

Rahul Chimata

Eden Prairie High School

Eden Prairie, MN

India, Water & Sanitation

Water Sanitation and Availability in India

India is a country located in southern Asia. India, being a peninsula, is surrounded by the Indian ocean in the South, the Arabian Sea in the West, and the Bay of Bengal in the East. Some neighboring countries include Pakistan, Bhutan, China, Nepal, Myanmar, Sri Lanka, and Bangladesh. India has a total land area of 3,287,263 square kilometers, making it the seventh-largest country in land area, and has an estimated population of 1,380,004,385 people. India's population consists of 17.7% of the world population with 35.47% of people living in urban areas, and 65.53% of people in rural areas. India is a socialist, secular, Democratic Republic with a parliamentary form of government, which is federal in structure with unitary features and is the most populous democracy in the world.

Due to the extensive geography of India, the production methods of crop vary to each region. As of 2015, there are 155.2 million hectares of land that is cultivated agricultural land. According to the World Bank's collection of development indicators, about 60.45% of all Indian land is agricultural. Since India's landscape consists of snow-capped mountains, deserts, plains, hills, and plateaus, farming methods vary based on the region(World Bank). In order to produce bountiful crops, all these methods heavily rely on monsoon cycles. The farming systems that significantly contribute to the agriculture of India are subsistence farming, organic farming, and industrial farming. As such India's major crops consist of rice, wheat, millets, lentils, pulses, tea, coffee, sugarcane, oilseeds, cotton, and jute. There are about 145 million farms, each sized around 1.08 hectares. For more perspective, the average farm is the same size as 1.87 football fields. India used to have a smaller number of farms, but in an attempt to increase production, they created more farms with smaller areas of land. Farming is a key component of Indian society, as it makes up more than 50% of the Indian workforce and contributes 17% - 18% to the country's gross domestic product (GDP).

The average household size in India is 4-5 people. Most households are multigenerational, which often include grandparents, aunts, uncles, cousins, siblings, children, and parents. Majority of housing in India is dominated by low-rise apartment buildings. As such, family relations are much more tight-knit compared to the average western family, and if someone dies they are replaced with someone of a younger generation, most notably young children and newborns. 50% of the Indian workforce is related to

agriculture, however there are still other common and popular career choices such as finance, technology, marketing, operations, human resources, accounting, legal, and health. The average annual per capita income for the average family in India is 44,901 rupees according to the LASI survey done in 2017-2018(LASI). However, this is only 39% of the per capita income in the same year according to the National Account Statistics. For a more accurate spectrum of data, it is important to note that LASI is confined to households who have someone of the age of 45 or higher. As per provisional estimates that were posted on January 9th, India's annual per capita income in 2019-2020 was estimated to be 126,968 rupees. The most important thing to note is that India does not publish income statistics. As such consumption estimates are not the best proxy due to the widely varying wage gaps between average Indian citizens. However, the varying wage gaps do not halt access to education. No matter where the school is located, education is considered a basic human right under various articles in the Indian constitution and is free for children 6-14. As such The Indian Education System is one of the largest in the world with more than 1.5 million schools, 8.5 million teachers, and 250 million children. 87% of schools in India are located in rural areas, and 90% of those schools are run by the government. Although education might be free, the quality and experience of that education takes a nose dive with certain rural schools. Some facilities are unable to produce clean water, while others cannot give committed teachers. Similarly, the healthcare system for India is universal. That being said, there is a great disparity in the quality and coverage of medical treatment in India. Healthcare between states and rural and urban areas can be vastly different.

Even though India ranks second worldwide in farm outputs as per the list of countries by GDP sector composition, India is ranked 74 out of 113 major countries on the food security index and ranked 94 out of 107 countries in the Global Hunger Index(GHI). According to the GHI, in 2000, India's score was 38.9, which was placed in the "alarming category" and improved in 2010 to 24.1. Although that score soon increased to 27.2 in 2020 and remained in the "serious" category of hunger(GHI).According to UN-India, there are approximately 195 million people who are undernourished in India(UN-India). One might ask what could cause India's current hunger predicament, and the answer involves multiple factors. For one, the World Bank states that the allocation of water is inefficient, unsustainable, and inequitable. The irrigation infrastructure is falling apart. The overuse of water is being caused by over-pumping aquifers but, each year the aquifers lose one foot of groundwater, making it a limited resource. The Intergovernmental Panel on Climate Change released a report that food security may be a big problem in the region post 2030. Along with the previously mentioned issue, there are also inconsistent government policies that are released for short-term political ends that change agriculture taxes on short notice. Illiteracy and inadequate marketing or finance skills also result in the waste of farm produce. To add to the list of issues, approximately one-third of all food produce goes to waste due to inefficient supply chains.

