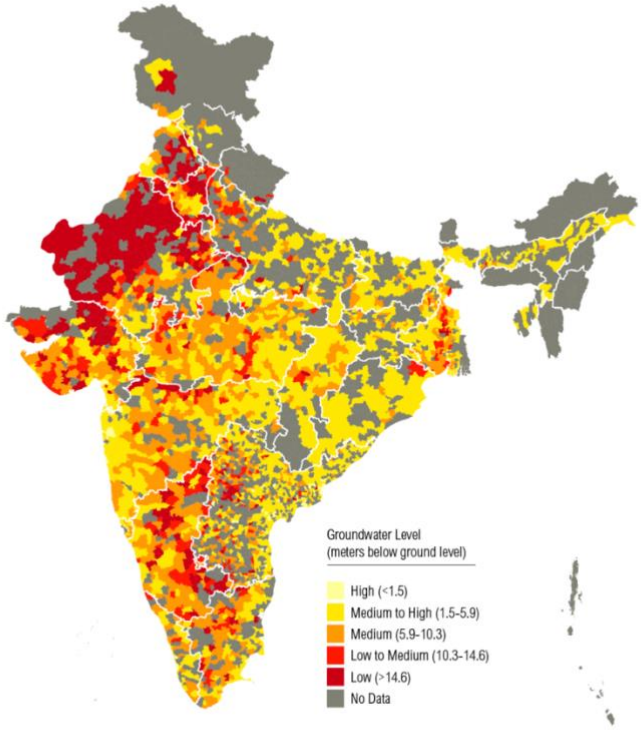


FIGURE 5: GROUNDWATER LEVEL OF INDIA IN 2015 (SHIAO ET AL., 2015)

This chasm (image 2) appeared in a wheat field of the Konya region in Turkey, created by an excessive use of groundwater. The rapid fluctuation of the water level causes hydroseisms, the increase of the frequency of earthquakes due to changes in groundwater levels (Salik Javaid, Khalid, and Zeshan Khalid, 2020). Moreover, the intensive pumping of groundwater dried up the earth and destroyed the flora and fauna of the entire affected area causing an environmental disaster. This anthropogenic phenomenon is now more likely to occur in India if no change is soon made.

IMAGE 2: THE KONYA CLOSED BASIN FIGHTING DROUGHT DUE TO IMPROPER IRRIGATION ACTIVITIES AND UNCONTROLLED AGRICULTURE (HORAC AND AFAD, 2021)

ASSESSMENT OF EXISTING GOVERNANCE

A National Water Policy (NWP) has been in place since 1987 and was revised twice in 2002 and 2012. But all three versions of the NWP have failed to improve water management in India (Pandita and Biswas, 2019). Many states have adopted their water policies and even such policies at the state level have failed to have a significant impact.

IMAGE 3: DEMOCRACY INDIA IS FACING AN OUT-OF-BREATH BUREAUCRACY BECAUSE OF A TECHNOLOGICALLY INEFFICIENT GOVERNMENT. CHANDIGARH, INDIA. PHOTO © J. CARL GANTER

electricity. Other studies suggest that groundwater levels in north-western India can be quickly restored to pre-economic-development levels (Shah, 2014). If farmers in the region change their rice-wheat system that depletes the groundwater. This proves that simple and targeted policies have real impacts on the population and environment of India.

Since 2010, the World Bank (2021), through its Dam Rehabilitation and Improvement Project in India aims to guide institutions to sustainably manage dam maintenance. The ultimate goal is to enable India to manage the impact of climate change on its country. In 2019 floods in India had an estimated cost of US$10 billion (Eckstein, Künzel and Schäfer, 2021). Rehabilitation is therefore essential to cope with drought as well as floods to instore environmental stability. Of the 223 dams that India possesses approximately two-thirds have been either improved, revised, or brought up to standards (Table 1).

INDICATOR		BASELINE	CURRENT	TARGET
Number of project dams with the improved ability (structural or non-structural) to safely cater for the design floods.	Value	40.00	155.00	197.00
	Date	June 2, 2010	January 29, 2021	March 31, 2021
	Comment			
Number of project dams with acceptable stability and seepage.	Value	100.00	180.00	198.00
	Date	June 2, 2010	January 29, 2021	March 31, 2021
	Comment			
Number of project dams with basic dam safety facilities in place.	Value	69.00	184.00	198.00
	Date	June 2, 2010	January 29, 2021	March 31, 2021
	Comment			

TABLE 1: PROJECT DEVELOPMENT OBJECTIVE INDICATORS (WORLD BANK, 2021)

The reasons for these failures are the lack of planning and feasibility studies, social acceptance, regulatory directives, and poor institutional frameworks (Image 3) that have made sustainability impossible (Paulo Pereira, 2020, pp. 1-31).

