Newsletter

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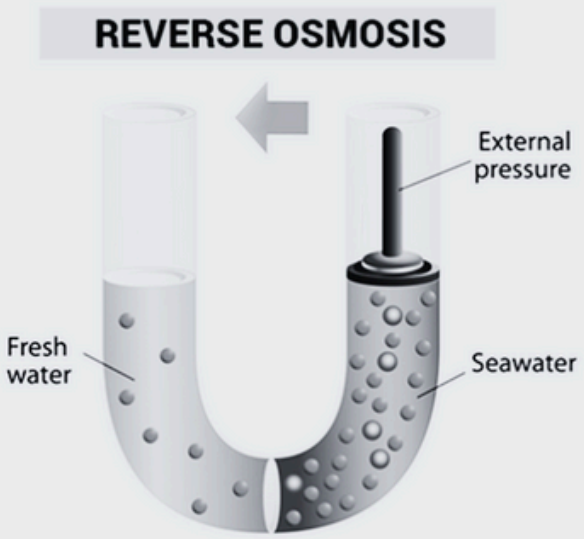
JAL SHAKTI BOARD NLUO

REVERSE OSMOSIS: HOW PURE IS TOO PURE FOR SAFE DRINKING WATER?

SURBHI LAKRA

In a small village in Kerala, India, an unexpected health crisis unfolded. Residents, relying heavily on Reverse Osmosis (RO) systems for water purification, began to experience alarming symptoms—fatigue, muscle cramps, and bone weakness. The culprit? Over-purification. By stripping essential minerals from the water, these RO systems disrupted the natural balance necessary for good health. This isn't an isolated issue.

Similar concerns have emerged in Slovakia and Czechoslovakia, where the use of over-purified water has led to comparable health problems. Could our quest for purity be compromising our well-being?



Reverse osmosis (RO) is one of the most widely used water purification methods today, dating back to the 1950s when it was primarily employed for seawater desalination. While initially slow and limited to laboratories, technological advancements have greatly improved the efficiency of RO systems, especially in developing more effective membranes. Today, reverse osmosis is commonly used for residential, industrial, and scientific purposes.

This newsletter focuses on the use of RO systems for residential water purification. While RO is effective at removing contaminants, questions arise about whether 100% purity is actually beneficial for health. Is the water we drink becoming too pure? This piece explores the potential health risks and environmental impacts of over-purified water and seeks to find the balance between purity and well-being.

Reverse osmosis purifies water by forcing it through a semipermeable membrane that blocks solutes (like salts and impurities) while allowing water molecules to pass. This process requires pressure to overcome the natural osmotic force, effectively removing contaminants from water.

Although RO systems dispense water free from harmful substances and biological organisms, this also includes essential dissolved minerals such as calcium, magnesium, and potassium. These minerals are important for human health, which raises the question: Is mineral-free water really healthy?

While reverse osmosis delivers ultra-pure water, over-purification comes with risks. Stripping water of essential minerals can negatively affect health. Calcium and magnesium, for instance, are critical for bone health, cardiovascular function, and overall metabolism. Drinking water devoid of these minerals may lead to deficiencies over time, potentially contributing to conditions such as osteoporosis and cardiovascular disease.

Moreover, ultra-pure water may be slightly more acidic, which can disturb the body's pH balance. The World Health Organization (WHO) warns that demineralized water can increase the risk of electrolyte imbalance, particularly in vulnerable populations such as children, the elderly, or those with pre-existing health conditions. Prolonged consumption of this "dead" water can cause mineral leaching from the body, which stresses organs like the kidneys.

Another drawback of RO systems is their environmental footprint. For every liter of purified water produced, RO systems typically waste 3-4 liters of water, aggravating water scarcity in regions where access to water is already limited.

Moreover, the rejected water (brine) contains concentrated salts and other impurities, which, if not managed properly, can cause soil salinization and water pollution. Additionally, the energy-intensive nature of RO systems adds to the environmental burden, especially when powered by non-renewable sources. As we pursue purity, we must also weigh its impact on our environment.

