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THE AWARE CONSUMER

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RESEARCH FEATURE
What Constitutes Safe Drinking Water ?

IN FOCUS
Tackling Water Stress

HOW SAFE IS YOUR DRINKING WATER ?

PLUS ROUND UP • MY MARKET • THE PRESCRIPTION

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VIEWPOINT

BEJON KUMAR MISRA | bejonmisra@theawareconsumer.in

Time To Become Water Warriors

Globally, 844 million people lack access to clean water. Without clean, easily accessible water, families & communities are locked in poverty for generations. Children drop out of school and parents struggle to make a living.

ACCESS TO SAFE and clean drinking water is a fundamental human right. Unfortunately, it is increasingly becoming a luxury that only the rich can afford. Water scarcity can be due to physical reasons, for example the lack of adequate groundwater and natural water resources, extreme climatic conditions, geographical terrain among others. And then there is economic scarcity of water caused by mismanagement and overexploitation of natural water resources. This water stress is manmade. It has happened because we have been unmindful and greedy. We have lacked foresight or ignored warnings willfully closing our eyes to the impending disasters.

Just to name three prominent reasons for the global water stress, they are over-exploitation of existing resources by agriculture and industry, pollution and contamination of water resources with our garbage, sewer lines and industry effluents and climate change leading to severe draughts, uncertain monsoon and ravaging floods. Who had heard of dry days during monsoon? But experts say that the number of dry days during monsoon are increasing while we are witnessing rains and hail during other seasons.

When building our cities, we destroyed the existing traditional water reservoirs, the wells and the baolis. But we forgot to build new water storage facilities in our concrete urban centers. We forgot to construct proper drainage systems and used our rivers and canals to empty the cities' garbage. Our metaled roads meanwhile obstructed the passage of rainwater into the ground and even as we exploited the groundwater through our borings, we did nothing to replenish it. Our sewers leaked into the ground and contaminated that precious reservoir too. Our rivers and ponds that once fulfilled the water needs of the rural populace became unfit for consumption. The groundwater became contaminated with arsenic and other hazardous matter that causes cancer and deformities.

All this while we sat and watched thinking nature has plenty of water. But not anymore. Water scarcity is near, present and dangerous to human existence. We need to become water warriors to save the planet.

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Ensures prickly heat rash/boils do not lead to fungal infection	✓	✗
Proven long lasting solution* and not temporary relief	✓	✗
Effective against itching, irritation, redness and rashes caused due to fungal infections	✓	✗

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4 SKIN PROBLEMS

REDNESS RASHES

PRICKLY HEAT FUNGAL INFECTION

BBDO INDIA

*As per the study published in Mycoses Journal, April 2002
+ As per IMS prescription data MAT March 2016 | **Related to fungal infections

glenmark

Message from the Editor-in-Chief

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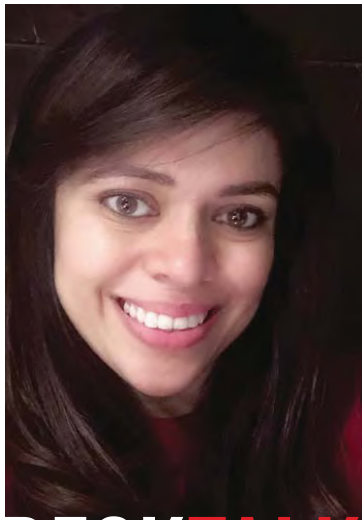

DESKTALK

Water Quality A Big Concern

REPORTS ESTIMATE THE annual impact of water borne disease in India as huge affecting 37.7 million persons annually and leading to the loss of 73 million working days and the death of 1.5 million children from diarrhea alone. And the culprit –contaminated drinking water. As is obvious, the lack of access to clean and safe drinking water has resulted in an acute public health crisis in India and is a matter of grave concern. According to Water.Org, unsafe drinking water is responsible for 21 percent of communicable diseases in the country. And worse, a majority of the affected population is children who are highly vulnerable to water-borne infections. A Forbes report further highlights that 780,000 deaths in India take place annually and these are due to contaminated water. Another report by Safe Water Network states that India ranks 120th among 122 nations surveyed by the UN on poor drinking water quality.

A populous country, India's water problem is further aggravated by the fact that while it is home to 18 percent of the world's total pollution, it has only 4 percent of the total water resources in the world. Apparently, the available water is inadequate to serve the needs of its people. Making matters worse is the mismanagement, pollution and contamination of water resources and the unplanned overexploitation of groundwater resources.

In the absence of adequate measures from the authorities to ensure safe piped water, Indian consumers have increasingly become dependent on commercial water suppliers or on different water filtration devices. However, even this is not without risks as the consumer has no way of knowing if the water that they are getting comply with BIS water quality standards. The government too has raised concern with the Union Environment Ministry issuing a draft notification seeking to regulate membrane-based water filtration systems in areas where the source of water meets drinking water norms of the Bureau of Indian Standards. This primarily affects reverse osmosis (RO)-based water filtration systems and the rules, at least in letter, effectively prohibit homes from installing domestic RO systems. The concern is that a lot of water is wasted in the process and also essential salts like calcium, zinc, magnesium essential for the body are filtered out.

However, till piped water meets the quality parameters, consumers have no option but to rely on what the market offers.

INSIDE

World Health Organizations provides comprehensive guidelines for governments and concerned bodies to help them ensure safe drinking water for consumers.

The constraints in supply of quality and safe water are severe and call for concerted efforts by all stakeholders. For this to happen, water must take center stage through political debates.

Dr. Mahesh Gupta
Chairman and Managing Director of KENT RO Systems Limited, in a chat with The Aware Consumer.

While governments struggle to ensure the quantity and quality of potable water for their citizens, it has boosted the growth of the water testing and packaged water markets among others.

India has developed protocols to govern its water in order to ensure a just and equitable distribution of this precious resource in the prescribed quantity and quality. But implementation is the key.

Since water is a state subject, it is incumbent upon the states to take urgent steps to tackle water distress through a multi-pronged program.

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DR. RAJENDRA SINGH

WATERMAN OF INDIA – IN AN INTERVIEW TO REUTERS

"See, the A-class water of the country, which is supposed to be used for drinking, is used for C-class (agricultural and other) purposes. I give you an example; we can grow sugarcane with C-class water. C-class water is the wastewater from urban centers that can be treated and used for sugarcane farming. That way, we will be able to deal with the issue of water pollution also. Under no circumstances we shall be using groundwater for farming or industrial purposes."

ROUNDUP

The scientific evidence is clear: the climate is changing and will continue to change, affecting societies mainly through water. Climate change will affect the availability, quality and quantity of water for basic human needs, threatening the effective enjoyment of the human rights to water and sanitation for potentially billions of people.

CLEAN DRINKING WATER FOR ALL

On World Water Day, March 22, the **Japan International Cooperation Agency** renewed its resolve to facilitate availability of clean drinking water to all in India.

DATA BRIEFING

21% –

More than 21% of the diseases in India are water-related.

It was World Water Day on March 22!

IMAGE: PIXABAY

WORLD WATER DAY on March 22 passed unnoticed amid the mounting threat of Covid-19 which was declared a pandemic by the World Health Organization. But more than ever, with the emphasis on washing your hands every 20 minutes and in general maintaining hygiene – personal and of the surroundings – it reminded the average Indian of the water crisis. The scarcity of potable water in India is scary.

In this direction, the Japan International Cooperation Agency (JICA) has been working towards improving the condition of water in India, through both water supply and sewerage treatment projects. JICA is committed to improve India's water quality and has extended ODA loans of over 722 billion Japanese Yen (approximately Rs 46,000 crore) towards Water and Sanitation Projects across the country including Agra, Varanasi, Bengaluru, Hyderabad, Jaipur and Delhi amongst other major cities. These projects of JICA together support water supply for 30 million people in India.

This World Water Day, JICA observed it by laying impetus on supplying safe drinking water and mitigation of water resources pollution.

Through its efforts, the amount of available water (per capital and per day) has increased from 37 liter (in 2007, before the project) to 90 liter (in 2017, after the project completion) in municipality area and from 10 liter (in 2007, before the project) to 40 liter (in 2017, after the project completion) in habitation area.

For rural water supply, JICA has extended an ODA Loan of 39,482 million Japanese Yen (approximately Rs 2,632 crore) for the Hogenakkal Water Supply and Fluorosis Mitigation Projects that aim to provide safe and stable drinking water supply to the dependent communities.

JICA has also extended a cumulative loan of 41,101 million Japanese Yen (approximately Rs 2,740 crore) for the Agra Water Supply Project in Uttar Pradesh in an effort to support world-class tourism city. It is expected that 1.7 million people will be benefitted after completion of the project.

JICA has also granted an ODA loan of 28,975 million Japanese Yen (approximately Rs 1,930 crore) to the Delhi Water Supply Improvement Project which aims to provide clean water for all.

Till now, JICA has extended 35 ODA loans, 4 Grant Aids and 12 Technical Cooperation's for the water and sanitation sector in India. On World Water Day, JICA strengthened its resolve to achieve the targets of SDG-6 in India that aims to ensure availability and sustainable management of water and sanitation for all.

Water Security For All Makes Waves

Your Groundwater Is Under Threat Of Contamination

Climate change and urbanization may be the leading culprits for the increasing levels of groundwater organic carbon.

FOR MORE THAN half of the world's population safe drinking water may soon be a pipe dream. As climate change and urbanization lead to increase in groundwater organic carbon, the threat to the quality and availability of drinking become imminent.

According to an UNSW study published in Nature Communications, based on the examination of the largest global dataset of 9404 published and unpublished groundwater dissolved organic carbon (DOC) concentrations from aquifers in 32 countries across six continents, the threat is real and of grave concern.

The research says that while DOC is a naturally occurring component of groundwater, its higher concentration in water makes it difficult and expensive to make groundwater drinkable. For example, in Australia, groundwater is the main source of drinking water in many cities and towns.The study forecasts the DOC concentrations would become elevated because of the changes in temperature and rainfall due to climate change, as well as increased urbanization.

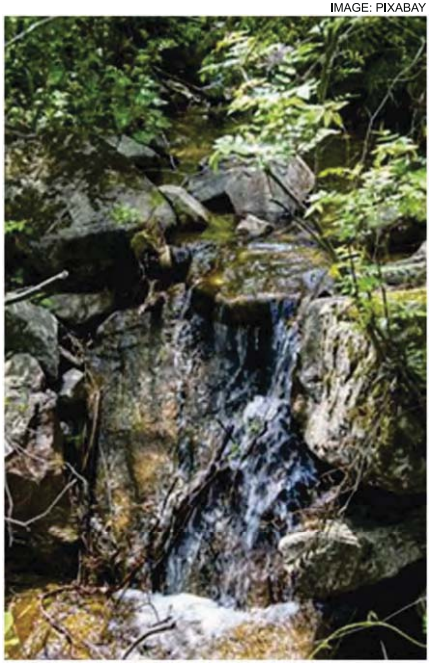
The study identified groundwater DOC concentration increases of up to 45 per cent, largely because of increased temperatures in the wettest quarter of the year; for example, in a number of south-eastern states in the United States where such increases in DOC in these locations could increase water costs for a family of four by US$134 per year.

The study said that in areas such as eastern China, India and parts of Africa that already experience severe groundwater contamination, the issues may be further compounded, by groundwater DOC increases associated with large predicted increases in temperature in the wettest quarter of the year by 2050.

Urbanization is estimated to increase groundwater DOC concentrations by up to 19 per cent as compared to agricultural or natural land use, due to contamination that could occur through, for example, leaking septic and sewer systems.

According to the report, there are four major factors that spike groundwater DOC levels: climate, land use, inorganic chemistry and aquifer age.

IMAGE: PIXABAY



Increasing organic carbon in groundwater poses threats to humanity.

According to the report higher levels of groundwater DOC, whether naturally occurring or brought on by contamination are a threat to human health.The health impacts of DOC are due to the formation of by-products of water treatment chlorination and depend on concentrations of other water chemical parameters, says the report. However, the World Health Organization and many countries do not regulate DOC concentrations in drinking water directly.

DOC though occurs naturally and is a key element of groundwater, when it combines with and transports potentially dangerous heavy metals that are bound to rocks and sediment where groundwater occurs, it becomes a health threat.The report says that this is a cause of concern as many cancer cases can be attributed to drinking water contaminants.

In 2019, WaterAid had launched "Beneath the Surface: The State of the World's Water' to mark the World Water Day. Why it is a wake-up call for India.

IMAGE: PIXABAY

INDIA STARES AT WATER SCARCITY

WATER SCARCITY IS a real threat and in India one billion people are living with water scarcity during at least one part of the year and around 600 million live in areas of high to extreme water stress. Needless to say, India is in the midst of the worst water crisis in its history.

What is exacerbating this water crisis? According to reports, export of food and clothing items is a major reason if production is not sustainable. Hence, while export is an important sources of income, it ends up making life harder for poor and marginalized communities as access to clean water supply becomes difficult, a WaterAid report warned and on World Water Day (March 22) last year WaterAid India called for more sustainable means of production of some identified goods and appealed to consumers to be more thoughtful in their purchasing habits.

Here is the list of products identified by WaterAid that we consume on a regular basis and that have a huge water footprint:

- That morning cup of coffee we cannot do without contains about 200ml of actual water, but the ground coffee guzzles 140 liters to produce. Time to limit that cuppa.
- Wheat, a common household staple accounts for 22% of groundwater depletion. Its global average water footprint is 1,827 liters per kilogram, although this varies by region. A 300gbaguette from French wheat has a much lower water footprint of 155 liters than the global average; but when it comes to India, it has an average water footprint of 1,654 liters per kilogram (which can vary depending on geography and climate). When at the patisserie next do pause and think if it is actually worth eating a baguette?
- Indians are by and large a rice eating nation. But know that while rice accounts for 40% of all global irrigation, and 17% of global groundwater depletion, with an average water footprint of 2,500 liters of water per kilogram; in India, it has an average water footprint of 2,800 liters per kilogram, which again varies depending on geography and climate.

Currently, under two-thirds of the world's population or close to 4 billion people inhabit water-scarce areas, where for at least one part of the year demand exceeds supply. But by 2050, this number is forecast to go up to 5 billion. Further, while one in nine people around the world currently do not have clean water close to home, the figures for India are damning. Take a look:

- Almost one-fourth of the total groundwater extracted globally is being done in India; this is more than that ofChina and US combined. We are thus using the largest quantity of groundwater – 24% of the global total.
- Between 2000 and 2010, the rate of groundwater depletion in India increased by 23%.
- India is the third largest exporter of groundwater – 12% of the global total.
- In India 75% of households do not have drinking water on the premises
- As regards water quality index, India is was ranked 120 among 122 countries in 2019

It is important to note that India committed to the UN Sustainable Development Goal 6 in 2015 under which it has to ensure that by 2030 all Indians have access to clean water, decent sanitation and good hygiene. It is up to us citizens whether we allow the human right to water take precedence over other competing demands by becoming mindful of our purchases and practices that deplete water resources.

Source: Secondary research & media reports

Consumers, Beware

Breakthrough In Water Contamination By Cancer-causing Chemical Compounds?

Scientists may have found a way to destroy dreaded 'forever chemical' found in our drinking water.

IMAGE: PIXABAY

NOT JUST IN India, but groundwater contamination by cancer-causing chemical compounds are also found in wells in the US. In 2019, around two dozen water agencies in Southern California had reportable levels of cancer-causing chemical compounds in their wells. By 2020, this number has swelled to 700 agencies with similar contamination being identified across the United States.

As regards India, a 2017 CNN report had revealed that millions of people in Bihar were exhibiting symptoms of arsenic poisoning, which has been linked to cancer, due to consumption of contaminated drinking water. The tragedy is that the symptoms of poisoning arise after many years of exposure. In one of the most impoverished states of the country, more than 10 million people were estimated to be under threat from arsenic poisoning or arsenicosis from contaminated groundwater.

These chemical compounds are known as perfluorinated alkylated substances or PFAS and earned the sobriquet of "forever chemicals" because for a long time it had not been known how to break them down.

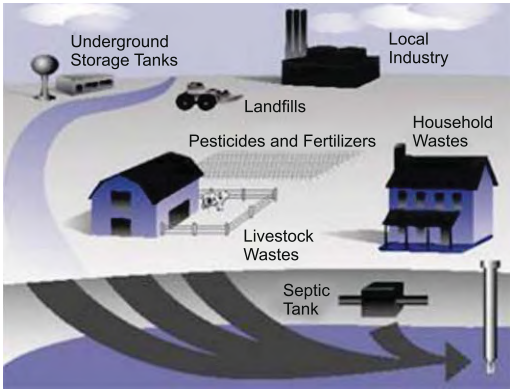
It seems that a way to break down these chemicals has been found by Sharma Yamijala, a computational chemist at the University of California, Riverside. In 2019, Yamijala heard about the issue at a seminar and got down to working on finding a solution with two colleagues at the university. The results of their research project were published in the journal *Physical Chemistry Chemical Physics* in January this year.