India is currently facing one of the biggest crises that will go down in history. The country is currently struggling against the world's worst water and sanitation crisis, and this issue is something that can not be fixed by simple water purifiers and regular water pumps. Over 50% of the Indian population is living day-to-day life with no access to clean water, and lack of clean water is a cause for over 200,000 deaths. Sadly, only 82% of rural homes contain water pumping systems, and most of the time, the water isn't cleaned or filtered properly. The situation is constantly worsening by the day, and some key factors to the acceleration of the problem at hand include poor government planning, corporate privatization, human waste, and the waste of farm produce. With every year, at least one-third of the annual crop rots away due to poor supply chains, and the amount of water used to produce said crops are essentially put to waste. With the rising population, the rate at which water becomes more of a precious resource also increases, due to the need to provide sustenance to even more plants and a rising number of people. It is predicted that by 2050, water scarcity is expected to become a number one factor to the cause of a national political conflict. Though on the other hand, families living in areas that are more humid and damp, are able to harvest the water from the atmosphere and rain. Furthermore, clean and sanitized water also acts as a marker for social classes, mainly due to the fact that the closer you are to poverty, the less access you have to clean water. Other issues include the overcrowding of the population. Most people who are poor also live in illegal areas that the government considers inhabitable land, therefore making sanitation even poorer and in turn further reduces their chances of getting access to clean water. An annual assessment done by the government shows that the annual per capita water availability is below 1,500 cubic meters. This is due to climate change, which is causing extreme disruptions in the quantity of rain. India is also rated "High Risk" in the Climate Change Vulnerability Index, as such the country witnessed below-average monsoon for the last couple of years(CCVI). The lack of rainfall also brings about, also brings about reduced water levels in reservoirs. As seen in 91 major reservoirs for the first year of reduced rain, it was recorded that there was a 32% drop in water capacity.

All the issues listed bring about the downfall of food security in India, and the amount of crops needed to feed the large population of India will no longer be produced in large quantities due to the worsening water quality and availability. As a result, the cultivation of certain crops like rice and wheat starts to face large risks due to extreme water scarcity. According to UNICEF data, it is estimated that the economic burden of handling waterborne diseases is \$600 million USD annually. As chemicals contaminate water in over 1.96 million homes, the price and availability of clean water also skyrocket and become more scarce(UNICEF). Though it may not seem like it, the Indian government is constantly looking for new solutions to prevent the development of their current predicament. Prime Minister Narendra Modi announced a plan to provide piped water to every rural household by 2024. There are also private sectors pitching new smart purifiers with the goal of being a long-term solution.

There were more solutions such as producing millions of purified water bottles, though this solution isn't the best due to the fact that “storage, transportation, and exposure to heat still leave the water susceptible to dirt, pollution, and chemical contamination” (Hota). It will also increase the amount of pollution by adding an immense amount of plastic bottles to the surrounding environment. Though in reality, for a sustainable solution to take place, all of the Indian society will have to make an effort to solve the issue at hand.

Though the water crisis is a somewhat complex issue, it can be resolved by a community effort to reduce underground water consumption by installing new regional treatment plants, substituting the existing crops for different crops that consume less water, as well as developing new irrigation systems. India mostly utilizes groundwater compared to other countries. The total amount of groundwater used for irrigation alone has risen from 30%-60%. To make matters worse, with recent changes to India's climate, the monsoon period is gradually getting reduced to almost half the period of time of what it normally used to be, and the intensity of the rain is also somewhat dialed down. Therefore in order to reduce the stress of running out of groundwater, alternative solutions need to be made in order to alleviate the usage of groundwater. It will be extremely difficult to ensure that large corporations do not privatize the essential resource. It is also important to note that India does not have any policies or proper guidelines that dictate the amount of surface and groundwater that can be used. As such, the Indian government should enforce new policies for the purpose of limiting the amount of water that is consumed and used. The next question is to determine which groups of people get priority access to the groundwater. The majority of the source should go to the general public. A vast number of external consumers like corporations, businesses, and agriculture will get a lower portion of the water, mainly due to the fact that farmers can invest in a more suitable, sustainable, and more advanced forms of irrigation. These new systems can involve soil meters, drip irrigation systems, and water flow systems. By utilizing more surface water, crops can be directly watered without having to be seriously treated. Considering that the current irrigation systems are considered to be inefficient, it is important to ensure the irrigation system does not fail and can last for a long time with low maintenance. It should not have any leaks or poor structuring. Considering that the average farm size is about 1.08 hectares, it will cost 337,502.03 rupees to 468,752.81 rupees to install an effective irrigation system, given the average margin of size per each farm.