In 2022, the legal debate surrounding Reverse Osmosis (RO) water systems in India took center stage when the Supreme Court intervened in the issue of their usage. The case stemmed from concerns raised by the National Green Tribunal (NGT) regarding the environmental and health implications of these systems, particularly in relation to the Total Dissolved Solids (TDS) levels in treated water.

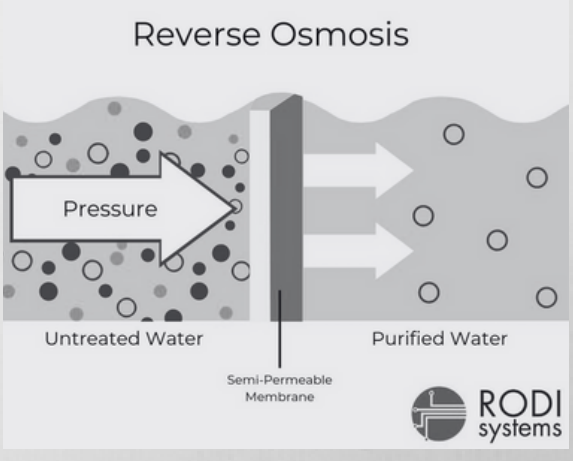
The Supreme Court's involvement came in response to an appeal challenging an NGT order from 2019, which had called for restrictions on the use of RO systems in areas where the TDS level in water was below 500 mg/l. The NGT's concern was based on findings that RO systems not only waste a significant amount of water during the purification process but also indiscriminately strip water of essential minerals, even when the water quality does not require such extensive filtration.

RO systems are not only environmentally costly but also financially burdensome. Installation and maintenance can be expensive, particularly for low-income households or those in rural areas. The recurring cost of replacing filters, along with energy consumption and waste management, adds to the long-term financial strain.

Given the high costs, many communities and individuals are left with limited access to clean water, raising the question of whether more affordable and sustainable purification options exist. The challenge lies in finding solutions that balance health, affordability, and environmental sustainability.

Achieving a balance in water purification means ensuring safety without over-purifying. While RO effectively removes contaminants, it can also strip away beneficial minerals, leading to "dead" water that may negatively affect health over time. Experts recommend maintaining a Total Dissolved Solids (TDS) level between 200-250 mg/L, which allows for essential minerals like calcium and magnesium to remain in the water.

A practical solution is remineralization, a process in which minerals are added back to RO-purified water. This can be done through specialized filters or by introducing trace minerals, improving the water's taste and health benefits. Remineralization restores balance and ensures that water is clean, safe, and mineral-rich—without being overly purified.



Given the environmental and economic drawbacks of RO, alternatives like activated carbon filters, UV purifiers, and ceramic filters are worth exploring. These systems are often more affordable, waste less water, and retain essential minerals while still removing harmful contaminants.

Testing local water sources is also crucial to tailor solutions based on specific needs. For areas with fewer harmful contaminants, simpler filtration methods may suffice, reducing both costs and environmental impact.

While reverse osmosis is an effective water purification method, it's important to recognize that too much purity can be harmful. Removing essential minerals from water can lead to long-term health issues, particularly in vulnerable populations. Moreover, the environmental and economic costs of RO systems make them less sustainable in the long run.

The key is to strike a balance between removing harmful contaminants and retaining beneficial minerals. Remineralization and exploring alternative filtration methods can help achieve this balance, ensuring that drinking water remains both safe and health-promoting.

Ultimately, when it comes to water purity, more is not always better. Understanding your local water quality and making informed decisions will help ensure that you're drinking water that supports your health without compromising the environment.