In 2008, the government of Punjab banned the planting of rice nurseries before the monsoon begins (Singh, 2009). The effects were noted in 2013, the average annual groundwater use rate was reduced by 65%, saving 275 million kWh of

In 2015, with the achievement of the Millennium Development Goals, India succeeded in providing 93% of the population with water supply in rural areas (JMP, 2017). However, with the establishment of the Sustainable Development Goals, the new baseline estimated that ultimately less than 49% of the rural population used safely managed drinking water.

The Ministry of Jal Shakti (meaning “power of water”) aims to provide running water to all households by 2024 (MJS, 2021). Launched in 2018, The Swajal program provides sustainable access to safe drinking water for people living in rural areas (MDWS, 2018). The Program enables communities to plan, design, and monitor drinking water systems in their village. It has provided 18. 6 million people with access to safe drinking water while reducing the environmental impact of their water use (MDWS, 2019).

Moreover, one of the greatest activities of this ministry is to clean up the Namami Ganges River (MJS, 2021). However, the parliamentary standing committee on water resources (2019), has revealed the failure over the slow pace of the Ganga cleaning and therefore urged the central government to address sanctions toward the projects.

GOVERNANCE RECOMMENDATIONS

Targeted water policymaking aims to tackle problems such as water availability, droughts, floods, and water quality so that this resource can rapidly fulfil its three functions: social, economic, and environmental sustainability (Kumar, 2018, pp.259–280).

A study focused on the effects of quality and quantity information on effective decision-making shows that implementing too many policies can be counterproductive (Keller and Staelin, 1987). Being aware that this study could be outdated, the findings still hold true as they do not relate to a historical context but rather to the general human cognitive capacity. It was found that the quality of information improves the efficiency of decisions while the amount of information decreases it. Additionally, researchers have warned that when there are too many policies in place on a single topic, they can lead to poorer results, citing numerous results from lab experiments showing that humans are cognitively limited (Everett and Fiske, 1951; Miller, 1956). For those reasons, to strengthen water governance, it is necessary to synthesize the various policies related to water within the country to improve their coherence and coordination to create more effective policies (Hudson, Hunter and Peckham, 2019).

The country must now move from the Green Revolution to the Revolution on farmers' income and ecologically sustainable agriculture and water management (Ghosh et al., 2020). Therefore, the long-term sustainability of agriculture and water management must be based on four objectives: reasoned agricultural practices, mitigation, and adaptation to climate change, diversification of high value-added crops that require less water demanding, and biodiversity management. These principles should not only be financed but also explained to the population so that they become aware of the gravity of the current situation (Kumar, 2018, pp. 259-280).

Due to the dramatic situation of groundwater in India caused by the constant depletion of groundwater, legislations to stop overexploitation and the adoption of a rational water policy based on a volumetric system are needed (Salik Javaid, Khalid and Zeshan Khalid, 2020). To ensure the management, conservation, and equitable distribution of water, existing institutions need to put in place specific water-related laws, regulations, strategies, and policies that encourage and guide people to take a long-term view of the situation. In a third-party context - world, with a limited role for public partnerships - private in the management of urban water services government is required to have a key role in planning, organizing, and implementing water sector decisions (Gupta 2004).

Finally, mainly because 35% to 40% of the total annual freshwater available in India is wasted due to leaks in the pipeline network, current water tariff levels in India are too low to even cover operating costs (ASSOCHAM and EY, 2019). For this reason, studies have shown that investing in pipeline repairs is essential to improve the financial situation of water services (Singh, Upadhyay and Mittal, 2005). Indeed, the money then saved can be reinvested in the improvement of current networks, or its maintenance, etc. so that India can advance toward a sustainable water future (Sargaonkar, Kamble and Rao, 2013).

LIST OF CITED REFERENCE

ASSOCHAM and EY (2019). Think Blue. ASSOCHAM.
Chindarkar, N. and Grafton, R.Q. (2019). India's Depleting groundwater: When Science Meets Policy. Asia and the Pacific Policy Studies.

Dangar, S., Asoka, A. and Mishra, V. (2021). Causes and implications of groundwater depletion in India: A review. Elsevier B.V., 596(126103).

Eckstein, D., Künzel, V. and Schäfer, L. (2021). Global Climate Risk Index 2021. Berlin: German watch.

Everett, K. and Fiske, D. (1951). The Predictions of Performance in Clinical Psychology. University of Michigan Press. Ann Arbor: University of Michigan Press.

Ghosh, P.K., Nath, C.P., Hazra, K.K., Kumar, P., Das, A. and Mandal, K.G. (2020). Sustainability Concern in Indian agriculture: Needs science-led Innovation and Structural Reforms. Indian Society of Agronomy, 65(2), pp.131–143.

Government of India (2015). hydrological Data. [online] Central Water Commission. Available at: http://www.cwc.gov.in/get-hydrological-data [Accessed 25 Apr. 2021].

Government of India and Ministry of Statistics and Programme Implementation (2012). Drinking Water, Sanitation, Hygiene and Housing Condition in India. Government of India.