PFAS have been used in a wide variety of products since 1940s. It finds usage in food packaging, nonstick pans, paints, cleaning supplies, and smartphones as well. Since these chemical compounds do not break down in the environment, they escape into drinking water and other living organisms, many of which are consumed by humans. The human body also cannot digest these compounds and hence they accumulate inside of us.

The researchers explain that these pollutants are very persistent and last for a long time. The effect of these chemical compounds on humans is devastating as high levels of PFAS intake have been linked to cancer and are also known to lead to low birth weight and thyroid hormone disruption.

To study the chemical structure of the PFAS that are most commonly found in the environment, perfluorooctanoic acid and perfluorooctanesulfonic acid, the researchers used computer simulations. The carbon-fluorine bond that makes up the backbone of these chemicals is among the strongest in organic chemistry, and that is why they seem to last forever. The researchers through their breakthrough study address this. They exposed the compounds to excess electrons — a process called reduction — and found that the bond with the fluorine atom broke. Moreover, the broken molecules that resulted from the process had a domino effect on the remaining PFAS in the water. The researchers found that in the simulation the smaller molecules accelerated the breaking down of the other PFA molecules.

While the results are encouraging, the researchers say more work needs to be done before the process can be applied in the real-world scenarios to decontaminate water.



A well owner must be aware of their well's potential for contamination and the possible health effects those potential contaminants can have.

An important next step for the researchers is to establish whether or not the new molecules created by breaking down PFAS are carcinogenic. The researchers will be running longer simulations in order to understand these new molecules and how they function.

However, the findings are still a major breakthrough as they have the potential to break down the forever chemicals that have contaminated water systems around the globe.

The method of breakdown can be used at water treatment plants and aquifers so that these cancer-causing chemicals are removed before the water reaches consumer households.

Earlier studies on the possibility of using reduction to break up PFAS has led researchers to conclude that this is a cost-effective method.The research is pertinent as despite companies like DuPont who are the traditional users of PFAS in their products have stopped their use over the years, the chemicals are still found to be to contaminating nearly every facet of our environment, especially in developing nations that do not have advanced cost-effective methods to stop the contamination.

Scientists have a large role to play in the cleaning up the environment since they are the ones who created this monster for use by corporations. Hence, it is their responsibility to find a way for people to break these chemical bonds.

Source: Secondary research & media reports

What Constitutes SAFE DRINKING WATER?

World Health Organizations provides comprehensive guidelines for governments and concerned bodies to help them ensure safe drinking water for consumers.

IMAGE: PIXABAY

WHO sets the parameters for safe drinking water.

WATER IS INDISPENSABLE for life. But for humans, we not just need water but safe drinking water. Water should be safe and readily available if we want our people to be healthy. Safe water is required in every aspect of human activity, whether it be for drinking, domestic use, food production or recreational purposes. It is an established fact that improved water supply and sanitation along with optimal management of our water resources, can boost economic growth of a country and help in poverty reduction.

It was in 2010 that the UN General Assembly officially recognized the human right to water and sanitation. The UN recognizes the right of every individual to sufficient, continuous, safe, acceptable, physically accessible, and affordable water for personal and domestic use.

Safe Drinking Water: Sustainable Development Goal 6

Universal and equitable access to safe and affordable drinking water is a specific goal under Sustainable Development Goals. The UN tracks the target with the indicator of "safely managed drinking water services", which indicates drinking water from an improved water source that is located on premises, available when needed, and free from fecal and priority chemical contamination.

According to the data available, in 2017, safely managed drinking-water services were available to 5.3 billion people. It means that these people could use improved water sources located on premises, available when needed, and free from contamination. There were 2.2 billion people who went without safely managed services in 2017. These included:

- 1.4 billion people with basic services, meaning an improved water source located within a round trip of 30 minutes
- 206 million people with limited services, or an improved water source requiring more than 30 minutes to collect water
- 435 million people taking water from unprotected wells and springs
- 144 million people collecting untreated surface water from lakes, ponds, rivers and streams

As is apparent, there are distinct geographic, sociocultural and economic inequalities and these are not just between rural and urban areas but also within towns and cities with those in the low-income, informal, or illegal settlements getting less access to improved sources of drinking-water than the affluent.

How water impacts health

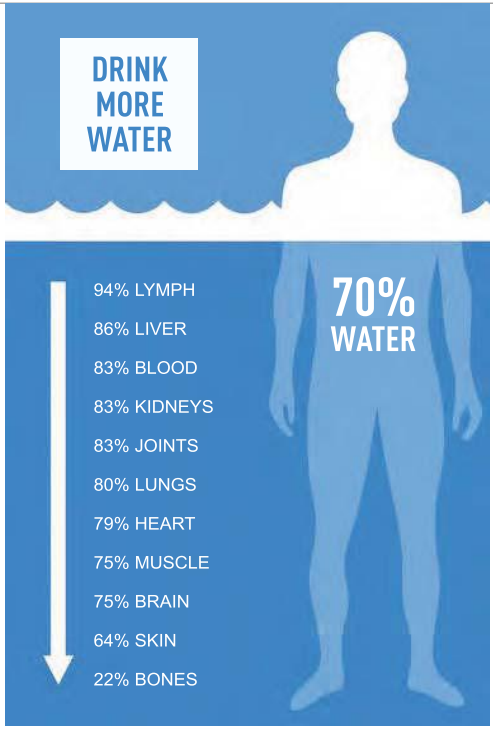
The relation between safe water and health is well established. We all know how contaminated water and poor sanitation lead to the transmission of water borne diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid, and polio. The reasons for many people especially the poor falling ill every year is mostly the absence of or, inadequate, or inappropriately managed water and sanitation services that expose them to such preventable health risks. In places where even the health care facilities lack water, sanitation, and hygiene services, both patients and health care staff are at additional risk of infection and disease. According to reports, 15% of patients around the globe contract an infection during a hospital stay. These numbers are higher in low-income countries given safe water and sanitation both are nearly absent.

The problem is compounded in places where the management of urban, industrial, and agricultural wastewater is abysmally inadequate as this leads to contaminated or chemically polluted drinking water supply for millions of people.

It is a tragedy that diarrhea which is largely preventable kills more than 8,29,000 people annually all because the unavailability of safe drinking-water and sanitation, and the lack of hand hygiene practices. It is estimated that more than 2,97,000 children aged below 5 years could be saved if we could address these risk factors. In

IMAGE: PIXABAY

Universal and equitable access to safe and affordable drinking water is GOAL 6 of Sustainable Development Goals.



Your body is 70% water and all the systems of the body depend on water to function at their highest capacity. Lots of people don't realize how chronic dehydration can impact your overall health and energy levels.

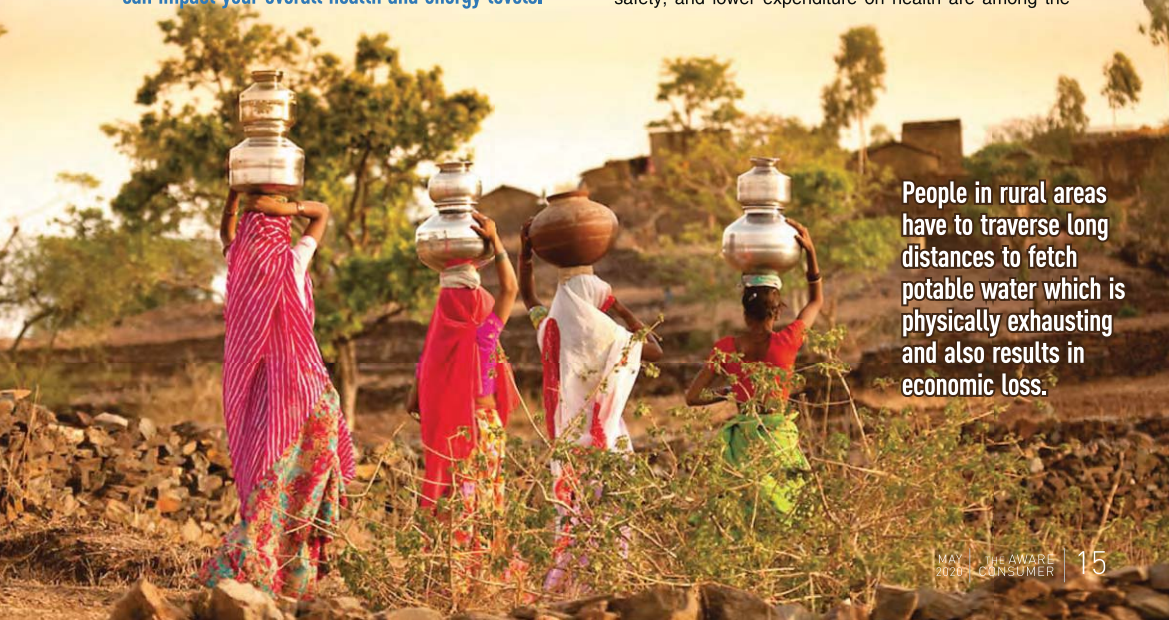
the absence of adequate water, people's priorities are storing enough water to cook and drink rather than washing hands. This leads to contamination of both food and water and is one of the primary causes of diarrhea and other diseases.

Apart from diarrhea, which is most prevalent and known disease to be caused by contaminated food and water, there are other health hazards too causedby unsafe drinking water. One example is Schistosomiasis, an acute and chronic disease caused by parasitic worms contracted through exposure to infested water. In 2017, more than 220 million people required preventative treatment for it.

Insects that live or breed in water also carry and transmit diseases.Dengue fever is one of the most viral threats to human health that claims many lives every year. According to experts, such insects called vectors, not only breed in dirty stagnant water but can also breed in clean water like household drinking water containers. There needs to large scale mass awareness programs to make people understand the importance of covering water storage containers at all times to prevent such diseases. Such simple steps can also reduce fecal contamination of water at the household level.

Water, its economic and social effects and challenges

The economic effects of water availability are many. For example, if safe drinking water is available readily, people who normally have to traverse long distances in search of potable water will not need to do so. This would mean less time and effort required in physically collecting water and more gainful employment in other ways. Personal safety, and lower expenditure on health are among the



People in rural areas have to traverse long distances to fetch potable water which is physically exhausting and also results in economic loss.

advantages as with readily available clean drinking water less people will fall ill. This would also mean they remain economically productive for the larger part of the year. As regards children, safe drinking water means better health throughout the year, better growth, improved school attendance and more positive longer-term consequences.

Water supply systems are under increasing threat. Climate change is creating havoc and leading to increasing water scarcity everywhere. Add to it the growing population pressure on scare water resources, demographic shifts and rapid urbanization. It is forecast that by 2025, half of the world's population will be inhabiting areas that are waterstressed.

To overcome the depleting water resources issue, innovations focused on reuse of wastewater, recovery of water, nutrients, or energy, is becoming an important part of the global strategy. Many countries are finding uses for their wastewater in irrigation; and developing countries are already irrigating 7% of their land with wastewater. However, adopting waste war reuse poses several challenges and adequate safety measures must be put in place before doing it as it poses health risks. But safe management of wastewater promises multiple benefits, including increased food production.

Countries across the globe are investing in research and development in a continuous cycle to develop options for water sources use for drinking water and irrigation. There is an increasing reliance on groundwater and alternative sources, including wastewater while climate change is leading to greater fluctuations in rainwater harvesting as rainfall patterns change. These challenges more than ever call for strategic management of all water resources by governments to ensure adequate availability and quality of water.

WHO's Role

World Health Organization has been spearheading these efforts as the international authority on public health and water quality. It is working and guiding nations on prevention of transmission of water-borne diseases and on the importance of developing health-based targets and regulations.

There are a number of WHO guidelines on water quality, including on drinking-water, safe use of wastewater, and safe recreational water environments. The water quality guidelines are based on managing risks. Since 2004, the Guidelines for Drinking Water Quality have been promoting the Framework for Safe Drinking Water. This Framework recommends establishment of health-based targets, the development and implementation of Water Safety Plans by water suppliers to most effectively identify and manage risks from catchment to consumer, and independent surveillance to ensure that Water Safety Plans are effective and health-based targets are being met. Further, WHO provides support to countries to implement the drinkingwater quality guidelines through the development of practical guidance materials and provision of direct country support. These efforts include the development of locally relevant drinking-water quality regulations aligned to the principles in the guidelines, the development, implementation and auditing of water safety plans and strengthening of surveillance practices.

Guidelines for drinking water quality

The purpose of guidelines for drinking-water quality (GDWQ) is to promote the protection of public health by advocating the development of locally relevant standards and regulations (health based targets), adoption of preventive risk management approaches covering catchment to consumer (Water Safety Plans) and independent surveillance to ensure that Water Safety Plans are being implemented and effective and that national standards are being met.

The Guidelines are a set of recommendations of the WHO for managing the risk from hazards that may compromise the safety of drinking-water. The recommendations should be considered in the context of managing the risk from other sources of exposure to these hazards, such as waste, air, food and consumer products.

The guidelines state that all efforts should be made to achieve the provision of safe drinking-water. It defines safe drinking-water as that water which does not present any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages. It is infants, young children and elderly who are at greatest risk of waterborne disease. It is understood that there will be categories of people who are at greater risk of waterborne illness and will have to take extra precautions such as boiling their drinking-water.

The Guidelines are applicable to packaged water and ice intended for human consumption as well. The WHO Guidelines support the development and implementation of risk management strategies aimed at ensuring the safety of drinking-water supplies through the control of hazardous constituents and contaminants.

The water safety strategies developed by individual countries include national or regional standards developed basis the scientific basis provided in the Guidelines. The WHO Guidelines describe reasonable minimum requirements of safe practice to protect the health of consumers and derive numerical “guideline values” for constituents of water or indicators of water quality.

The WHO Guidelines need to be considered in the context of local or national environmental, social, economic and cultural conditions and it advises that the Guidelines are a part of an overall health protection strategy that includes sanitation and other strategies, such as managing food contamination. What is the acceptable level of risk in safe water or the judgment as to what water is considered safe, is to be decided by the community.

IMAGE: PIXABAY

Water safety plans must take into account the regional and community factors.

WHO recommends a framework for safe drinking water as the basic and essential requirement. This framework should include health-based targets established by a competent health authority, adequate and properly managed systems (adequate infrastructure, proper monitoring and effective planning and management) and a system of independent surveillance. By putting in place a holistic approach to the risk assessment and risk management of a drinking water supply, we can increase the confidence of the consumers in the safety of the drinking-water.

This requires a systematic assessment of risks throughout a drinking-water supply—from the catchment and its source water through to the consumer—and identification of the ways in which these risks can be managed, including methods to ensure that control measures are working effectively. It is to be noted that climate change leading to increased and more severe and prolonged periods of drought or heavier rainfall leading to flooding can have a major impact on both the quality and the quantity of water. Governments need to be prepared to manage such disruptions arising from adverse climactic conditions. Climate change further leads to demographic change, for instance rapid urbanization, which itself strains drinking-water supply.

The WHO Guidelines are applicable to large metropolitan and small community piped drinking-water systems and to non-piped drinking-water systems in communities and in individual dwellings. The Guidelines are also applicable to a range of specific circumstances, including buildings, travelers and conveyances.

To prevent the contamination of drinking water or to reduce contamination to levels not injurious to health multiple barriers need to be put in place. These include barriers to protect water resources, selection and operation of treatment and management of distribution systems (piped or otherwise) to maintain and protect treated water quality. The aim is to prevent or control the entry of pathogens into water sources and thereby reduce the need for treatment processes for removal of pathogens. The ingestion of water contaminated with feces from humans or animals (including birds) can be the source of pathogenic bacteria, viruses, protozoa and helminths and these pose huge risks to human health. Water contamination apart from fecally borne pathogens can also be due to other microbial hazards, such as guinea worm, toxic cyanobacteria and Legionella.

Disinfection is one of the most crucial ways to ensure contamination-free supply of safe drinking-water. The destruction of pathogenic microorganisms involves the use of reactive chemical agents such as chlorine. However, chemical disinfection of a fecally contaminated drinking-water supply reduces the overall risk of disease but is not necessarily adequate to make water supply totally safe. Chemical safety of drinking-water is also extremely important. There are few chemicals for which the contribution from drinking-water to overall intake is an important factor in preventing disease, for example, fluoride in drinking-water protects against dental caries. However, the WHO Guidelines do not attempt to define minimum desirable concentrations for chemicals in drinking water.

Conclusion

Taste, odor and appearance of water should be acceptable to the consumers. That means water should be free of tastes and odors that majority of consumers would find unpalatable. In assessing the quality of drinking-water, consumers rely principally upon their senses. Microbial, chemical and physical constituents of water affect the appearance, odor or taste of the water, and for the consumer the evaluation of water quality and acceptability is based on these criteria.

Source: Secondary research & media reports

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India On The Brink Of WATER DISASTER

According to a report, at least 21 cities in India, including national capital New Delhi, Bengaluru, Chennai and Hyderabad, will be running out of groundwater this year. The consequences will be devastating for more than a 100 million people. Can we save us?