ASSAM URBAN WATER BODIES (PRESERVATION, CONSERVATION, AND PROTECTION) BILL

NAMRATA BORDOLOI

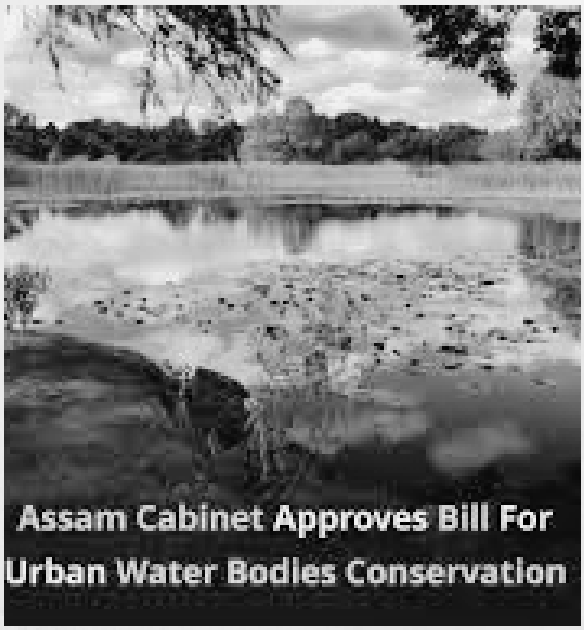
The state government in Assam proposed the Assam Urban Water Bodies Bill in the Assam Cabinet on 14 August 2024. The Assam Cabinet later sanctioned a legislative proposal with the aim to conserve and preserve water bodies, which was unanimously approved by the Assam Legislative Assembly on August 29, 2024. The objective of this bill is to safeguard the groundwater resources and address the problems caused by artificial urban flooding. This bill will facilitate the preservation, protection, rejuvenation, conservation, regulation and maintenance of water bodies including natural water channels that are located within the state's designated master plan regions. It will encompass all community water bodies, ponds, tanks, including those associated with religious institutions, measuring two acres or more.

However the legislation excludes the private water bodies that are smaller than two acres or those located in those regions designated as Reserved Forest, Wildlife Sanctuary, or national park.

Two levels of committees will be established by the proposed law- district and state levels. This new legislation has a significant clause that forbids any authority from awarding the allocation of land designated as water body without first receiving approval from the State Level Committee. The government has put strong sanctions for infractions to guarantee compliance within these laws. Activities like construction and dumping debris are strictly prohibited.

The level of urbanization stands at 14% according to the 2011 census. This level of urbanization is envisaged to expand significantly in the upcoming decades due to improvements in the infrastructure sector inside metropolitan areas. One of the many consequences of urbanization, the conversion of natural ecosystems into man-made environments is perhaps the most prominent. Development of growing cities requires the use of hills and waterways in addition to accessible undeveloped land. This has led to unregulated encroachment onto low lying areas, steep terrain and aquatic bodies in an effort to make these areas suitable for human settlement. These low-lying areas and water bodies play a crucial function in the drainage system of an area by serving as retention tanks holding surplus precipitation and thus alleviating the risk of flash floods in the area. In addition to serving as water reserves for human and other purposes while also contributing substantially in replenishing the ground water supply, which is rapidly running out as a result of urbanization.

The rapid urbanization of areas leads to the filling of the water bodies significantly reducing the retention capacity, disrupting the entire natural drainage system, resulting in flash floods in urban areas during a heavy downpour.



Currently, this has become a very common occurrence in the towns and cities of Assam, especially during the rainy season causing widespread inundation and damage to public property and disrupting daily life. Consequently, Assam Urban Water Bodies (Preservation and Conservation) Bill, 2024, was necessary in order to address the issue of flash floods in the urban settings and to protect, conserve and preserve water bodies, especially within the master plan areas of Assam.