It is also important to note that there are certain crops that use more water than others, such as rice and sugarcane. Rice can only generate 28,050.17 rupees on average for every acre-foot of water, and sugarcane is also known for selling for very good prices, though it consumes a lot more water compared to other produce. A solution to this issue would be to reduce the amount of water-consuming crops and increase the crops that are substantially more efficient with water. This can include peas, lentils, beans, cauliflower, brussel sprouts, broccoli, corn, and etc. Though speaking from a cultural perspective as well as a way of life, rice is used as a common staple and by reducing the production of rice will in turn force

millions of people to change their food lifestyle. Instead of resorting to other options in the absence of common staples, there can be an increase in trade relations with other nations, such as China. China is considered the world's largest provider of rice, and India comes in at second. By utilizing India's main exports, such as mineral fuels, gems, and precious metals, machinery including computers, and organic chemicals, it is possible to increase the amount of produce India receives from other countries in turn for these exports. Considering that groundwater makes up 40% of irrigation for agricultural usage, by implementing the previously mentioned changes, new crop sets, and new irrigation systems, the usage of groundwater can significantly decrease in terms of agricultural usage and can benefit India in the long run.

Aside from providing a solution to ensure good food security, there is also the issue of sanitizing the water in order for the water to be used for the general population for consumption. According to the Central Pollution Control Board(CPCB), there are currently a total of 269 water treatment plants in India, and only 231 of the plants are operational. Therefore the existing treatment capacity is only 21% of the present wastewater generation(CPCB). In order to increase the amount of usable water, the amount of treatment plants would also need to be increased. To start up new treatment plants, the cost of construction would be 2.5-3 lakh rupees. Considering that each plant has its own operating costs, it would be much more efficient to start up some of the nonoperational facilities instead of constructing new facilities. With the given solutions, it is evident to see that the government will need to enforce policies to control and regulate the usage of ground and surface water. Farmers will most likely need to change their crop rotations by replacing high water-consuming produce like rice and sugarcane, as well as implementing proper irrigation systems. In order to compensate for the reduced production of said staples, trade relations can be improved and built with neighboring nations in order to replace the lost produce and to maintain cultural and lifestyle preferences. The reuse of nonoperational water treatment facilities would also need to be employed in order to provide even more water that is fit for consumption.

Works Cited

- Board, Impakter Editorial. "Water Scarcity: How Climate Crisis Is Unfolding in India." *Impakter*, 18 Sept. 2019, <https://bit.ly/3daMiqY>.
- "Clean Drinking Water." *UNICEF India*, 24 Mar. 2021, <https://uni.cf/3dWHEMf>.
- "Global Hunger Index Scores by 2020 GHI Rank." *Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels*, www.globalhungerindex.org/ranking.html.
- "How People in India 'Really' Live." *Population Reference Bureau*, www.prb.org/howindianslive/.
- "India - Agricultural Land (% Of Land Area)." *India - Agricultural Land (% Of Land Area) - 1961-2016 Data | 2021 Forecast*, <https://bit.ly/3mImzsTl>.
- "India - Rural Population." *India - Rural Population - 1960-2019 Data | 2021 Forecast*, <https://bit.ly/3daJPg0>
- "List of Careers Options & Occupations in India." *Careerizma*, 18 Aug. 2018, www.careerizma.com/careers/.
- National Portal of India*, www.india.gov.in/topics/governance-administration.
- O'Neill, Aaron. "India - Urbanization 2019." *Statista*, 31 Mar. 2021, www.statista.com/statistics/271312/urbanization-in-india/.
- Online, FE. "India's Water Crisis: Is There a Solution?" *The Financial Express*, The Financial Express, 23 Sept. 2020, <https://bit.ly/2Rn7Ury>.
- Pandey, Avantika. "GROWTH OF EDUCATION: RURAL INDIA." *Scicomm*, 8 Aug. 2020, scicomm.in/education/growth-of-education-rural-india/.
- says:, Vastu Consultant, et al. "Housing in India." *The World of Tealida*, 18 Mar. 2021, www.tealida.com/world/india/.
- "Unite For Sight." *Unique Urban Sanitation Issues*, www.uniteforsight.org/urban-health/module4.
- "Water In Crisis - Spotlight India." *The Water Project*, <https://bit.ly/2Rn7YaM>.