IMAGE: PIXABAY

INDIA IS STARING at an imminent water crisis. This is not an alarmist statement but based on sound assessment of India's depleting and drying water resources. A NITI Aayog report in 2018, flagged these concerns and said that three rivers, four water bodies, five wetlands and six forests have completely dried in Chennai despite having better water resources and rains than any other metro cities. The report also said that 21 cities in the country including Delhi, Bengaluru, Chennai and Hyderabad, will run out of groundwater by 2020. This would affect around 100 million people.

Even more alarmingly, the report notes that by 2030, 40 per cent of India's population will have no access to drinking water. We are already in 2020 and with wild fluctuations being experienced in the climactic patterns due to climate change, the report is not far-fetched.

People across the country are in the midst of critical drought conditions and water shortages as summers become prolonged and severe. As of June 25, 2019, nearly 65 percent of India's reservoirs and been reported running dry, with Maharashtra among the worst affected with six of its 17 reservoirs dried out.

Sadly, while we may be getting richer, we will not be able to buy water even if we can afford it if our water sources dry up.

As regards Chennai, the government has pinned its hopes on desalination – a very expensive process and further it disregards the fact that the earth is a limited planet and oceans will dry and hence, desalination is not a panacea.

Rainwater harvesting can help manage our water needs.

IMAGE: PIXABAY

Experts say using ocean water and desalination is not the solution to water distress, but water harvesting is. Further, water conservation is not just the state responsibility. Rather, it is the collective responsibility of the government and the people and we must collaboratively work towards increasing the groundwater levels.

Rainwater harvesting can be done at the individual household level as it isn't very expensive or too scientific and technical. It can be successfully implemented in

Desalination is not the panacea to water distress.

IMAGE: PIXABAY

housing societies as well. All that it needs is a sense of responsibility towards our children.

Fortunately, several state governments in water-stressed regions have come up with mandatory guidelines for rain harvesting by citizens at the household level and in housing societies.

What must be borne in mind when rainwater harvesting is that only filtered water should be allowed to seep into the ground, else we will end up contaminating the groundwater. Rainwater collected on roofs and terraces is safe to be harvested but water that accumulates on the roads is dirty and may contaminate the groundwater.

Climate change has been weakening monsoon season and it has become erratic and insufficient. Experts advise that water-intensive crops that guzzle groundwater should be controlled in rain deficit regions.

From Chennai in the south to Delhi in the north, cities are increasingly becoming dependent on water tankers, especially in the summer season as water supply becomes infrequent and taps run dry.

A vast majority, precisely 70 percent of India's population depends on agriculture and 75 percent of water for irrigation comes from the southwest monsoon. Since there aren't sufficient water storage reservoirs that could take care of the irrigation and domestic needs, it is the common practice to dig boreholes to access groundwater.

Adding to the water crisis is the increasing population, increasing irrigation requirement in the absence of sufficient monsoon and the increasing need of drinking water. Each year, the groundwater drops even further as more and more people are digging boreholes. It is a vicious cycle.

The Government of India created a new Ministry of Water Power to deal with the growing water crisis, even as traditional water conservation practices have almost disappeared with ponds and lakes being filled up to build houses.

National Capital out of Groundwater?

Experts have been warning that Delhi could be nearing "zero groundwater levels" by 2020. While many debunked it as a myth, it is undeniable that fast depleting groundwater is one of the key challenges being faced by in the national capital territory region, especially the suburbs.

The problem in Delhi is the rising water needs of a rapidly growing population. To fulfill its water requirement, the megapolis has been trying to build its new infrastructure on top of the existing traditional water systems that it inherited. In the olden days, Delhi's water needs were met by its network of check dams, stepwells, and natural drains that worked to store rainwater during the monsoon season, which then was utilized through the year.

Unfortunately, in the past decades these ancient water systems lost their relevance in the modern architecture and were neglected, falling to their ruin. Meanwhile, the growing garbage of the city choked the natural drains and lakes and other natural water bodies dried up or become trash cans and were also contaminated by sewage in the absence a planned sewage infrastructure.

Adding to the issue of groundwater contamination is the flooding that occurs in the monsoon season in the absence of proper drainage, spreading contaminants throughout the water supply.

IMAGE: PIXABAY

Concrete infrastructure prevents rainwater from seeping into the ground.

IMAGE: PIXABAY

If the state of groundwater is grim, that of surface water is abysmal. Yamuna River, that served as the city's lifeline has been converted into a toxic sewage of industrial effluents, chemicals, agricultural runoff and the city's waste. According to a report, Yamuna receives fecal sludge from 1,500 unauthorized slums that dot its banks.

While 81% of the city's households have access to piped water, albeit not of safe drinking quality or regular; almost 40% of this water does not reach the consumers as it is stolen or leaks.

The 2011 census report said that around 625,000 households in the city are still not connected to pipelines; and most of these households are in slums or informal settlements. These millions denied access to water collect it from illegal borewells or tanker trucks.

Undeniably, this overexploitation of groundwater has played a big role in pushing Delhi to the brink of water crisis. The 2016-2017 Ground Water Year Book of the Government of India reported that Delhi uses 390 million cubic meters of groundwater a year, which is approximately 25 percent higher than the natural recharge rate of 310 million cubic meters.

The unchecked urbanization in the city is further impacting rejuvenation of the city's aquifers. The infrastructure is growing haphazardly, and this concrete layering is blocking rainwater from seeping into the ground.

In May 2018, a government report had noted that the groundwater levels in Delhi is decreasing, on average, by 0.5 to 2 meters per year. The water table in 2000 which was 40 meters below ground and is now 80 meters below ground.

Saving Delhi's Water

As per the NITI Aayog report, Delhi would likely exhaust its groundwater this year. Though some experts feel the city is doomed as we have failed to work on long-term water sustainability; there are others who are working to save the city from such a fate by developing alternative water sources.

Work has been going on to restore Delhi's traditional water networks like the baolis and wells. Pavements are being made porous so that rainfall could seep into the ground. There is also focus on managing Delhi's wastewater through treatment and on rainwater harvesting.

Government is also working on providing clean water to the slums twice daily through sophisticated water supply networking adopting a community-based approach to water management.Guardians from the community itself have been appointed to ensure there is no disruption, equal distribution and to inform the concerned officials in case of a breakdown in supply.

As the government works to improve water access and sanitation through building of toilets; it is also engaging in ICT efforts to educate the residents on the city's water woes and how each citizen can work to mitigate it by working on small conservation steps.

Conclusion

Water scarcity is a primary cause of insanitation and leads to health hazards. Not just Delhi but all states must work on making their natural aquifers workable, restore natural water networks, invest in rainwater harvesting and work on saving as much water as possible through active engagement and collaboration with the citizens.

The situation is dire as the country's water reserves are getting dirtier and smaller and we are slowly losing our capacity to safeguard public health, ensure toxin-free farm productivity, and grow the economy,

Climate change is no longer a distant threat but a looming crisis year after year. Weak monsoons have been a bane affecting a quarter of the country's population with severe drought. Failed rains mean failed crops and aggravating plight of the farmers. It is time we cut down our dependence on monsoon and make concerted efforts to save our water resources.

Source: Secondary research & media reports

The Debate Must Go On

The constraints in supply of quality and safe water are severe and call for concerted efforts by all stakeholders. For this to happen, water must take center stage through political debates.

The quality of Delhi's piped water is suspect.

IMAGE: PIXABAY

WE SHOULD THANK the politics over Delhi elections that put the spotlight on the quality of water being supplied to residents of the city. A Bureau of Indian Standards (BIS) report in November 2019 on drinking water status in the national capital stirred up a hornet's nest with denials and accusations flying across. However, it served to prioritize the issue of water quality politically.

It is undeniable water must be treated as an urgent concern for public health and must be prioritized. Also, the water ecosystem of the country should become the top concern of the government as we are staring at frightening water scarcity. Poor water quality and inadequate supply are threats to human health and yet are largely ignored till there is an outbreak of an epidemic. As a result, consumers are exposed to poor water quality that insidiously robs them of their health. What's more the citizens have in no way consented to receive low quality water as this without their knowledge or consent.

Water takes center stage

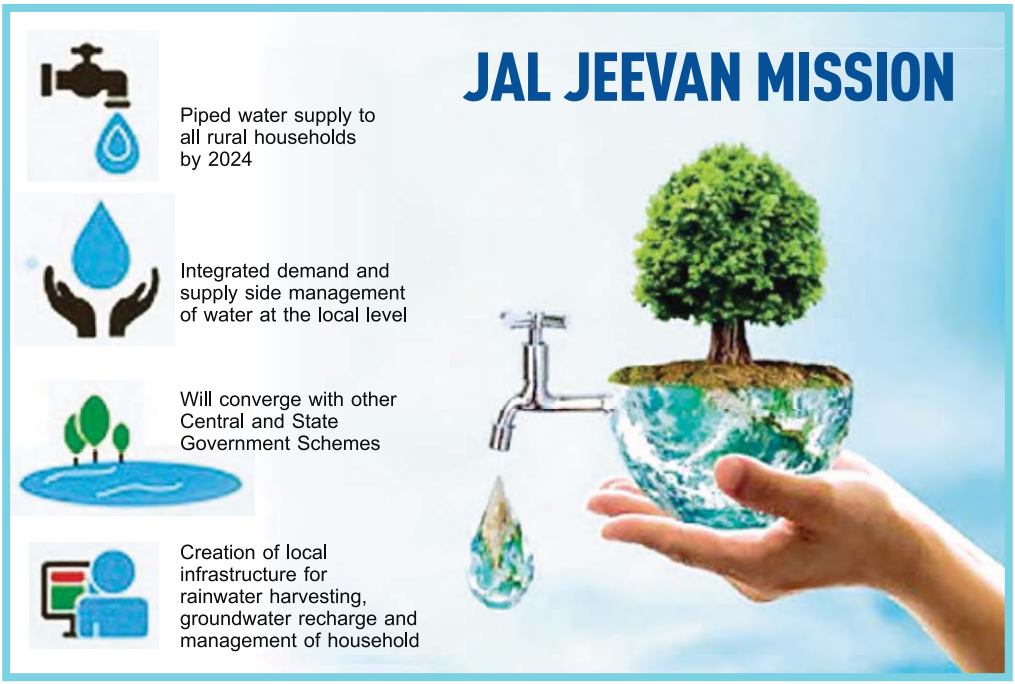
In November last year, BIS released its report for 21 major Indian cities, under the 'Jal Jeevan Mission', which aims to provide safe piped water to all households by 2024. The controversy had its genesis in the fact that the report ranked drinking water in Delhi as the most unsafe. The report was based on the findings that said that water samples failed in 19 out of 28 parameters. This was challenged by the Government of Delhi and the Delhi Jal Board (DJB).

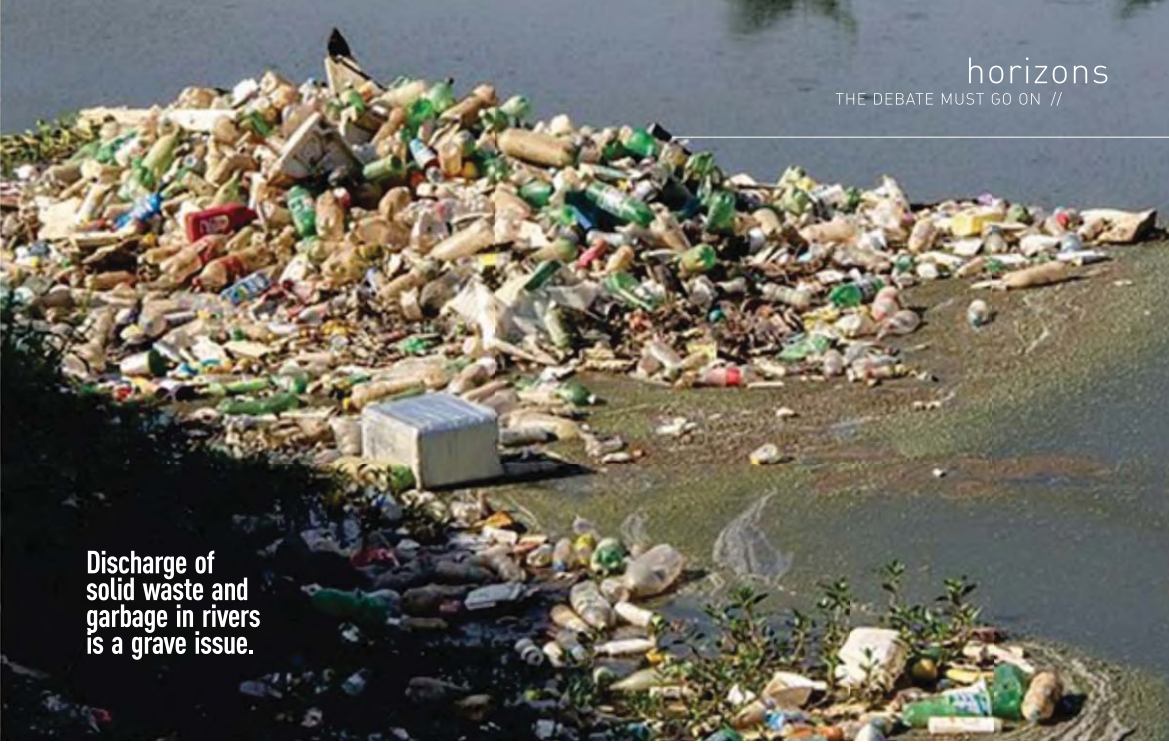
Further, as per data presented in the Rajya Sabha in March, nine districts in Delhi had contaminated groundwater in 2019. According to the data findings in the National Capital Region, including parts of Haryana, Rajasthan and Uttar Pradesh that fall under it, apart from Delhi, at least 30 districts had some form of pollutants in their groundwater, including arsenic, iron, heavy metals such as lead, cadmium and chromium, fluoride, nitrate and salinity, the data showed.

The Jal Jeevan Mission study will cover all districts in the country within a year.

Given the severity of the water crisis, supply of potable water is being compiled on priority. India's water crisis cannot be blamed just on the gradual reduction in per capita availability of water due to a rising population; it is also because of the rising and unchecked pollution in the country's rivers and water bodies. The second cause has till now been mostly overlooked in most deliberations on water resources management.

According to the estimates published by Central Pollution Control Board, India's treatment capacity is small at a mere 30% of sewage generated in the major cities. This





Discharge of solid waste and garbage in rivers is a grave issue.

IMAGE: PIXABAY

does not include the other urban and rural areas where treatment capacity is mostly non-existent and untreated sewage finds its way into local water bodies or rivers.

Water stress

Currently 600 million Indians face high to extreme water stress and about two lakh people die every year due to inadequate access to safe water, as per the 2018 report of Niti Aayog. It is expected that this crisis will only get worse as by 2030, India's water demand is projected to be twice the available supply. Apparently, this will lead to severe water scarcity for hundreds of millions of citizens.

If we look at Delhi, of the 33.41 lakh households only 27.16 lakh households, i.e., 81.30% have access to water through a piped supply system and only 75.20% of the households get treated water.

The treatment method is also not highly scientific. It is conventional and involves sedimentation, filtration and disinfection through chlorine and chloramine; the effect of this method depends upon how good or poor the overall quality of water is. For example, the water that comes from Yamuna when released from Haryana, cannot be supplied directly, as the DJB has tooften stop the supply for a few days if the concentration of methane is higher than the acceptable level. The reason being the tri-chloromethane produced during the disinfection process which is highly carcinogenic. However, its effect on human health is not immediately visible and only becomes obvious over a period of time.

High pollutant load

Add to the above Delhi's high pollutant load. Delhi constitutes less than 1% of the total catchment of the Yamuna but contributes more than 50% of total pollutant load in the river. This is being discharged over the 22 km-stretch between the Wazirabad and Okhla barrages. Not only this, the city is woefully short on sewer lines. It has 7,000 km of sewer line against a requirement of 24,000 km. The problem becomes compounded as the 17 sewage treatment plants operated by DJB can take care of only about 30% of sewage treatment. Meaning that for over 45% of the population mostly in unauthorized and even regularized colonies and rural areas, there is no sewerage system at all. Reports say the city has 18 major drains carrying sewage, garbage and industrial effluents into the Yamuna.

Further aggravating the challenges that the city faces is the rampant discharge of solid waste and construction material by individuals, companies and municipal bodies that have effectively suffocated of the Yamuna. The encroachment of Yamuna floodplains by unauthorized settlements is also a huge issue.

The challenges therefore in the supply of safe drinking water are not only related to the high costs involved but also to poor governance that makes any effort ineffective.Water management officials need urgent technical knowledge upgrades and regulations must also be made stringent and effective.

We cannot blame one body or another for the state of affairs. Given the severe constraints, it calls for concerted efforts by all stakeholders to ensure that the consumers are not denied their right to safe water. For this to happen, the debate must go on.

Source: Secondary research & media reports

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India Works On Its Water Quality

The government of India is taking various urgent measures to ensure provision of potable drinking water in quality-affected areas.

Jal Jeevan Mission targets to provide piped water to every rural household by 2024.