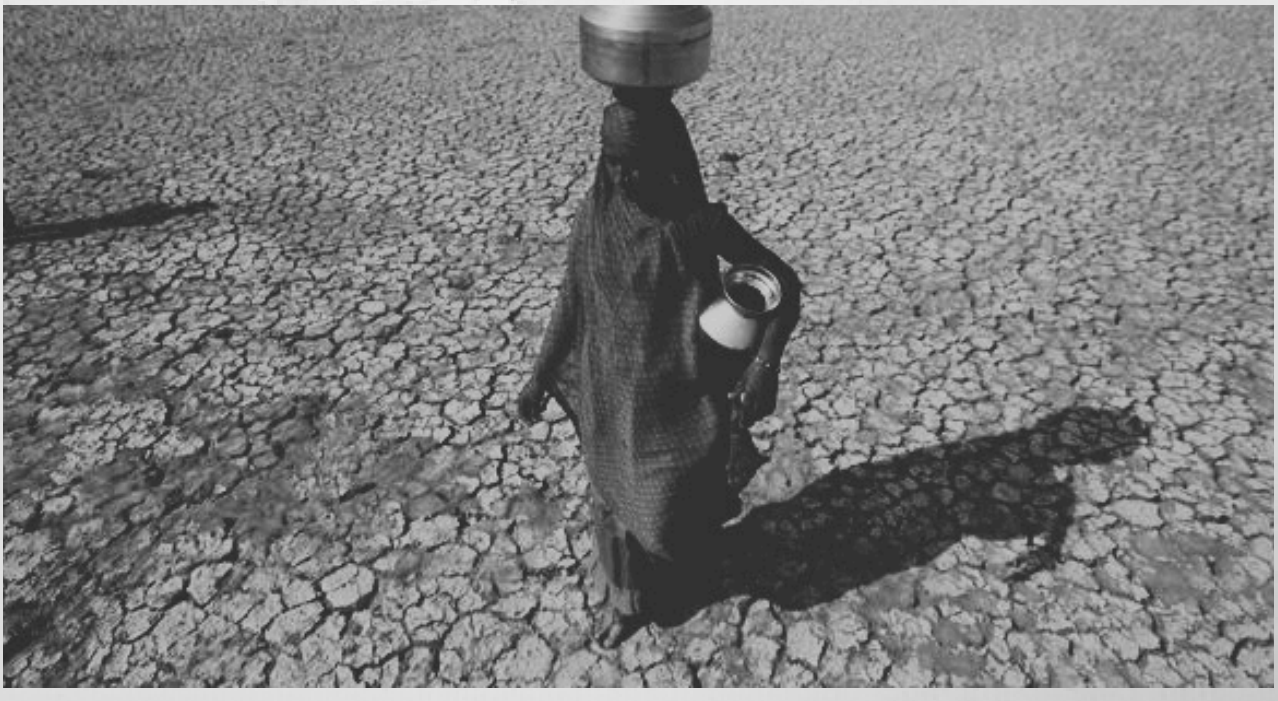
For this scheme's implementation, the idea is to integrate ULB grants with federal, state and local government funding. It is worthy to note that any violation of the act's terms will be a punishable offense and result in a criminal penalty of up to Rs. 100,000 in fines or three years in jail, or both. Additionally, the offender will be required to restore the water body in its original location. Urban water bodies like lakes, ponds and wetlands are crucial for preserving the natural equilibrium of metropolitan areas.

They are essential for sustaining biodiversity, replenishing groundwater, controlling regional climate and acting as catchment areas in the event of flooding. Determining and mapping every water body in Assam is one of the Bill's main objectives. Hence, a crucial step towards sustainable urban growth is needed. Strong administration and public support for effective implementation will maintain the state's environmental and economic wellbeing and guarantee that Assam's urban water bodies will continue to be essential resources.

WATER CRISIS IN INDIA: NATIONAL AND GLOBAL CONCERN

ALEN EKKA

Water scarcity is a big problem all over the world and recently in the cities like Bangalore and Mumbai are no exception where in some areas people are struggling to find enough water which is necessary for people's survival as well as economic system. Recently it has been found that Bangalore and Mumbai are suffering from severe water crisis that includes water supply shortage; water quality problems; and political implications. Although Bangalore is trying to adopt new ideas and technologies that will help in the proper management of its water supply,



Mumbai faces basic problems in water supply that even threaten the public health of the population. Each city demonstrates emerging crises of water sustainability that require immediate attention in face of increasing population density and climatic changes.