Gupta, R.K. (2004). Water Governance in Gujarat state, India. International Journal of Water Resources Development, 20(2), pp.131–147.

Gurman Bhatia (2019). India is running out of water. [online] Reuters Graphics. Available at: https://graphics.reuters.com/INDIA-ENVIRONMENT-WATER/0100B2C41FD/index.html [Accessed 24 Apr. 2021].

HORAC and AFAD (2021). The Konya Closed Basin Fighting Drought Due to Improper Irrigation Activities and Uncontrolled Agriculture. Ministry of Interior Disaster and Emergency Management Presidency.

Hudson, B., Hunter, D. and Peckham, S. (2019). Policy Failure and the policy-implementation gap: Can Policy Support Programs help? Policy Design and Practice, 2(1), pp.1–14.

Jaganmohan, M. (2020). Share of rural population having access to safe drinking water in India from the financial year 2016 to 2020. Statista.

JMP (2017). Safely managed drinking water. WHO and UNICEF.

Keller, K.L. and Staelin, R. (1987). Effects of Quality and Quantity of Information on Decision Effectiveness. Journal of Consumer Research, 14(2), pp.200–213.

Kumar, M.D. (2018). Water Policy Science and Politics: an Indian Perspective. Amsterdam, Netherlands; Oxford, United Kingdom; Cambridge, Ma, United States: Elsevier, pp.259–280.

MDWS (2018). A Community Led Approach to Rural Piped Drinking Water Supply. Ministry of Drinking Water and Sanitation.

MDWS (2019). Annual Report. India: Ministry of Drinking Water & Sanitation.

Miller, G.A. (1956). The Magical Number Seven, plus or minus two: Some Limits of Our Capacity for Processing Information. Psychological Review, 63(2), pp.81–97.

Minister of Jal Shakti (2021). National Mission for Clean Ganga. [online] National Mission for Clean Gang, Ministry of Jal Shakti. Available at: https://nmcg.nic.in/ [Accessed 25 Apr. 2021].

Mohapatra, M., Kumar, N., Mishra, K. and Devi, S. (2021). Journal of Earth System Science. Springer, 130(1).

Pandita, C. and Biswas, A.K. (2019). India's National Water Policy: "feel good" document, nothing more. International Journal of Water Resources Development, 35(6), pp.1–14.

Paulo Pereira (2020). Advances in Chemical Pollution, Environmental Management and protection. Volume 4, Soil degradation, Restoration and Management in a Global Change Context. London: Academic Press, pp.1–31.
Potsdam Institute for Climate Impact Research and Climate Analytics (2013). Turn Down The Heat. The World Bank.

Salik Javaid, M., Khalid, L. and Zeshan Khalid, M. (2020). Analytical Study of Environmental Impacts and Their Effects on Groundwater Hydrology. IntechOpen.

Sannigrahi, S., Pilla, F., Zhang, Q., Chakraborti, S., Wang, Y., Basu, B., Basu, A.S., Joshi, P.K., Keesstra, S., Roy, P.S., Sutton, P.C., Bhatt, S., Rahmat, S., Jha, S. and Singh, L.K. (2021). Examining the Effects of Green Revolution Led Agricultural Expansion on Net Ecosystem Service Values in India Using Multiple Valuation Approaches. Academic Press, 277(111381), p.

Sargaonkar, A., Kamble, S. and Rao, R. (2013). Model Study for Rehabilitation Planning of Water Supply Network. National Environmental Engineering Research Institute, 39, pp.172–181.

Shah, T. (2014). Groundwater Governance and Irrigated Agriculture. Global Water Partnership Technical Committee.

Shiao, T., Maddocks, A., Carson, C. and Loizeaux, E. (2015). 3 Maps Explain India's Growing Water Risks. [online] World Resource Institute. Available at: https://www.wri.org/insights/3-maps-explain-indias-growing-water-risks [Accessed 27 Apr. 2021].

Singh, K. (2009). Act to save Groundwater in Punjab: Its Impact on Water table, Electricity Subsidy and Environment. Agricultural Economics Research Review.

Singh, M.R., Upadhyay, V. and Mittal, A.K. (2005). Urban Water Tariff Structure and Cost Recovery Opportunities in India. Water Science and Technology, 52(12), pp.43–51.

Standing committee on water resources (2019). First Report: Demands for Grants. Standing Committee on Water Resources.

Truelove, Y. and Cornea, N. (2021). Rethinking Urban Environmental and Infrastructural Governance in the everyday: Perspectives from and of the Global South. SAGE Publications Ltd, 39(2), pp.231–246.

UNESCO World Water Assessment Programme (2019). Water, Crucial for Achieving SDGs. United Nation.

Union Minister of State of India, Social Justice and Empowerment, and Kataria, S.R.L. (2020). Per Capita Availability of Water.

World Bank (2021). Dam Rehabilitation and Improvement Project. [online] The World Bank. Available at: https://projects.worldbank.org/en/projects-operations/project-detail/P089985 [Accessed 25 Apr. 2021].