IMAGE: PIXABAY

THE IMPORTANCE OF potable water in socio-economic development cannot be overemphasized. Reports estimate that consumption of contaminated water is responsible for 80% of all diseases and over one-third of deaths in developing countries. Further, on average as much as one-tenth of an individual's productive t me is lost to water-related diseases. Children are the wealth of a nation, a country's future. This group is particularly vulnerable to water-related diseases. Needless to say, that access to safe water plays a big role in their growth and development as it can lead to better health and as a consequence better education that can have long-term impact on their lives.

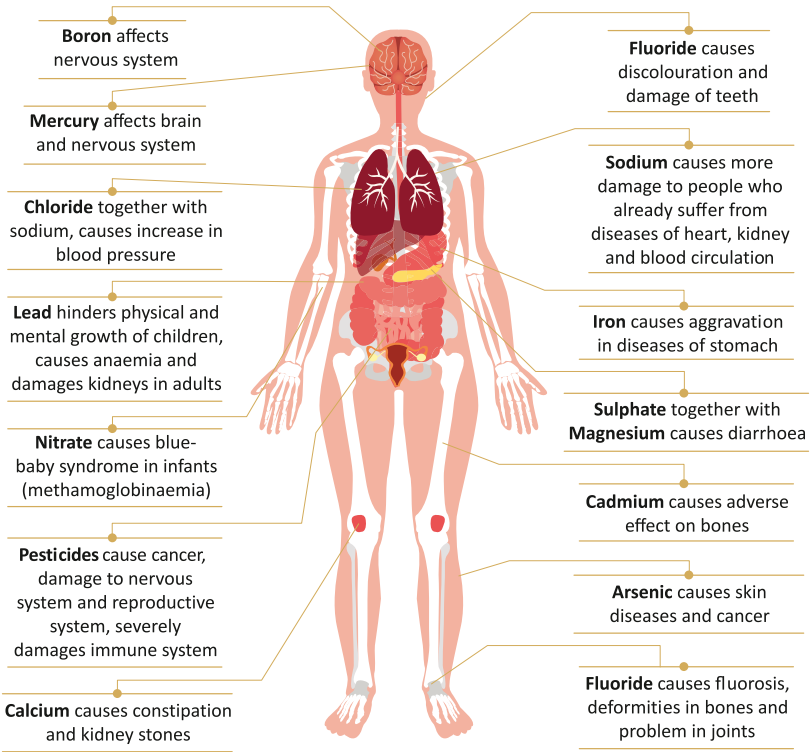
Groundwater is the main source of drinking water supply in rural India and is highly stressed due to rapid population growth, urbanization and rising demand from the farming sector for irrigation, industries, construction and other sectors. Moreover, groundwater water quality is also deteriorating due to various geogenic and anthropogenic causes.

'Ground Water Quality in Shallow Aquifers in India, 2018' and 'National Compilation on Dynamic Ground Water Resources of India 2017' published by Central Ground Water Board (CGWB), state that only about 50% of the total units assessed boasted of groundwater in sufficient quantity and of the quality prescribed by BIS.

The health of a community can be largely determined by the quality of drinking water available to it. While consumption of contaminated water can lead to health impacts caused by diseases, the cure often involves a comprehensive approach including nutrition of the population affected by water-borne diseases. The other area of concern is that poor quality of water in areas can allow contaminants to enter our food-chain and also affects the health of livestock adversely.

Apart from the various health issues caused by chemical contamination of drinking water; excess salinity of potable water has been known to cause cardiovascular diseases, diarrhea and abdominal pain; and heavy metals contamination is established to be carcinogenic.

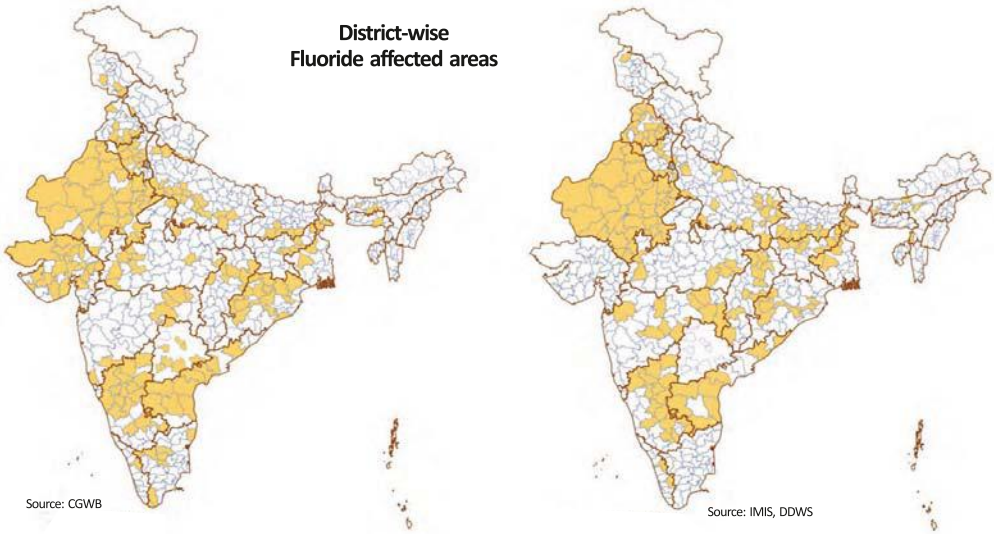
Figure 1: Adverse effects of drinking water with chemical contamination



To know if water is potable or not, get it tested in a laboratory

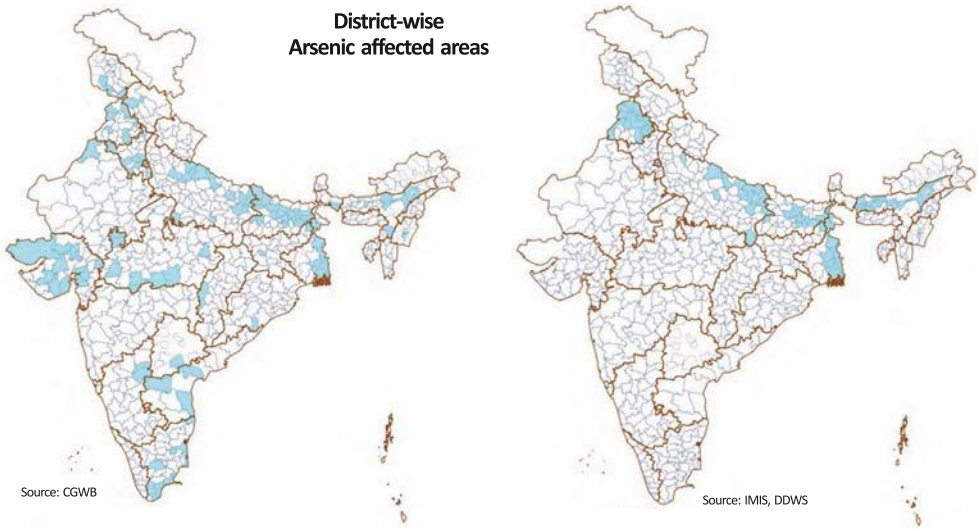
Source: Ministry of Jal Shakti,Department of Drinking Water and Sanitation, Government of India

Presence of water quality contamination hotspots across the country as per CGWB and IMIS



Source: Ministry of Jal Shakti, Department of Drinking Water and Sanitation, Government of India

Maps showing the spread of Fluoride and Arsenic based on CGWB Report on water quality and data reported by states on IMIS, DDWS



Source: Ministry of Jal Shakti, Department of Drinking Water and Sanitation, Government of India

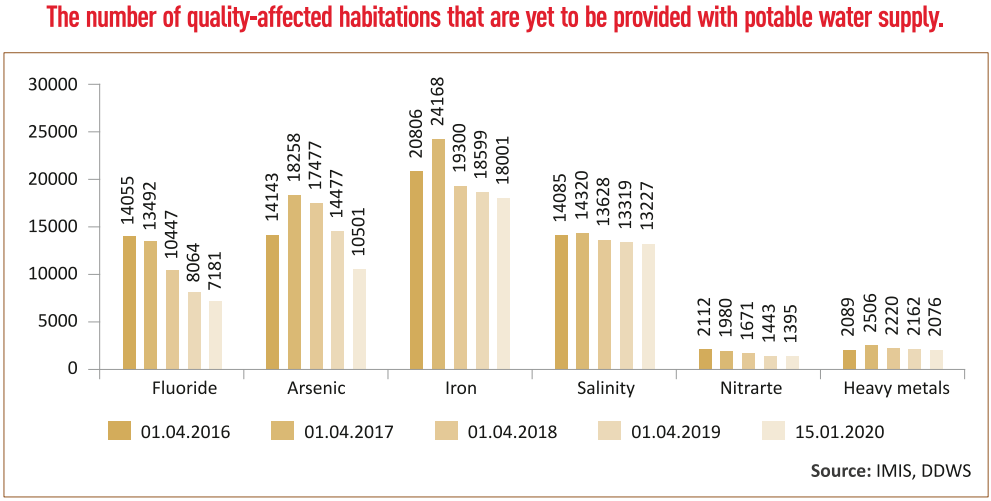


Figure 3: Quality-affected habitations yet to be provided with piped water supply over the last five years

Source: Ministry of Jal Shakti, Department of Drinking Water and Sanitation, Government of India

Water quality-affected areas

In 2018, a report published by CGWB had identified state-wise groundwater quality hotspots in unconfined aquifers of India for Arsenic, Fluoride, Salinity, Iron, Chloride and Nitrate. Drinking water sources that have been identified as having water quality issues mainly due to chemical contaminants such as Arsenic, Fluoride, Iron, Nitrate, Salinity and heavy metals as reported by states, are monitored by IMIS maintained by Department of Drinking Water and Sanitation. While CGWB indicates the overall groundwater quality; IMIS, DDWS indicates the areas wherein drinking water sources have water quality issues.

The state governments have taken some purely short-term interim measure like installing Community Water Purification Plants (CWPPs) in areas where the water quality has been identified as poor. These CWPPs are based on different technologies like reverse osmosis, adsorption, co-precipitation, solar electrolytic deionization, ion exchange, Nano technology and electric deionization plant keeping based on the type of water quality contamination in a specific area.

Provision of potable water in quality-affected areas

In India water is a state subject, and the Centre provides support to states in their endeavors to provide safe drinking water to citizens. Gram Panchayats were made responsible for the management of rural drinking water by the 73rd Amendment to theConstitution of India that placed the subject of rural drinking water in the Eleventh Schedule.

The Government of India announced the institution of Jal Jeevan Mission (JJM) on15 August 2019 and its implementation is being done in partnership with states/UTs. It aims to provide Functional Household Tap Connection (FHTC) to every rural household by 2024.

The JJM program focuses on service delivery at household level, i.e., water supply on a regular basis in adequate quantity and of prescribed quality to every household in the country.JJM is prior zing the provision of potable water supply in quality-affected areas and has adopted the following strategy to ensure FHTCs in quality-affected areas:

i) VWSCs to plan, implement, manage, operate and maintain in-village water supply infrastructure;

ii) Explore in-situ suitable treatment technology in areas with sufficient ground water;

iii) Explore bulk water transfer from long distance in areas where surface water source is not available nearby;

iv) Provide CWPPs as a purely short-term measure, since planning and implementation of piped water supply scheme based on a safe water source may

take me. However, SWSM is to prioritize provision of FHTCs to quality-affected areas by March, 2021;

v) Ensure water quality monitoring by PHE/RWS Department;

vi) Identify and train five women from every village to undertake water quality surveillance through Field Test Kits (FTKs) and sanitary inspection;

vii) Undertake NABL accreditation of laboratories at all levels.

Since March 2017, the government has been implementing National Water Quality Sub-Mission (NWQSM), as part of the erstwhile National Rural Drinking Water Program (NRDWP). The purpose of this program is to provide safe drinking water to identified 27,544 Arsenic/Fluoride affected rural habitations by March 2021. Looking at the fact that commissioning of piped water supply schemes may take two-three years, state governments have been advised to take up Community Water Purification Plant (CWPP) schemes in habitations affected by Arsenic and Fluoride contamination as an immediate measure.

To monitor the quality of water laboratory and field testing of water samples collected from water sources and FHTCs is done. In addition, water quality surveillance is undertaken by local community using Field Test Kits (FTKs). It is a good practice for the states to share the water quality monitoring results with the community, and they are encouraged to do so. Under the initiative, five women from every village are to be identified, trained and engaged to use Field Test Kits (FTKs) to undertake water quality surveillance.

Potable water must be of the quality as prescribed by the Bureau of Indian Standards (BIS). The IS 10500 has been formulated for this purpose and its objective is to assess the quality of water resources, and to check the effectiveness of water treatment and supply by the concerned authorities. This standard specifies the acceptable limits and the permissible limits in the absence of alternate source.

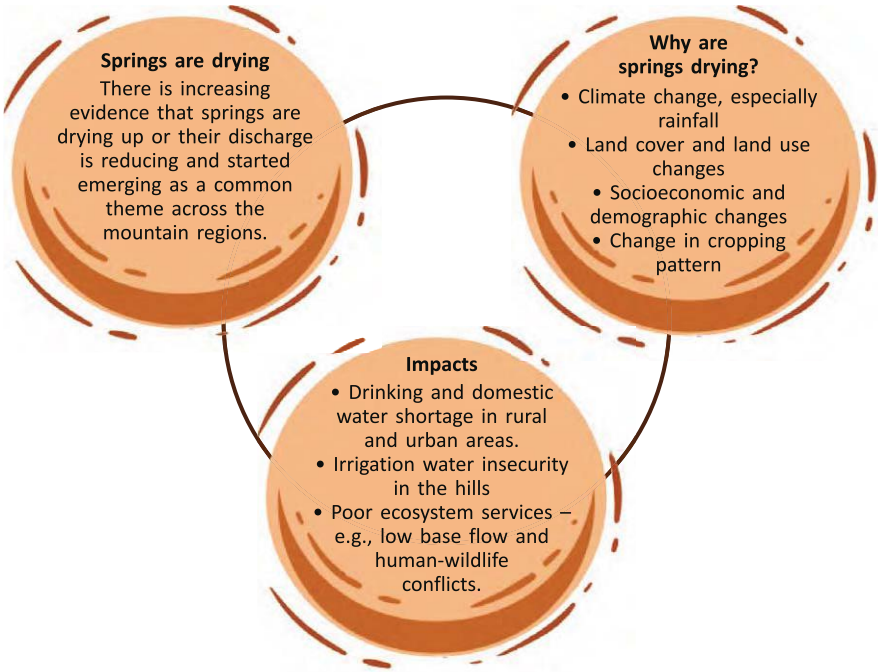
Potable water in India's mountainous regions

India's mountain regions are blessed with naturally discharges of groundwater in the form of springs. Springs occur where a water bearing layer (perched aquifer) intersects with a hill slope and groundwater seeps.

IMAGE: PIXABAY

India's mountains are blessed with natural springs.

Water Security in Changing Climatic and Socio-Economic Scenarios



Source: Government of India, Ministry of Jal Shakti, Department of Drinking Water and Sanitation, National Jal Jeevan Mission

The importance of springs cannot be emphasized enough as they have been the source of water to the mountain communities for centuries. It is extremely important that thesetraditional sources of water are revived as they play a crucial role in the region's sustainable growth. Springs are the main source of water for millions of people in the mountainous region of India. It has been estimated that nearly 200 million Indians depend upon spring water across the Himalayas, Western Ghats, Eastern Ghats, Aravallis and other such mountain ranges. It means that that more than 15% of India's population is dependent on spring water for their daily water requirement.

Unfortunately, mountain aquifer systems are under a lot of stress due to the changing climatic scenario especially the erratic rainfall pattern, seismic activity and ecological degradation associated with land use.There has also been a marked decline in winter rain, and India is now facing the problem of dying springs.

Needless to say, we urgently must expand the scope and scale of science based participatory spring-shed programs in the mountain ranges where a complex scenario of changing socio-economic conditions under the footprint of climate change and variability is unfolding.

Government is already working on comprehensive programs with community participation to ensure safe and adequate drinking water is available to every citizen of India. The government must ensure that drinking water security in the mountain regions is tackled through science based participatory spring-shed management approach under Jal Jeevan Mission. It requires sensitization through outreach and participation of all stakeholders.

Source: Secondary research & media reports

"Service Providers Managing Water Supply In Towns And Cities Are Completely Insulated From Any Kind Of Accountability Towards The Consumers"

Dr. Mahesh Gupta

Chairman and Managing Director of KENT RO Systems Limited, in a chat with The Aware Consumer sheds light on the reasons for India's water woes and suggests practical solutions to tackle it.

> By 2050, the water requirement is going to touch about 1,180 billion cubic metrics (BCM), whereas the present-day availability is only 695 BCM.

Q What exactly qualifies water as safe for drinking? What are the standards for judging water quality?