Economic and Social Implications

In a recent study, it was forecasted that, in 2030, India would face water scarcity situation than ever before, therefore the case will worsen. Moody's has also said there is a danger of food inflation going up and social unrest if water shortage persists. This has put a lot of pressure on the available water resources because India is endowed with only 4% fresh water resources and huge population. Currently, the per capita water resource in the country is about 1,100 cubic meters; it is very close to the level characteristic of water scarcity countries.

Marathwada Region in Maharashtra

The Marathwada region in the state of Maharashtra where out of the eleven major reservoirs present in the area at least five of them still contain water. Still the Latur city has not been threatened with severe water shortages in the immediate future as the authorities concerned have promised water supply for several months.

Government Initiatives

The Indian government has come out with various policies in a bid to address the problem. Take for instance the Jal Jeevan Mission is to provision all the households with tap water connection by the year 2024.

Furthermore, the recent formation of Ministry of Jal Shakti has made centralised efforts in usage of water for drinking and non-drinking purposes for Water Management. However, problems persist as rising cases of climate change have brought more frequent and prolonged droughts as well as unpredictable monsoons more challenging to the water supplies in the nation.

Health and Environmental Impact

Like for agricultural and industrial markets water scarcity is a problem also for public health. Some people are unwillingly using polluted water sources thus having a high prevalence of waterborne diseases. In addition, reservoirs have been depleted and over-extraction of the groundwater has led to the degradation of ecosystems and adversely affected plant and animal life.

Efforts towards Water Conservation

There has been massive effort by the government and the civil society towards the conservation of water. Awareness creating programmes on rain water harvesting and efficient irrigation and water management have been consistently broadcasted. All these a revery important in order to see sustainable usage of water today in the light of the future that is hard to tell what it holds.

Proper and efficient use of these water resources to support the world's increasing population is worthy for arresting this looming water shortage crisis.

GLOBAL PERSPECTIVE ON WATER CRISIS

According to the study launched by the United Nations Entity for Water Cooperation, UNESCO has predicted a future water crisis in the UN World Water Development Report 2023. The report also notable in indicating that 2 billion, which is equivalent to 26 percent of the world population, have no access to safe water for drinking. In addition, about 46 percent of population of the world is without safe sanitation.

It is also shown that from 2 to 3 billion individuals lack water supply during a month at least once a year. This has not only a life- threatening possibility but also effects food production and energy generation as well. Thus, there is an urgent need for intersectoral co-operations from the governments, scientist, civil society and communities to tackle the worsening water situation.

THE DYING RIVER GANGA

ANAND MEENA

The river Ganges in India is more than 2,500 km long and has the most populated river basin in the world. The Ganga originates from the Gangotri Glacier in Uttarakhand and flows down to the Bay of Bengal. Its main source is the Bhagirathi River, which meets the Alaknanda at Devprayag, and then flows into the northern plains before reaching the Bay of Bengal. The basin that houses the river is heavily populated, with millions of people dependent on it for water, as well as diverse wildlife. However, increasing levels of pollution are posing a deadly threat to this vital river, which is also seen as a motherly figure.

The Ganga, in particular, is very important due to its religious significance among Hindus across India, and yet its current condition is so poor that some parts of it might even be confused with gutters. It wouldn't be wrong to say that it is one of the most polluted rivers in India.

The Ganga has been polluted by various pollutants from industrial waste, agricultural runoff, and untreated sewage.

Industrial Waste: Over 700 tanneries along the Ganga discharge toxic substances like chromium, sulfuric acid, arsenic, and mercury into the river. This causes far-reaching environmental damage and serious health issues for nearby populations, including high rates of cancer and blindness in children.

Agricultural Runoff: The river is also polluted by chemicals used in farming. Fertilizers and pesticides run off into the river, depleting oxygen in the water and killing aquatic life. Additionally, the water contains excessive levels of nitrates, which can cause health problems such as "blue baby syndrome" in infants.