The exact definition of water as safe for drinking is prescribed by The Bureau of Indian Standards (BIS). According to the Central Ground Water Board, BIS (IS_10500 and revised module IS 10500:2012) has specifications in Uniform Drinking Water Quality Monitoring Protocol. This standard has two limits i.e. acceptable limits and permissible limits in the absence of an alternate source. If any parameter exceeds the limit, the water is considered unfit for human consumption. The standards for judging water quality are to figure out if the water is bacteriology contaminated (E-coli and viruses, etc.), or if chemical contamination exceeds maximum permissible limits. The BIS standards also prescribed about the dissolved salts and minerals as solids found in the water, which is also considered while water is found fit or unfit for drinking. In broad terms, if the water is bacteriology contaminated (E-coli and viruses) or if chemical contamination exceeds maximum permissible limits, then the water as per BIS standards is considered unfit for drinking.

Q According to some estimates, 99 million people in India are denied access to safe drinking water, even though it is a fundamental right. Why is this so?

The key reason for such a disparity in terms of accessibility to safe drinking water in India is due to inadequacy in the existing system in transporting safe drinking water to the citizens, who mostly live in villages. Even today majority of the citizens are denied access to piped water supply. Even though accessibility to safe drinking water is a human right, the priority for conservation of water or treating water as per standards prior to distribution is completely missing. 80% of water in India is either used for agriculture or industry purposes and mostly groundwater is used irrationally which causes the crisis and the concerns pertaining to the availability and the demand for accessibility to safe drinking water.

Q Till even a few decades back, Indians were drinking piped water, especially in small towns and villages.Why did piped water become unsafe for drinking?

The only reason behind the breakdown in the supply chain to access piped safe drinking water at home is because all the service providers managing water supply in towns and cities are completely insulated from any kind of accountability towards the consumers and safety issues concerning safe water supply lost the priority, which it had earlier. By 2050, the water requirement in a high use scenario is likely to be 1,180 billion cubic metrics (BCM), whereas the present-day availability is only 695 BCM. The total availability of water in the country is lower than this projected demand, at 1,137 BCM, according to NITI Aayog's report. Excessive groundwater pumping without it being sufficiently recharged, an inefficient and wasteful water management system and years of deficient rains have been the main culprits. Water conservation and implementation of rainwater harvesting are rightfully priorities on everyone's agenda, but they don't address the major issue with the water management system. Hence, any realistic and effective solution needs to include smart water management which cuts down water wastage besides providing real-time data and high-quality analytics to the water utilities and in turn to the government.

Q A November 2019 report by the Bureau of Indian Standards has politicized the quality of water available to Indians. However, it is undeniable that water should be treated as an urgent concern for public health. Why has water not received the attention it deserves?

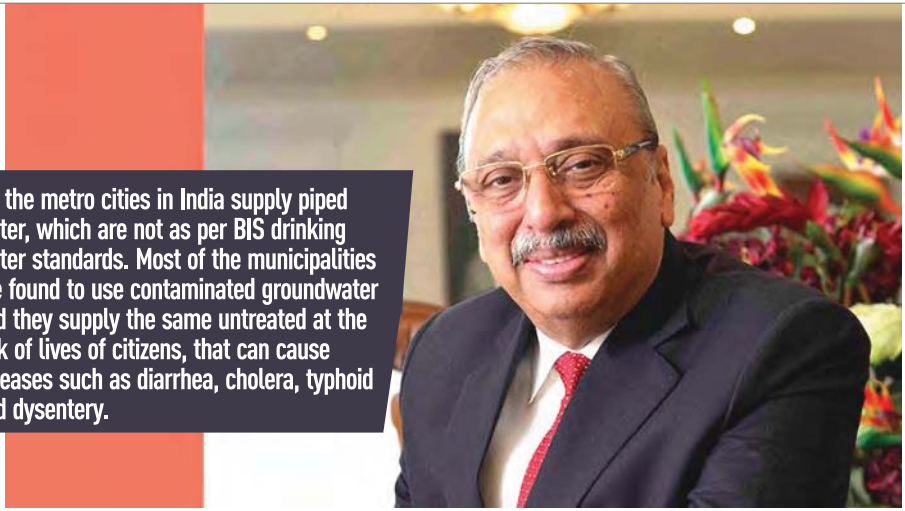
The report revealed that all the metro cities in India supply piped water, which are not as per BIS drinking water standards. Till we do not make the system accountable to the consumers, it will never work. All the municipalities spend cores of rupees on water supply and most are found to use contaminated groundwater and they supply the same untreated at the risk of lives of citizens. Contaminated water can cause diseases such as diarrhea, cholera, typhoid and dysentery. According to the latest Union Health Ministry data, at least 10,738 deaths were caused due to water-borne diseases. As I said earlier, accessibility to safe drinking water has never been a priority amongst the state governments. We made a National Water Policy in 2012 but never got it implemented. Our Prime Minister Shri Narendra Modi has understood the importance and formed a new Ministry in May 2019 by merging of two earlier existing ministries; Ministry of Water Resources, River Development & Ganga Rejuvenation and Ministry of Drinking Water and Sanitation Ministry and called it Ministry of Jal Shakti.

Q The Jal Jeevan Mission aims to provide safe piped water to all households by 2024. How do you think the government should proceed to achieve this mission? What are the challenges the government faces in providing safe drinking water?

The only way to proceed is to develop a proper comprehensive action plan. By 2050, the water requirement is going to touch about 1,180 billion cubic metrics (BCM), whereas the present-day availability is only 695 BCM. The total availability of water in the country is lower than this projected demand, at 1,137 BCM, according to NITI Aayog's report. Excessive groundwater pumping without it being sufficiently recharged, an inefficient and wasteful water management system and years of deficient rains have been the main culprits. Water conservation and implementation of rainwater harvesting are rightfully priorities on everyone's agenda, but they don't address the major issue with the water management system. Hence, any realistic and effective solution needs to include smart water management which cuts down water wastage besides providing real-time data and high-quality analytics to the water utilities and in turn to the government.

Q A 2018 Report of the NITI Aayog has observed that currently 600 million Indians face high to extreme water stress and about two lakh people die every year due to inadequate access to safe water. The crisis is only going to get worse and 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. Why are we heading towards this calamity? How can India fight this looming crisis?

The battle can only be won, only if we can change the mindset of the citizens and make them appreciate the value for each drop of water. Unfortunately, water in our country is a big political issue and is treated as a social issue because of that most of the time, it is provided free or given with minimal charges and with relatively higher non-revenue water (NWR) figures, things get more complex. NRW can take various shapes, from a leak that is not detected by the utility over time, to a burst pipe that causes major damage to the infrastructure and low accuracy of water meters or unmetered supply. While a United Nations 2016 World Water Development report, estimates about 30% of water being lost through leakage globally, in India, this could be as high as 40-50%. Imagine how this water being saved significantly can supplement the supplies thus reducing the demand for water. These are some simple solutions to the existing crisis.



All the metro cities in India supply piped water, which are not as per BIS drinking water standards. Most of the municipalities are found to use contaminated groundwater and they supply the same untreated at the risk of lives of citizens, that can cause diseases such as diarrhea, cholera, typhoid and dysentery.

Q Despite a full-fledged ministry to look after water, why has India not been able to manage this precious resource?

The only reason in my view is poor or should I say non-existence of a robust water management system. The realistic and effective solution needs to include smart water management which cuts down water wastage besides providing real-time data and high-quality analytics to the water utilities and in turn to the government. It is the right time to create the real time data on the availability and demand for water by all the different users. The work of the Ministry of Jal Shakti should be to find sustainable solutions to severe scarcity for hundreds of millions of people and an eventual 6% loss in the country's GDP, as per Composite Water Management Index (CWMI) report by NITI Aayog in 2018.

Q Do you think Composite Water Management Index (CWMI) developed by the NITI Aayog to evaluate States' water management performance is an adequate measure to ensure safe and adequate potable water for Indians?

The Composite Water Management Index is an important tool to assess and improve the performance of the states and Union Territories in managing water resource. The assessment is carried out through a one-of-its-kind water data collection exercise, which is conducted in partnership with the Jal Shakti Ministry, Rural Development Ministry and all the states and Union Territories. What is missing is the coordination between the states to learn from each other. We can not only churn out data through CWMI and rank the states on their performance based on agreed criteria and weightage;it has to be much more than data crunching. We need to encourage the states to learn the best practices from the success stories and Central Government should incentivize the states by providing the technical and financial resources to build the capacity of the concerned service providers. We have to adopt best business practices model and pilot the intervention as functioning elsewhere to make safe drinking self-sustainable.

Q Do you think India has adequate laws to prevent contamination of water sources and ensure safe water to its citizens?

Of course, we have more than adequate laws in our country to prevent contamination of water sources. What we do not have even after 70 years is effective implementation of the laws and policies. There is wide temporal and spatial variation in availability of water, which may increase substantially due to a combination of climate change, causing deepening of water crisis and incidences of water related disasters, i.e., floods, increased erosion and increased frequency of droughts, etc. We have several initiatives to address such challenges; but are we serious about working on these issue in a unified manner? My answer is a big NO. We have to make the systems work in the interest of the citizens.

Q How do you suggest India tackle its safe water deficit?

We have to have a proper framework to institutionalize the various needs for water in our country like for farming, industry and usage by citizens for drinking and livelihood. Making policies and laws will not facilitate in improving the deficit for accessing safe water in India. We need a comprehensive plan by engaging with all the stakeholders, especially community groups for awareness on rational use of water. We do not need overhead tanks on every building, what we need is assured 24X7 water supply at homes and offices, which is safe for drinking.

AFTERWORD

Pyush Misra
Director,
Consumer Online Foundation

It is time governments prioritized the rights to water and sanitation as basic human rights as in their absence achieving Sustainable Development Goals is well neigh impossible.

The Right To Water Is A Fundamental Human Right

Animals and humans share water sources in India.

IMAGE: PIXABAY

THE HUMAN RIGHT to water and sanitation was recognized on 28 July 2010 through Resolution 64/292 by the United Nations General Assembly. The UN acknowledged the importance of clean drinking water and sanitation for ensuring of all human rights.

The Resolution urges states and international bodies to support countries, especially developing ones to ensure that safe, clean, accessible and affordable drinking water and sanitation is available to all. It calls upon the nations to help achieve this human right with financial resources, in capacity-building and technology transfer.

General Comment No. 15 on the right to water adopted in November 2002 by the Committee on Economic, Social and Cultural Rights states that "The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights". It also defines the right to water as the right of everyone to sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses.

Rights to Water and Sanitation are fundamental

By recognizing access to water and sanitation as a human right, the United Nations emphasized how fundamental and basic are water and sanitation for human existence. It focused the attention of the world on how the lack of access to safe, sufficient and affordable water, sanitation and hygiene facilities can lead to devastating outcomes on human health and the resultant impact on the dignity and prosperity of billions of citizens across the world. More importantly, how these basic rights impact the realization of other human rights.

It is the duty of states to ensure that their citizens are able to access water and sanitation services. The citizens can demand that the government ensure these rights are fulfilled as they are the rights-holders and sates are duty-bearers with the responsibility to guarantee the rights to water and sanitation equally and without any discrimination to each citizen.

Challenges and opportunities

International human rights law emphasizes the need to focus on those who are unable to enjoy their rights fully. This calls for pro-poor development and requires governments to commit to reducing inequalities progressively. Governments must ensure that there is no discrimination and stigmatization of the poor that can lead to denial of rights to water and sanitation access.

The 'human rights-based approach' of the UN emphasizes the correspondence between rights and

IMAGE: PIXABAY

Rights to water and sanitation are fundamental to human dignity.

obligations and provides a framework to Member States and other organizations to ensure that human rights are integrated into development plans at all levels.

Water and sanitation as human rights

The UN mandates:

- The right to water entitles everyone to have access to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use.
- The right to sanitation entitles everyone to have physical and affordable access to sanitation, in all spheres of life, that is safe, hygienic, secure, and socially and culturally acceptable and that provides privacy and ensures dignity.

What do these terms mean?

- **"Sufficient":** The water supply for each person must be sufficient and continuous for personal and domestic uses. These uses ordinarily include drinking, personal sanitation, washing of clothes, food preparation, personal and household hygiene. The World Health Organization (WHO), estimates that each individual needs between 50 and 100 liters of water per day to meet their most basic needs. This would ensure fewer health concerns arise.
- **"Safe":** The water required for each personal or domestic use must be safe, therefore free from micro-organisms, chemical substances and radiological hazards that constitute a threat to a person's health. Measures of drinking-water safety are usually defined by national and/or local standards for drinking-water quality. The WHO Guidelines for drinking-water quality are a basis for the development of national standards and it is expected that if implemented properly, it will ensure the safety of drinking-water.
- **"Acceptable":** Water should be of an acceptable color, odor and taste for each personal or domestic use. All water facilities and services must be culturally appropriate and sensitive to gender, lifecycle and privacy requirements.

- **"Physically accessible":** Everyone has the right to a water and sanitation service that is physically accessible within, or in the immediate vicinity of the household, educational institution, workplace or health institution. WHO mandates that these water source must be within 1,000 meters of home and collection time should not exceed 30 minutes.
- **"Affordable":** Water, and water facilities and services, must be affordable for all. As per the suggestions of United Nations Development Programme (UNDP) the water costs must not exceed 3 per cent of household income.

The Human Right to Water and Sustainable Development Goals

Recognizing water as a basic human right is seen as a way to encourage the governments across the world to shore up their efforts to ensure that a fundamental human need is not denied and that it leads to the achievement of the Sustainable Development Goals.

For the poor in most developing countries, safe water and sanitation are pipe dreams. According to reports, many poor and marginalized households share their domestic water sources with animals or have to rely on wells that are nothing more than stagnant pools of dirty water unfit for human consumption. For many women, who are chiefly responsible for accessing water in many developing countries, they have to walk on average 6km daily to access water. Because of the distance required to travel for water, many households on average use less than 10 liters per person per day and in many poor countries because of the distance involved in fetching water it is as low as 5 liters a day of unsafe water. This is drastic when we look at the basic requirement for a lactating woman engaged in even moderate physical activity is 7.5 liters a day.

Reports also say that for almost half of all people in developing countries at any given time health problems caused by poor water and sanitation are a reality. Together, unclean water and poor sanitation are the world's second biggest killer of children. It has been calculated that 443 million school days are lost each year to water-related illness. In many countries the poor also use water from canals and irrigation ditches, which is hazardous. Schools have no water supply and as a result no sanitation either. In this scenario, girls especially avoid drinking water at school as they want to avoid urination. This leads them to become dehydrated and affects their concentrate in classroom.

The poor are also exploited by private tankers who sell water of dubious quality at a premium. There is an urgent need to check such water mafia.

Unless we prioritize water and sanitation as basic human rights backed by relevant policies and law; the poor will continue being subject to indignities and health hazards. Achieving SDGs when humans are denied this basic right would remain a far goal.

Source: Secondary research & media reports

CORONAVIRUS

COVID-19

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus.

Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.

The best way to prevent and slow down transmission is be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing your hands or using an alcohol based rub frequently and not touching your face.

The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so it's important that you also practice respiratory etiquette (for example, by coughing into a flexed elbow).

At this time, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments.

SYMPTOMS

COMMON SYMPTOMS INCLUDE:

- fever
- tiredness
- dry cough.

OTHER SYMPTOMS INCLUDE:

- shortness of breath
- aches and pains
- sore throat
- and very few people will report diarrhoea, nausea or a runny nose.

People with mild symptoms who are otherwise healthy should self-isolate and contact their medical provider or a COVID-19 information line for advice on testing and referral.

People with fever, cough or difficulty breathing should call their doctor and seek medical attention.

PREVENTION

To prevent infection and to slow transmission of COVID-19, do the following:

- Wash your hands regularly with soap and water, or clean them with alcohol-based hand rub.
- Maintain at least 1 metre distance between you and people coughing or sneezing.
- Avoid touching your face.
- Cover your mouth and nose when coughing or sneezing.
- Stay home if you feel unwell.
- Refrain from smoking and other activities that weaken the lungs.
- Practice physical distancing by avoiding unnecessary travel and staying away from large groups of people.

Helpline Number Toll free: 1075

+91-11-23978046

Email : ncov2019@gov.in • ncov2019@gmail.com

Packaged water is a huge market.

IMAGE: PIXABAY

SAFE DRINKING WATER SCARCITY A HUGE MARKET OPPORTUNITY

While governments struggle to ensure the quantity and quality of potable water for their citizens, it has boosted the growth of the water testing and packaged water markets among others.

IMAGE: PIXABAY

THE "GLOBAL ENVIRONMENTAL Water Testing Market Size by Test Type (TOC, pH, DO, Conductivity, Turbidity, Heavy Metals, Nitrate and Phosphate) by Product Type (Handheld, Portable, Bench top) by Application (Laboratory, Industrial, Environmental, Government, Others) by End User (Environmental, Home & Drinking Water Suppliers, Bottled Water Suppliers, Waste Water Treatment Organizations, Hospitals, Diagnostic Laboratories, Others {Government Agencies, Groundwater Testing, Farm water Testing}) by Region and Forecast 2019 to 2025", a study by Adroit Market Research provides an elaborate view of historic, present and forecasted market estimates.

Water quality is expected to deteriorate rather fast over the next few decades, increasing the hazards to human health, financial growth and thousands of aquatic ecosystems in both developed and developing economies. Looking at the gravity of the situation, many governments all over the globe are adopting preventive measures to minimize water shortage and water contamination contingencies. This is being done in collaboration with private corporations. These measures are majorly affecting the acceleration of the global environmental water testing market. Which is expected to reach a valuation of USD 5.35 billion by 2025.

For both municipal organizations and sectors working to provide supply of clean and secure water, there are significant challenges that make it daunting. Rapid population growth and industrialization are responsible to a large extent for the substantial water resource contamination and worsening water shortage problems.

In the residential, commercial and industrial sectors, water analysis is critical. The increasing levels of water contamination have led to governments instituting a string of stringent regulations and legislations for water quality control. This has boosted environmental water testing demand. Testing of water quality is important if we are to monitor the environment effectively. Water quality impacts not only aquatic life, but also the surrounding environment. Chemical, physical or biological factors have direct bearing on the quality of water in the environment.

According to the report, temperature and turbidity are the physical characteristics of water quality; while parameters such as pH and dissolved oxygen are involved in chemical features and algae and phytoplankton are biological indicators of water quality. These parameters define the quality of water in not just oceans, lakes and rivers but also, but also of groundwater and industrial procedures.

Although most test techniques using colorimetry and spectrophotometer have not seen "significant" changes since the 1950s, improvements in terms of accuracy, sensitivity, effectiveness, consistency and convenience have been taking place. Technological advances over the years have improved the accuracy of analytical testing. As a result of these technological advances in testing, more and more emerging contaminants (ECs) are being discovered in water supplies.

In terms of test type, the global environmental water testing market was dominated by the TOC segment, accounting for almost 30% of the overall market. TOC refers to an indirect measurement of organic molecules that can be found in carbon-measured pharmaceutical waters. TOC can also be used to track the efficiency of unit operations that comprises the purification and distribution system as a process control attribute.

In 2018, Asia Pacific held the largest share in the global environmental water testing market occupying more than 25% of it and is expected to maintain its dominance over the forecast period.

The governments of developing nations such as India and China impose strict public laws on the use of water in various food and beverage products and therefore pose an entry barrier for businesses manufacturing food, beverage, pharmaceutical goods where the quantity of the tested water is the highest. The governments want these businesses to set up their factories' water testing facilities and test the water according to the established standards. Such measures are expected to maintain the dominance of this region in the global environmental water testing market.

Bottled Water Testing Equipment Market Projected to Reach $6.46 Billion by 2021, at a CAGR of 5.3%

The report "Bottled Water Testing Equipment Market by Technology (Traditional, and Rapid), Component (Instruments, Consumables & Reagents, and Reference Material), Test Type (Microbiological, Chemical, Physical, Radiological), and Region - Global Forecast to 2021", by MarketsandMarkets forecasts that the bottled water testing equipment market will reach USD 6.46 Billion by 2021, at a CAGR of 5.3% from 2016.

The report notes that the market is driven by increasing need for quality testing of water, increased bottled water consumption around the world, and stringent regulatory requirement by different regulatory bodies.

The chemical test type was the largest in the bottled water testing equipment market in 2015 and the market for bottled water testing equipment for chemical segment, was the largest in 2015. Chemical tests in bottled water include various tests of chemicals such as toxic by-products, pesticide pollutants, and pharmaceutical residues.

The chemical contaminants pose health problems, resulting in strict regulations of their levels by national governments and international bodies. Therefore, the analysis of relevant contaminants requires high valued equipment which makes this segment fastest growing.

The rapid technology segment is projected to grow at the highest CAGR by 2021. Rapid techniques refer to methods used for rapid results and are projected to form the fastest-growing segment in the bottled water testing equipment market, from 2016 to 2021. This segment is further sub-segmented into chromatography, spectroscopy, testing kits, and other instruments, where other instruments include molecular-based techniques such as PCR, Immunoassay, and others. These methods are used in the detection of indicator organisms such as E. coli and other pathogens. These advanced technologies are quick, accurate, and easy to use. Some of the rapid methods are expensive and require extensive sample preparations. However, the availability of new testing methods has reduced the overall cost of determination.

India is the fastest-growing country in bottled water testing equipment market

The India bottled water testing equipment market is projected to be the fastest-growing in the Asia-Pacific region. Given India's population and size, there is ample potential in the market for bottled water manufacturers to meet the rising demand from consumers. The major bottled water manufacturers such as Coca-Cola (Kinley), Nestle, and PepsiCo (Aquafina) have found India to be a potential market and are increasing their geographical share in the country through expansion of a number of bottling water plants.

Bottled Water Market Production, Demand and Top Key Players 2020

Bottled water is defined as the processed and packed water which is made appropriate for drinking. The standards for checking the quality of drinking water are established by governments with reference to international standards. These standards mainly emphasize on minimum and maximum concentrations of minerals, TSS etc. All the water handling units should be properly approved and certified by the regulations and standards given by the government. A newest trend of fortifying water with vitamins and electrolyte is being followed so as to revitalize the body. The process of desalination of ocean/sea water in which the salt is removed from water has gained high importance in the regions where there is lack of fresh water. After the process bottle water is available in plastic and glass water bottles and is the most convenient way for the body to full its hydration needs being easily available in nearby retail stores and supermarkets.

The market determined by the rise in healthcare awareness about waterborne diseases such as malaria, typhoid, diarrhea, food poisoning, and others. Furthermore, bottled water is more transportable and appropriate to use as it is handy, thus supporting the market growth.

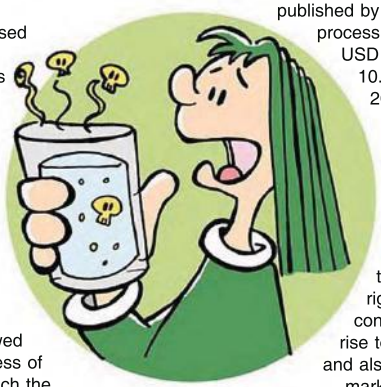
Increase in health alarms has subsequently led to better consumption of bottled water which has powered the growth of the market. Also, growth in per capita expenditure and rapid urbanization is additional key driver of the market.

Data Bridge Market Research has published a new report titled 'Bottled Water Market reports provides 5 year pre-historic and forecast for the sector and include data on socio-economic data of global.

Global bottled water market is expected to rise from its initial estimated value of USD 210.8 million in 2018 to an estimated value of USD 341.1 million by 2026, registering a CAGR of 6.2% during the forecast period of 2019-2026. This rise in market value can be attributed to rising need of plant protein amid rising amount of health concerns and veganism worldwide.

The market drivers include developing lifestyles and health concerns and consumer demand for vitamin and minerals rich drinking water. The market restraints on the other hand are imposed by environment pollution through plastic bottles and the absence of awareness regarding health issues through low-cost tap water.

As per the report 'Global Bottled Water Processing Market by Product Type (Still Water, Sparkling Water), Packaging Material (Plastic, Glass, Others), Equipment, Technology, Region Global Industry Analysis, Market Size, Share, Growth, Trends, and Forecast 2018 to 2025', published by Fior Markets, the global bottled water processing market is expected to grow from USD 420.9 billion by 2025 at a CAGR of 10.51% during the forecast period from 2018-2025.



Dependence on bottled water is increasing exponentially as water quality deteriorates and water scarcity increases.

Conclusion

The rising contamination of groundwater along with the scarcity of safe potable water has made governments around the world come up with stringiest laws to ensure that the citizens are nor denied their basic rights. However, this scarcity and contamination of potable water has given rise to a flourishing market for bottled water and also water testing equipment. These markets are being driven by the growing needs of the developing nations as they struggle to ensure sufficient quality and quality of drinking water.

Source: Secondary research and media reports

GOVERNING WATER

India has developed protocols to govern its water in order to ensure a just and equitable distribution of this precious resource in the prescribed quantity and quality. But implementation is the key.

IMAGE: PIXABAY

Protocols in place, now India must implement it to get clean drinking water.

IN INDIA, IT is the Bureau of Indian Standards (BIS) that specifies the drinking water quality standards in a bid to ensure that safe drinking water is available to all. This calls for regular testing of drinking water sources to ascertain that water meets the prescribed standards. In case the water being tested fails to meet the prescribed water quality standards then the extent of contamination/unacceptability is established and follow done to ensure that it meet the quality parameters.

There is another guideline for water quality, which was prescribed by the Ministry of Water Resources, Government of India in 2005. This is known as the Uniform Protocol for Water Quality Monitoring and it was necessitated because of the increasing risk of geogenic and anthropogenic contamination of water sources.

While access to clean and safe drinking water is recognized as the right of every citizen in the country, unfortunately, most of the natural water resource that help in sustaining life on earth, are dangerously contaminated. In this context, a report by NSO had found that two-thirds of households in India drink unsafe and untreated water. A meager 8% of the households boil water before drinking; a recognized efficient measure to remove contaminants.

The Sustainable Development Goals (SDGs) mandate that every country in the world achieve the goal of providing safe drinking water to its citizens by 2030. In pursuance of this goal, the Bureau of Indian Standard developed a specific guideline for safe drinking water. Despite this guideline, according to a recent report, 13 metros receive contaminated water. In this scenario, what quality of water is available to the vaster majority residing small towns and villages, is anybody's guess.

Fixing water quality standards

The recent water quality test conducted by BIS showed Delhi's tap water to be the most unsafe among the 13 cities whose water samples were collected and tested. In fact, the national capital is at the bottom of the list. The cities from where the water samples were drawn and tested include Kolkata, Chennai, Bengaluru, Jaipur and Lucknow. Not surprisingly given the dubious quality of drinking water available in the country, all the cities failed in the water quality test. It was only Mumbai where the samples of tap water met all the parameters under Indian Standard 10500:2012, which is the specification for drinking water.

What are BIS Standards for drinking water quality?

BIS (IS_10500 and revised module IS 10500:2012) lays down the specifications in Uniform Drinking Water Quality Monitoring Protocol. The BIS standard for water quality recognizes two limits, i.e., acceptable limits and permissible limits in the absence of an alternate source. If the water being tested exceeds the limit, it is considered unfit for human consumption.

What this implies is that if the water is bacteriology contaminated (with E-coli and viruses, etc.), or if chemical contamination exceeds maximum permissible limits, the BIS considers that water unfit for drinking.

According to BIS 1500-2012 the acceptable limit of bacteria and other major contamination are as follows:

Test parameter	Acceptable limit	Permissible limit (In the absence of alternate source of water)
pH value	6.5-8.5	No relaxation
Turbidity	1	5
Total hardness as CaCo3, mg/l, Max	200	600
E.coli presence/ absence	Shall not be detectable in any 100ml sample	Shall not be detectable in any 100ml sample
Total iron as Fe, mg/l, Max	0.3	No relaxation
Taste	Agreeable	Agreeable
Odour	Agreeable	Agreeable

According to a report published by the Ministry of Drinking Water and Sanitation in 2013, more than 85% of rural households in India have access to drinking water within or near their premises. The risks of chemical and microbial contamination of groundwater is high in rural areas and this makes the provision of safe drinking water for the mind health protection of the rural folks high priority.

In India, the Ministry of Drinking Water and Sanitation, Government of India has evolved the Uniform Drinking Water Quality Monitoring Protocol which emphasizes water quality and safety. This protocol encompasses various laboratory management practices ensuring scientifically correct interventions to improve water quality. A water safety plan for effectively utilizing water quality data in the planning of preventive and corrective actions becomes pertinent to ensure the provision of safe drinking water for citizens.

The Government of India for this purpose earmarks 3% of state allocation of National Rural Drinking Water Program (NRDWP) for water quality monitoring and surveillance. The government provides guidance on all relevant aspects of water quality management including infrastructure requirement, manpower, instrumentation, sampling and testing procedures, etc.

Policy to preserve water

The Government of India, Ministry of Water Resources, National Water Policy (2012) treats water as a scarce natural resource that is fundamental to life, livelihood, food security and sustainable development. It is challenging that India with more than 18% of the world's

IMAGE: PIXABAY

population, has only 4% of world's renewable water resources and 2.4% of world's land area.

The uneven distribution of these water resources further place restrictions on the utilizable quantities of water. India also faces frequent floods and droughts in one or the other part of the country, which make the goal of providing safe and adequate drinking water for all a huge challenge.

The growing population and rising needs of a fast-developing nation are stressing the limited water resources further. Climate change is also a huge reality that is straining the availability of utilizable and will negatively impact its availability in the future leading to fears of water wars among different consumer groups.

Though there is a rising consciousness regarding the importance of using and preserving our scare water resources, vast majorities are still unaware of it and how important water is for sustaining life or the erosion of economic value with the mismanagement, wastage, and inefficient use of water. Not many are aware of the impact of environmental pollution on the quality of water and how it reduces its flows below minimum ecological needs.

India also faces huge inequities in the distribution of water with rich utilizing the larger share while the millions of poor are denied even the minimum essential requirement.

Till now the country has also been plagued by mismanagement of water resources due to lack of a unified planning and perspective.

Looking at the challenges, the National Water Policy proposed a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective. It took cognizance of the many challenges that India faces in the management of its water resources chiefly the fact that years of neglect

have already rendered large parts of India water stressed. Yet, the demand for water is increasing rapidly due to population growth, urbanization and changing lifestyle. All these factors together pose serious challenges to water security.

The National Water Policy also acknowledged the mismanagement in water governance. Further, given the wide variation in the availability of water, it is feared that these imbalances may increase substantially brought on by a combination of factors. Climate change is expected to deepen the crisis as it will cause water related disasters, like floods, draughts and increased erosion, etc. Sea levels are rising under its impact and it is expected that salinity intrusion in groundwater aquifers/surface waters would increase. Climate change is also expected to increase coastal inundation in coastal regions. The impact of the on populations residing on riverbeds and catchmentareas would be severe, impacting their homes and livelihoods as agriculture and industry in the regions would also be adversely impacted.

The skewed availability of water in different regions will make access to safe water for drinking and other domestic needs a challenge for many. Further, with groundwater in many regions being perceived as an individual property, it is exploited inequitably. There is no concern for the sustainability of water resources and many areas are over exploited.

stagnant pools in which no aquatic ecology would survive.

When drinking water for many is just a pipe dream, water for sanitation and hygiene is almost absent. Inadequate sanitation and lack of sewage treatment are polluting the water sources.

Conclusion

India's water woes lie in its lack of holistic and inter-disciplinary approach to water management. Community and stakeholder consultation in taking decisions is absent. Therefore, comprehensive public policies on water resources are required and these need to be approved so that there is some commonality in approaches in dealing with planning, development and management of water resources.It is time that India worked on good governance through transparent informed decision making and with the expressed objectives of equity, social justice and sustainability.

The government should encourage intensive participation of all stakeholders in the decision-making process and to ensure transparency and accountability in the management of water resources. Experts suggest that water should be treated as a common community resource and should be under the state government.

Water is essential for human existence and for the sustenance of ecosystem. All efforts should be made to ensure that water is not just available, but available in adequate quantity and of prescribed quality. Every effort should be made to promote its conservation and efficient use as we are yet to find a way to enhance its availability. How and if we are to meet the future needs of the human population will depend on how successfully we are able to manage the demand for water.

This calls for a change in the mentality that will help us view water as a scarce and essential resource. It will help us evolve better was of utilizing water whether it be by evolving an agricultural system which economizes on water use to industries treating our water resources with respect and bringing in laws to protect it. We need to evolve ways to maximize efficiency in use of water and drastically cut down its wastage.

Water quality and quantity are closely interlinked, and we must realize this link if we are to manage water in an integrated manner by adopting wider environmental management approaches.

Source: Secondary research & media reports

- **Contaminated water can transmit diseases such diarrhoea, cholera, dysentery, typhoid, and polio. Contaminated drinking water is estimated to cause 485 000 diarrhoeal deaths each year.**
- **By 2025, half of the world's population will be living in water-stressed areas.**
- **In least developed countries, 22% of health care facilities have no water service, 21% no sanitation service, and 22% no waste management service.**

There are several water resources projects that are multi-disciplinary with multiple stakeholders that are being planned and implemented in a fragmented manner. These programs disregard optimum utilization, environment sustainability and holistic benefit and are aggravating the water woes giving rise to Inter-regional, inter-state, intra-state, as also inter-sectoral disputes in water sharing.

The consequence of all this mindlessness is the widening gap between irrigation potential created and utilized. Further, according to reports, the natural water bodies and drainage channels are being encroached upon and diverted for other purposes. Groundwater recharge zones are often blocked.

Industries flouting all norms are polluting water sources with untreated effluents being dumped in the rivers and canals. This has affected the availability of safe water and is a potential environmental and health hazard.

India is a land of many rivers, but today in many parts of the country, it has been reduced to polluted and

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Tackling Water Stress

Since water is a state subject, it is incumbent upon the states to take urgent steps to tackle water distress through a multi-pronged program.

IMAGE: PIXABAY

Nearly 600 million Indians are facing high to extreme water stress.