Untreated Sewage: Huge amounts of untreated sewage, including human waste, are dumped into the Ganga every day. This has led to waterborne diseases such as diarrhea, cholera, and dysentery in rural areas. It is said that nearly 80% of diseases in rural India are waterborne, with contaminated water responsible for up to 600,000 deaths every year

Health and Environmental Impact

Pollution in the Ganga has led to major health problems and ecological damage. Stagnation in parts of the river has increased levels of mosquito-borne diseases like malaria and dengue. The most deadly type of malaria, Plasmodium falciparum, is now developing resistance to drugs, posing a serious health risk.

The ecological health of the river has deteriorated to the point that India's national aquatic animal, the Ganges river dolphin, was declared functionally extinct in 2007. Many other species that once thrived in the Ganga are on the brink of extinction due to pollution and habitat destruction.

Spiritual and Cultural Significance

To Hindus, the Ganga holds unparalleled cultural and religious importance, with the belief that its waters cleanse one's soul of all sins. Varanasi, one of the holiest cities in India, sees many Hindus seeking to be cremated on its ghats, with their ashes scattered in the river. However, rising pollution has turned the pure waters of the Ganga into a health hazard, raising questions about the future of religious and cultural practices associated with the river.

Policies and Performance

The Indian government has implemented various policies and programs to combat Ganga pollution: National Mission for Clean Ganga (NMCG): This flagship program focuses on sewage treatment, riverfront development, industrial pollution regulation, and afforestation. Despite achievements, challenges such as infrastructure inadequacies and urbanization remain.

Namami Gange Program: Complementing the NMCG, this initiative aims for a clean and pollution-free Ganga, focusing on afforestation, riverfront development, and public awareness campaigns.

Ganga River Basin Authority (GRBA): The GRBA coordinates and oversees rejuvenation projects related to the Ganga.

While these initiatives have made some progress, much work remains.

Hazards of Ganga Pollution

The principal hazards of Ganga pollution include: Waterborne diseases: Contaminated Ganga water can lead to diseases such as typhoid, cholera, and diarrhea.

Loss of biodiversity: Pollution threatens aquatic life, including fish and other organisms.

Soil contamination: Pollutants seeping into the soil make it unsuitable for agriculture.

Climate change and economic impact: Pollution may contribute to climate change through the release of harmful gases, affect natural water cycles, and harm tourism and agriculture, negatively impacting the regional economy.

Only a concerted effort involving proper government initiatives and public participation can effectively tackle Ganga pollution.

Government Initiatives and Technological Efforts

The Indian government launched the Namami Gange initiative to purify the river. The ₹20,000 crore project primarily focuses on building and upgrading sewage treatment plants. However, the project is developing slowly. As of 2019, only 20% of the sewage produced by cities along the Ganga was being treated, with estimates of reaching 60% by 2026.

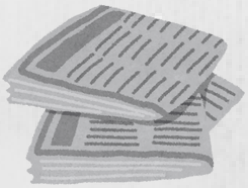
Technological innovations like floating trash skimmers are being used to remove surface-level waste, but these efforts have not yet significantly improved the river's overall water quality.

Current Challenges

Despite the efforts, much more needs to be done to save the Ganga. Industrial waste continues to overflow into the river, and the increasing population is driving higher water demand. Without urgent and collective action, pollution will continue to threaten the livelihoods of millions, destroy wildlife, and erode the cultural and spiritual bonds surrounding the sacred river.

India’s growing population is expected to increase water demand by 32% by 2050, making it clear that the mission to restore the Ganga's water quality is far from complete.

The Ganga, once India's purest and holiest river, now stands on the brink of a grave environmental and public health crisis. For decades, industrial effluents, untreated sewage, and agricultural runoff have polluted the river, endangering aquatic life and the millions of people who depend on it. While initiatives like Namami Gange have been launched, progress has been slow, and much more needs to be done to reverse the damage. The Ganga is not only a water source for millions but also a symbol of Indian culture and spirituality. Both short and long-term actions are urgently needed to protect and restore the river, ensuring its health and vitality for future generations.



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