THE FACTS SPEAK for themselves: Nearly 600 million Indians are facing high-to-extreme water stress; more than 40% of the annually available surface water is used every year; about 200,000 people die every year due to inadequate access to safe water; and this situation is forecast to worsen with the demand for water exceeding the supply by 2050. These facts were reported in the 'Composite Water Management Index' (CWMI) report which was released on June 14, 2018.A report by the Asian Development Bank forecasts that by 2030, India will have a water deficit of 50 per cent. According to the Union Ministry of Water Resources estimates India's current water requirement is around 1100 billion cubic meters per year. By 2025 it is forecast to increase to 1200 billion cubic meters and will be 1447 billion cubic meters in 2050.

India's agricultural culture is water intensive and as a fast-developing nation the water demand for its industrial, energy production and domestic purposes are also high stressing the country's limited water resources.

Water scarcity on its own is devastating enough, but what makes it even more complicated is that a growing water stress will impact the country's food security badly. No wonder Niti Aayog has called for immediate steps to tackle the water scarcity.

The CWMI report is the first comprehensive collection of nationwide water data and it notes that it is time that states begin managing their groundwater and their agriculture water. While the report has been lauded as a right step, experts feel that it could have been made even more impactful by comparing the water management practices of the states with global best practices and should have taken into account their performance in implementing existing laws against groundwater exploitation.

As stated elsewhere this looming water crisis will impact 21 Indian cities including Delhi, Bengaluru, Chennai and Hyderabad that will run out of groundwater by 2020, affecting 100 million people. It is estimated that by 2030, 40% of India's population will have no access to drinking water.

A 2018 report by IndiaSpend has found that several states in the country including Andhra Pradesh, Chhattisgarh and Tamil Nadu, are already facing severe water shortages, which has been exacerbated by changing rainfall patterns

India's water crisis has been formally acknowledged by the Economic Survey 2017-18 and. The reasons for water stress as noted in the Economic Survey include rapid groundwater depletion, decline in average rainfall and increasing dry monsoon days.

As per reports, groundwater in India depleted at 10-25mm per year between 2002 and 2016, while average rainfall declined from 1,050mm in the kharif season of 1970 to less than 1,000mm in kharif 2015. The rabi season average rainfall also declined from 150mm in 1970 to about 100mm in 2015. Dry days during monsoon in India meanwhile have increased from ~40% to 45% in 2015.

The economic impact of water stress can be huge as the Niti Aayog report notes that in the absence of mitigation measures, India could face a 6% loss in its gross domestic product (GDP) by 2050.

In view of the water stress, it is indeed sad that nearly 70% of water in India is contaminated and it ranks 120th of 122 countries in a global water quality index. Further, while India holds about 4% of global freshwater; it is home to about 18% of its population.

The NITI Aayog exercise on water index evaluation has been conceived as an annual one and it judges states on nine broad sectors and 28 indicators, including groundwater, irrigation, farm practices and drinking water.

In India, water is a state subject and it is the states that take all decisions pertaining to water resources. Hence, the purpose of the index is to nudge states and UTs to understand the urgency of the country's water issues and take urgent measures to ensure efficient and optimal utilization of water and its recycling.

Performance of states: 14 of 24 score below 50% on water management

Of the 24 states analyzed in 2015-16, 14 scored below 50% on water management and were classified as “low performers”. As expected, these low performers are concentrated across the agricultural belts of north and east India that are populous and also the northeastern and Himalayan states.

Gujarat was the best performer with a score of 76%, followed by Madhya Pradesh (69%) and Andhra Pradesh (68%). The seven states that scored between 50-65% included Karnataka, Maharashtra, Punjab, Tamil Nadu, Telangana, Himachal Pradesh and Tripura. These states were categorized as “medium performers”.

Though the Water Index scores vary widely across states, most have scored below 50%. This is however not the end of the road for the states as it shows that they can improve their water resource management practices significantly.

The irony is that it is these low performers such as Uttar Pradesh, Bihar, Rajasthan and Haryana that account for 20-30% of the country's agriculture output and are overpopulated with over 600 million people. No wonder India's food security faces significant risks.

The water stress due to rapidly declining groundwater levels could have been arrested if the states had taken positive policy action. However, this did not happen, and the combination of policy paralysis and water scarcity have been deadly for food security of the country.

States that face water scarcity have performed better in the Index, the report said. It seems these states that are high and medium performers learnt their lesson when faced with severe draughts and improved their water management to battle water scarcity. Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Maharashtra and Telangana are in this list.

The report also showed that 15 of the 24 states have improved their scores in 2016-17 compared to the

Rajasthan has improved its score on water management index.

previous year.The report noted that these improvements are largely due to improvements in restoration of surface water bodies, watershed development activities, and rural water supply provision.

Among the top five states that improved their scores are Meghalaya, Sikkim and Tripura on the back of increasing water policy actions taken by them. Rajasthan, Jharkhand and Haryana are the non-Himalayan states that showed improvements.

Groundwater management, sustainable water use key

According to the report, most states fared well on the infrastructure-heavy themes of major and medium irrigation and watershed management. Many states have also enacted policies. However, many were found to be lagging on the critical themes of source augmentation (groundwater), sustainable on-farm water use practices and rural drinking water.

Experts feel that states can improve their performance on groundwater augmentation by strengthening regulation around groundwater and ensuring strict implementation of the same. States must also make concerted efforts to improve monitoring network and implement continuous monitoring of groundwater level and groundwater quality. Rainwater harvesting must also be strictly implemented, and it must be ensured that the infrastructure is in operation and maintained diligently if they are to improve groundwater level.

It is to be noted that the Central Ground Water Board (CGWB), which is a central authority for monitoring and management of groundwater resources of the country, has a network of 22,339 groundwater observation wells in the country. What this effectively means is that there exists one monitoring point in approximately 147 sq. ft.

The score of 17 of the 24 states that fell below 50% on the managing on-farm water parameter, raises concern given the fact that agriculture accounts for 80% of all water use and is the leading risk for water and food security risks for the country.

According to experts, adoption of micro-irrigation techniques is urgently required to significantly improve on-farm water use. India can successfully bring nearly

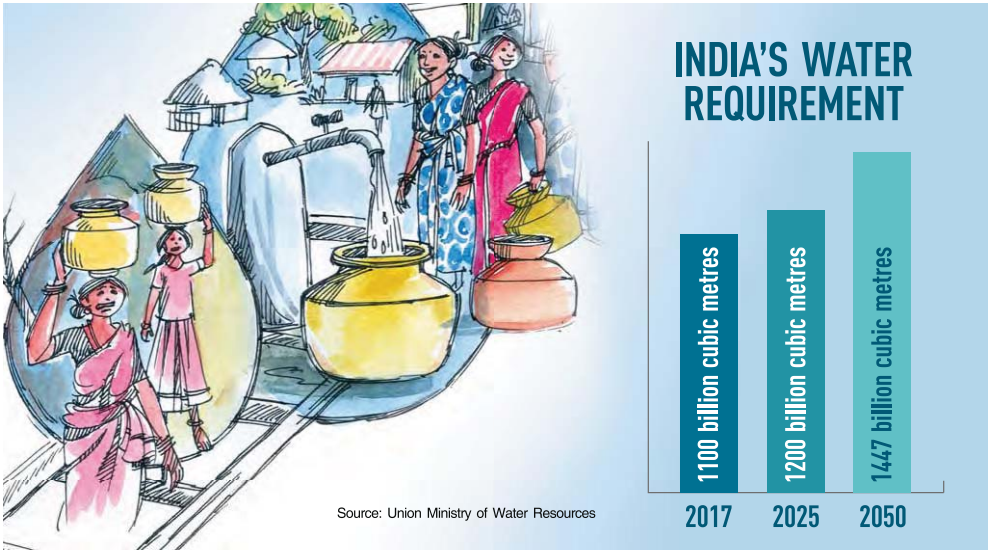
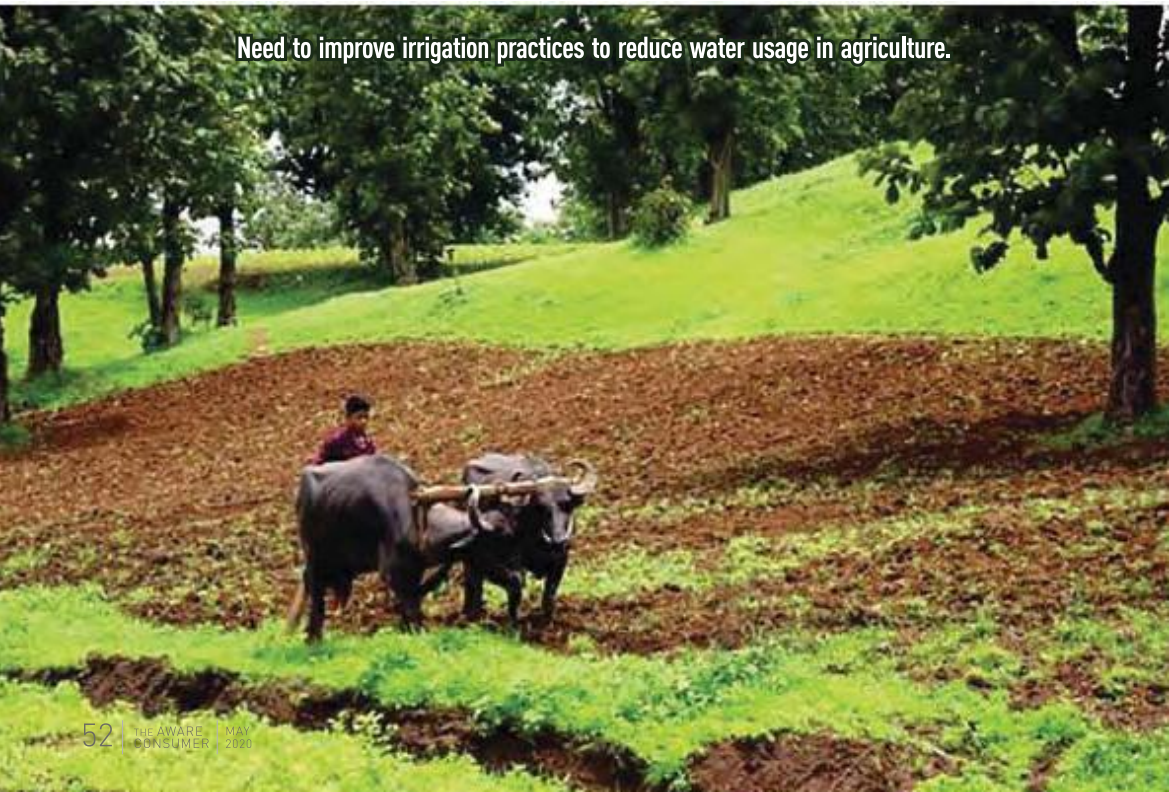


IMAGE: PIXABAY



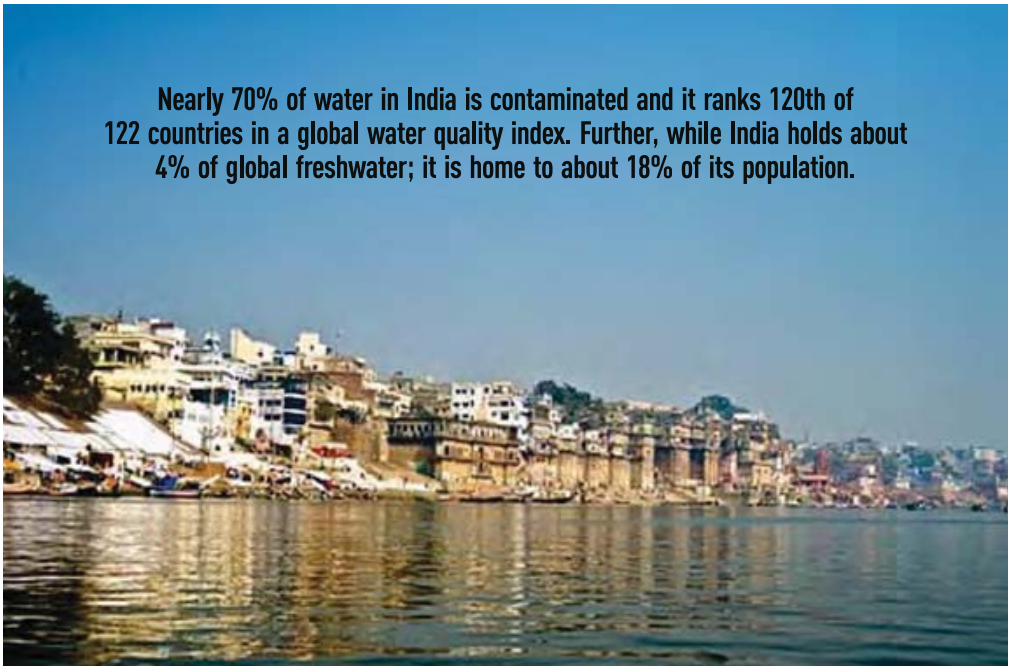


IMAGE: PIXABAY

Arsenic contamination of river water affects 900 million Indians.

half of its net cultivated area, i.e., 140 million hectares under micro irrigation. However currently only 7.73 million hectares are covered. Experts also encourage the use of sprinkler irrigation practices that uses 30-40% less water, while drip can use about 40-60% less water compared to flood irrigation methods, he added.

Water Woes

With the country's population slated to grow to 1.4 billion people by 2050, it is obvious that the total available water resources would fall abysmally short of the total water requirement.

It is to be noted that India is not a water scarce country as we have major rivers and also receive bountiful rainfall, an average annual rainfall of 1170 millimeters. What is causing this water scarcity is largely manmade – lack of awareness and sensitization regarding water conservation and water pollution. While the traditional water reservoirs have languished under newer urbanization, not enough water storage infrastructure have been built.

A major reason for the growing water deficit in the country is also India's shrinking rivers due to pollution and industrialization, even as the country's population keeps growing.

Absence of adequate and efficient waste disposal leads to rampant pollution of natural water resources due to dumping of sewage waste and abuse of the rivers making the unfit for human use. Such is the magnitude of river pollution that some reports peg 500 million liters of wastewater from industrial sources are dumped into the Ganga daily while Yamuna receives 850 million gallons of sewage daily from Delhi alone. There is also arsenic contamination of groundwater sources compounding the problem, especially in the Ganga-Brahmaputra belt in eastern India. Arsenic contaminated water is estimated to be affecting the health of over 900 million people in India. Another fallout of rising river pollution is the growing dependence of people on groundwater resources.

While the government has taken several initiatives to deal with water crisis, invested in river cleaning programs, and building biodiversity centers, crematoriums and toilets along the river banks to reduce river pollution, apparently these steps are not enough to counter the looming water crisis as the country's

IMAGE: PIXABAY

rainwater and groundwater resources are also at grave risk.

While the country has steadily increased access to water for its residents; 45,053 villages had access to piped water and handpumps by the end of 2016-17, accounting for 64.19 per cent of India; around 19,000 villages were still being denied regular water supply.

The solution to this water deficit lies in rainwater harvesting among other steps. While India receives an average annual rainfall of 1170mm, it stores only 6 per cent of it. Developed nations store 250 per cent of rainfall. As is obvious, there is a huge scope for rainwater harvesting in the country if we can improve our storage infrastructure and encourage rainwater storage and harvesting as a practice among the citizens.

Some states have been working on legislations to make rainwater harvesting compulsory. For example, in 2001, Tamil Nadu made it compulsory for each household to install rainwater harvesting infrastructure and in the last couple of years Jharkhand has also followed suit. In Tamil Nadu the results of this legislation were reflected in the improvement of overall water quality within 5 years. Bangalore and Pune are also working on similar lines making housing societies harvest rainwater compulsorily. However, there is a need to make rainwater harvesting a nationwide practice. States must invest in empowering local people to save water.

There is no denying the fact that the continuous efforts by both government and non-government bodies have led to much improvement in the country's water accessibility situation. But more needs to be done especially with regard to cleaning the country's major water bodies and on management of rain and surface water resources.

It is noteworthy that the government has set the target of providing clean drinking water to all by 2024, acknowledging that nearly 14 crore households do not have access to clean drinking water as yet. In some states including Uttar Pradesh, Bihar, West Bengal, Chhattisgarh, Jharkhand and Odisha, the coverage of clean drinking water is less than five per cent.

For a country of India's size, population water needs and water deficit and diversity of landscape, there can be no one size fits all solution. What is clear though is that any approach to tackling the looming water crisis must ensure that water conservation and water supply go hand in hand. Ensuring source sustainability and recharging groundwater are central to the plan.

Source: Secondary research & media reports

IMAGE: PIXABAY

Tackling Water Stress With Technology

Scientists and industry are coming up with inventions and innovations that can tackle the impending water crisis effectively.

Water stress is a relatively new phenomenon created by mankind.

WATER STRESS IS a relatively new concept and requires wide dissemination of knowledge and awareness among the masses. The problem for the common people is that getting fresh water for use during a period of time may be difficult, say the long summer months, and this leads to further depletion and deterioration of available water resources. What is imperatively needed at this juncture is management of available water. Hence, water harnessing and saving needs to be a critical part of any innovation to tackle the water scarcity.

Currently, 1.2 billion people of the world lack access to clean drinking water, as many nations grapple with acute shortage of water resources that are causing hardship to millions.As the unpolluted water continually decreases and is falling short of demand, there is a looming crisis of available potable. According to reports, this water scarcity is being driven by two converging phenomena – we are increasing our freshwater use, and this is leading to depletion of usable freshwater resources. Water scarcity is further classified physical or absolute water scarcity which is the result of inadequate natural water resources to supply a region's demand; and economic water scarcity which results due to poor management of the existing water resources. The latter is also the result of excessive use and wastage of pure water for domestic and agriculture purposes.


Water pumped from a solar water pump at a farms

We have yet not been able to invent water. But what can give succor to a thirsty world is innovations and management of water resources. As such many reputed institutions around the world are working on innovative design processes and systems for water harvesting and water management. There is an uptick in innovative ideas that provide plausible solutions to save water, right from rooftop rainwater harvesting to creating artificial glaciers. There has also been a spurt in design and development of innovative appliance and machines for water saving in domestic or agriculture use.

From startups to scientists, an entire ecosystem of water warriors is engaged is development of innovative solutions to India's water crisis. The inventions range from a low-cost ultra-filtration membrane-based drinking water purifier for a home kitchen to nearly 58,000KLD capacity rainwater harvesting tank for a large factory. What is common among all these inventions and innovations, whether by scientists or industry experts, is that they all aim to ensure efficient use of water. Some of these interventions have saved industries on the brink of shutdown for their usage of large amounts of water, while some like the candle-shaped ultrafiltration membrane-based on-line device developed by scientists at Bhabha Atomic Research Centre (BARC) that offers a low-cost alternative to reverse osmosis systems installed in households for potable water, look to the prevention of wastage at micro level.

This new technological innovation is designed to remove bacteria, color, odor and suspended solids. What is even better is that it does not require electricity to work and calls for minimal maintenance. According to reports, the new technology is wastage-proof as it recovers nearly 100% of the water of superior quality when compared to reverse osmosis that gives two liters water reject for every 1 liter of filtered water. Further, the new system costs only one-tenth of the cost of a reverse osmosis system.

WeGoT Utility Solutions, which is a startup has invented a sensor-based water meter to track consumption in real time through a smartphone. This technology takes care of the deficiencies in a traditional meter that leaves the scope for tampering, as it has no moving parts.This breakthrough technology is already helping many including apartment complexes. In one of the housing societies where it has been installed, the water consumption has come down from 29.8 lakh liters a month to 15.88 lakh liters per month.

While small changes are necessary at the household level to save water, there are larger technological innovations like low temperature thermal desalination that can be of great utility in solving a city's water crisis. In fact, much research is taking place on power desalination plants through renewable energy.

A rather innovative solution has come from an engineering student and innovator at NIT Srinagar, Shubam Kumar. He has been working with IIED Centre NIT Srinagar and has recently designed and fabricated a prototype of a “Multipurpose Food Grain Washer and Water Purifying Machine”. The USP of this device is that it saves substantial amounts of water that generally is wasted when washing grains, vegetables, etc., in the kitchen or during cooking. This machine however can also be installed in bigger kitchens like those of restaurants and hotels to ensure water is not wasted.

The inspiration for this innovation came from the young innovator's mother. The excessive water requirement and the resultant water wastage in the kitchen during regular cooking activities made his mother unhappy.Water availability in his village is also limited and the wastage was either due to ineffective system designs or lack of water management habits.

Upon joining NIT Srinagar, Kumar learnt about its Innovation, Incubation and Entrepreneurship Development (IIED) Centre and was motivated to work on the design of such a machine. The result of his passion and hard work

IMAGE: PIXABAY

was a multipurpose washing and water purification machine that efficiently and effectively meets the requirements of various kitchen chores such as winnowing, washing of various eatable items and them purifying the used water into potable water. The machine can also purify unclean water from other sources and convert it into safe drinking water. The icing on the cake is its low cost – if manufactured on a large scale, the per unit cost comes down to around Rs 6,000-Rs10,000 only.

Not surprisingly, the invention has won Kumar a number of accolades. In a typical household kitchen, around 5-7 liter of water is wasted daily while washing food grains before cooking. Even if we can save just two liters of water per day from a single household, it adds up to 360 million liters of water in a year from only about 10 lakh Indian kitchens. The importance of his invention cannot be overemphasized.

The device comes with an upper and a lower part. The upper part is the washer and contains food grain washer, winnowing process, flour sieving process, etc., while the lower part is the water purifier and water storage tank. The machine is about 2.5ft in height with a length and breadth of 1 foot each and has a steel and fiber body. The upper part of machine runs on a DC motor with few mechanical processes for winnowing and washing food grains whereas the lower part contains sedimentation process, RO and UV systems, for purification and recycling of wastewater from any source. The washing capacity of the machine is 1 kg of food grain just in 30 to 40 seconds. The water purifier system can purify about 100 GPD (gallon per day) of water.

Conclusion

With such innovations and inventions coming up, humanity can hope that water scarcity will not be the end of it. However, there is a need for widespread awareness programs to reach out the message of water preservation and conservation among the masses.

Source: Secondary research & media reports

The Water Warriors

Startups with their innovative solutions are taking on the onus of ensuring that India's millions are not deprived of their right to clean and safe drinking water.

IMAGE: PIXABAY

India's startups are proving to be its water warriors – high on innovations and social impact.

INDIA'S STARTUPS ARE high on innovation and with their heart in the right place – tackling burning social issues that need urgent solutions. India's looming water crisis and the rising levels of contamination that threaten the country's food security have attracted several startups to invest in the field. DrinkPrime and Taraltec are two such startups who are doing yeoman's services in the water sector.

DrinkPrime's found its motivation in the water scarcity in Bangalore and the lack of access to clean drinking water for many residents. While those who can afford it go for various home filtration solutions to ensure that they are drinking clean water; the poor are left to manage with water that is often unfit for human consumption. Bangalore has a largely migrant population who come from various parts of India to work in its IT industry primarily. Most stay in rented accommodations and do not want to invest in expensive filtration solutions. Hence, to fulfill their requirement for clean drinking water many depend on bottled water. Many studies have pointed to the adverse effect of bottled water on the health of the people. Several local units of bottled water of dubious quality have also come up in the market and as branded water is expensive, many consumers depend on these local manufacturers.

With water shortage growing these past few years, most Bangalore residents have come to rely on water cans to fulfill their drinking water requirement. However, not only is the water in these cans of poor quality, these cans are also filled in unhygienic conditions. The water can supply too is erratic adding to the woes of the residents.

DrinkPrime decided to tackle this problem at the crux and offer clean drinking water at affordable rates throughout Bangalore. It stepped into the demand-supply gap with the agenda to mitigate the problems of the residents. The two-step process adopted by it concerns ensuring the quality of water using purifiers and secondly, ensuring uninterrupted supply of water at a fixed rate per month.

To ensure affordability and accessibility, the company installs water purifiers in the premises of the customer. But how is it different from any other domestic filtration solution?

DrinkPrime brings in an innovative subscription method to ensure that the clean water remains affordable for most. They supply water under fixed charges based on the usage of the customer. To make this process easier, Drink Prime provides the user a mobile app that they can use to renew the subscription of a water filter.The water provided by DrinkPrime is treated with RO, UV and UF to ensure its quality.

What makes DrinkPrime a winner is that it provides the most efficient water service for consumers by handling end to end process — from installing the solution to filtering water to monitoring the entire process. Consumers are hence saved any headaches.

To ensure that the drinking water supply remains cost-effective for the consumer, DrinkPrime provides installation of the water purifiers free of cost. Hence, the cost of the water purifier is borne by the company. Not only this, the maintenance cost is also borne by DrinkPrime and the company upgrades purifiers to the latest technology every 36 months.

IMAGE: PIXABAY

There is no lag between an order placed and executed as the company completes the installation process within a day. Additionally, DrinkPrime offers a free 7-day trial post which the customer is free to continue or withdraw. The company also offers different plans at affordable price points to ensure affordability for different segments of society. Meanwhile the DrinkPrime mobile app takes care of customers' convenience.

The pricing scheme has been designed keeping customer convenience and affordability in mind. DrinkPrime offers three plans – basic, easy and intermediate – giving the customer a choice between the three. The basic plan of Rs 350/month provides 125 liters whereas in the easy plan the company provides 300 liters for Rs 500/month, while the saver pack supplies 600 liters for Rs700/month. Customers can pay through the Drink Prime mobile app.

What the company thus achieves is combining the convenience of a water purifier and the economics of bottled water into one product. Its more than 10K customer base spread throughout the city is a testimony to its services. DrinkPrime has certainly set a new standard for water purity in Bangalore.

DrinkPrime is revolutionary as it provides a solution to India's drinking water crisis, especially in cities. It takes care of the water needs of the busy professionals with little time to spare in cities. By keeping the water supply affordable, it is also fulfilling the needs of a larger population. By providing a constant clean water supply clean, the company provides alternative to the traditional methods of water supply.


Purifying groundwater for the village folk.

IMAGE: PIXABAY

Taraltec: A solution to contaminated groundwater

If DrinkPrime offers solution to clean drinking water in the cities, Taraltec offers a simple solution to purifying groundwater that ensures safe and clean water to 650,000 villages in the country.

Taraltec Disinfection Reactor is a 'fit and forget' device that converts contaminated water from borewell handpumps at the source to clean water by killing 99% of the microbes present in it.

The device works by converting the kinetic energy of the fluid into millions of targeted micro-bubbles each acting as localized reactors. The process generates extreme heat, pressure and turbulence releasing intense energy packets during the collapse of bubbles. The result is a shockwave that is marked by a bang sound and lacerates and kills the microbes. At the end of the process, water that is 99% safer than it was earlier, emerges from the borewell or pump.

The Taraltec reactor isn't a filter. Rather, it employs certain scientific principles inspired by biomimicry to ensure clean and safe water. Priced at less than Rs 7500 per piece, the solution that has won various awards has a few pending patents for this innovation.

What makes Taraltec device a winner is in its simplicity of use. It can be fit and used in less than 30 minutes even by someone who does not possess the requisite scientific knowledge or technical skill. It is easy to retrofit the reactor into a hand pump or a motorized borewell, thus eliminating nearly any chance of waterborne diseases making their way. The device is made of specially treated steel and engineering plastics and hence its maintenance cost is almost nil. It also does not require any fuel or electricity to work as the pumping movement done by a human being while withdrawing water from the hand pump powers the device.

The manufacturing of the device is being done by third parties. The company has an assembly cluster in West Bengal and plans to develop more in different parts of the country.

Taraltec also believes in word of mouth and has been collaborating with major corporations. Several hundreds of units have already been sold by the company and are impacting the lives of more than two lakh people directly. The tie-ups with corporations have resulted in the corporate social responsibility (CSR) wings of corporations like Lupin, Godrej, Reliance, Tata Trust, Nalanda Foundation, Water Aid and Jubilant deploying the reactors in various parts of rural India.

The reason why the Taraltec Disinfection Reactor has found so many takers is because it is a zero maintenance and simple device that can be installed and operated by even persons with little technical skill. It does not require any specialized tools or training.

Conclusion

India's water woes are real and imminent and experts and even the government have rung the warning bells. In view of this, these startups can prove to be the saviors of millions of Indians offering simple and affordable solutions to ensure clean and safe water supply.

Source: Secondary research & mediareports

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Write to us: bejonmisra@consumerconexion.org

MAKING CLEAN DRINKING WATER ACCESSIBLE TO THE MASSES

Two engineering students from Kerala invent low-cost organic purifiers that can help bridge the water gap.

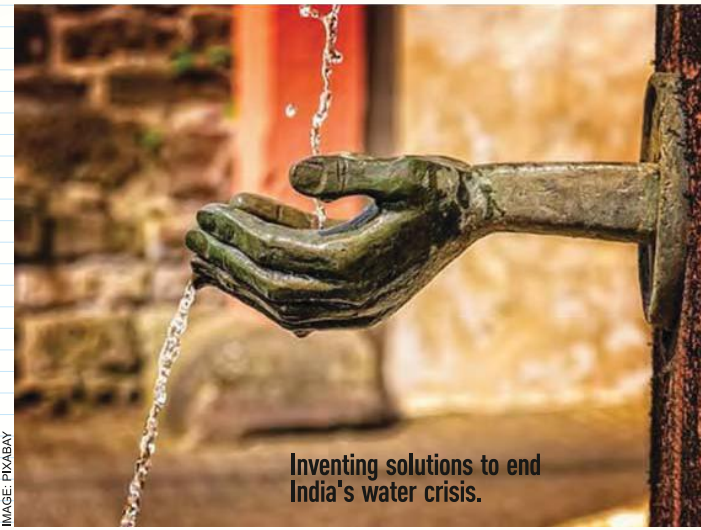

IMAGE: PIXABAY

Inventing solutions to end India's water crisis.

NECESSITY IS THE mother of invention and potable water is the most basic of human requirements. But years of exploitation and misuse of natural water resources coupled with environmental factors like climate change have made access to safe drinking water a grave problem.

Anto P Biju and Thomas Cyriac from Palai town of Kerala got the first-hand experience of the grave water crisis. The two friends were on a trip to another city in 2017 and had stopped on way at a food joint on the highway. When they requested for drinking water, they were served dirty brown water.

These students of St Joseph's College of Engineering and Technology had been working on inventions that targeted common problems of the people. This was indeed a rather serious everyday problem of the people that needed to mitigate.

This chance encounter on the highway led to the development of their first product – a pen. But this was no ordinary pen. In fact, this was designed to detect impurities in water. All one had to do was to dip it in water and it would list water impurities. Not only this, it could also tell the user whether the water was fit to be consumed or not.

The duo's invention was much appreciated at an innovation competition organized by Kerala Startup Mission. But it did not satisfy them, and they worked for nearly two years after that to build a prototype, while pursuing their academics. In the process, Anto and Thomas developed as many as 60 variations of water purifiers but ended up rejected all of them.

In their quest for the cost-effective purifier, they consulted several experts and finally all their hard work and sleepless nights bore fruit.The two budding engineers took inspiration from scientists at Institute of Minerals and Materials Technology in Bhubaneswar and finally completed the mini-cartridges project that could filter impure water using activated carbon.

In 2018, aged 21, the two formally registered their startup Lamaara Technologies Private Ltd and were ready to take their product to market. Their fledgling venture also received a seed funding of Rs 2 lakh from the Kerala Startup Mission.

The Works

The cartridge purifier is the size of an index fingered can filter harmful microorganisms. There are pores that act as micro-reservoirs and are fixed over a disc inside the cartridge. This eliminates foul smell, harmful metals and color from the water. The bonus is that the innovative technology adds minerals to improve the immune system.The purified water conforms to the Bureau of Indian Standards (BIS) standard for safe drinking water. This indigenously developed technology is an organic water filter that can purify up to 30 liters of impure water

within a few hours. The cartridge would need to be replaced every five years and costs a paltry Rs 60.

The Impact

The young engineers' product was developed at a very crucial time. Kerala was in the grip of devastating flood in 2018 and the technology was put to test during this critical disaster with thousands of people displaced and shifted to relief camps overnight. The floods had given rise to several problems and one of the most critical was access to clean drinking water.

Their initiative gained momentum as word spread and many people became interested in purchasing their product. Several investors too showed interest in the technology and offered funding. The startup received an investment of Rs 4.5 crore to develop more water purifiers and has sold more than 200 water purifiers in the state. This is over and above the water filters they donated during the Kerala floods.

IMAGE: PIXABAY

A chance encounter with a dirty glass of water sets off a trail of tech innovations.

There's more invention coming...

For Anto and Thomas, this was just the beginning. The duo is now ready with their next invention – a bottle water filter.

This product comprises a silicon bottle with a water filter cartridge. The in-built organic filter at the center-bottom on the base filters the water by removing all impurities. Called the iBo or 'Intelligent Bottle', it has a three-layer filtration system that consists of Nano-fiber membrane, made with the help of nanotechnology. The iBO is capable of removing microorganisms such as bacteria and protozoa. It also has coconut activated carbon that will effectively remove odor, chemicals and chlorine contents from the water.

This bottle filter, in the third stage, consists of a mineral add-on feature that will add minerals to the water and make it slightly alkaline. This will make the filtered water beneficial for the health of the customer as alkalinity of the water can kill viruses.

The user of the bottle has to do nothing except fill it up with any available water and the purifier will do its job, converting the water into safe drinking water within minutes!

The iBo priced at Rs 600 has different versions. In its Alpha avatar it comes with an application that is linked with the bottle. Once you fill up the bottle, the app shows the components or matter present in the water. It also offers the user an option to fill in personal details like BMI, with the help of which the app will send reminders to the user that it is time to drink water to avoid dehydration.

The iBo BETA version comes in stainless steel form and is foldable taking care of the space and weight issue that an ordinary steel bottle present. This version is targeted at school and college students who generally ditch the water bottle for lack of space and weight issues.

Conclusion

India's millennials have their heart in the right place and are willing to work on challenging social issues that impact the masses. The simple water filters are inventions with far reaching impact that can help the country cope with the problem of water contamination. It can ensure that clean drinking water is available till the last mile.

Source: Secondary research & media reports

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