Effective Water Source Management: A Sustainable Lifeline

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He is the Chief Strategist of TS Advisory Services which works on the philosophy to evolve, adapt, and innovate as success means choosing to change for the better. He is responsible for evaluating, defining and developing measurable business and communication strategies for water companies. A doctorate in media, he has over 26–years of experience working with different sectors including water and wastewater.

Water, the elixir of life, is unquestionably one of the most vital resources on our planet, essential for all forms of existence on earth. Water sustains life, and its value cannot just be ornamental. It is the primary constituent of all living organisms, crucial for various processes such as hydration, sanitation, and food production. Beyond its direct importance for human survival, water also drives economies by supporting agriculture, manufacturing, and energy production.

With ever increasing population and intensifying climate change events, responsible and sustainable management of water sources has become an urgent necessity. The safety and sustainability of water sources are paramount, as it directly impacts our well–being, ecosystems, and economic progress.

Challenges to Water Source Management

Water resource management has far–reaching implications on every aspect of human life and the economy. With unsustainable use of precious water resources over the years, water scarcity has become a critical challenge, especially in India where almost half of the population facing severe stress. It is imperative to enhance its management for long–term sustainability. Managing water sources is a complex task with various challenges that need to be addressed to ensure the sustainable availability of clean and safe water. Some of the key challenges to water source management include:

Population Growth:

Over the past five decades, the global population has more than doubled, rising from 3.92 billion in 1973 to its current 8.04 billion. Although the growth rate has slowed down significantly, dropping from over two percent annually to less than one percent, the increasing population has substantially heightened the demand for freshwater. This exerts tremendous pressure

Dried Water Pond

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Fresh Water Reservoir

on existing water sources, resulting in their depletion and heightened competition for this vital resource. From an Indian perspective, the situation is particularly critical, with less than four percent of the world's fresh water sources catering to a population that accounts for nearly eighteen percent of the global total.

Pollution:

Industrial, agricultural, and domestic activities release pollutants into water bodies, exposing the quality of available freshwater. The contamination of water sources, such as rivers, lakes, oceans, ponds, groundwater, and even drinking water sources, by harmful substances or pollutants has been increasing. These pollutants can be in the form of chemicals, microorganisms, or other substances that alter the physical, chemical, or biological characteristics of the water, making it harmful or unsuitable for various uses, including drinking, commercial, and aquatic life.

The rampant wastewater discharge into water bodies in developing countries including India has become a big challenge. According to the Central Pollution Control Board (CPCB), the current sewage treatment infrastructure in India can only manage to process approximately one–third of the total daily municipal sewage output. An approximate estimate indicates that urban areas in the country produce nearly 80,000 MLD (million litres per day) of domestic wastewater, and a similar volume of industrial and other wastewater is also generated daily. The extensive discharge of untreated wastewater into water bodies has resulted in significant pollution of groundwater sources in various locations. This has led to the deterioration of some of the nation's prominent rivers, with either their disappearance or severe contamination that the water is unfit for any practical use.

Groundwater Depletion:

Over–extraction of groundwater for agriculture, industry, and domestic use has led to the depletion of aquifers in many areas. India is the largest user of groundwater, extracting an estimated 230 cubic kilometers of groundwater per year – over 25% of the total global groundwater usage. Almost 89% of the groundwater extracted is used for irrigation and the rest for domestic and industrial use. More than 60% of irrigated agriculture and 85% of drinking water supplies are dependent on groundwater.

Groundwater depletion in India is a serious issue. According to the Fifth Minor Irrigation Census, the groundwater level in India has declined by 61% between 2007 and 2017. It was further observed that more than 1,000 blocks in India have become water–stressed.

Around 65% of India's total water demand is being met from groundwater sources which plays an important role in shaping the nation's economic and social development. However, an increasing number of aquifers are reaching unsustainable levels of exploitation. If current trends continue, in 20 years, about 60% of India's aquifers will be in a critical condition, says a World Bank report.

India's northern and eastern states such as Assam, Punjab, Haryana, Delhi, Uttar Pradesh, Bihar, and West Bengal saw a rapid decline in usable groundwater in the past decade, raising

River: Valuable Resource of Water Supply

the risk of severe droughts, food crisis, and drinking water scarcity for millions of people. About 40% of India's population possibly would have no access to drinking water by 2030, as reported by the Niti Aayog.

A survey conducted by the Water Ministry in India have analysed 10,219 wells across several states to ascertain the groundwater levels; around 55% of them were showing fall in groundwater level.

Fall in Water Level in Wells

Tamil Nadu	76%
Punjab	72%
Kerala	71%
Karnataka	69%
Meghalaya	66%
Haryana	65%
West Bengal	64%
Delhi	62%

Aging Infrastructure:
The ageing water storage infrastructure is an emerging global risk. In their report in 2021, the United Nations University Institute for Water, Environment and Health (UNU–INWEH) provides an overview of the current state of the ageing of large dams. It highlights that tens of thousands of existing large dams have reached or exceeded an "alert" age threshold of 50 years, and many others will soon approach 100 years. The report further explores the emerging practice of decommissioning ageing dams, which can be removal or re–operation, to address issues such as ensuring public safety, escalating maintenance costs, reservoir sedimentation, and restoration of a natural river ecosystem. The recent flooding in Libya, that killed nearly 12000 people, deaths still counting, due to bursting of two dams after the heavy rainfall in the region could have been avoided if the dams were maintained properly.

In India, there are 5334 large dams, third largest number of dams in the world after the USA and China. The number is set to increase in the coming years as India constructs more dams to meet the rising demand for electricity and water. Over a thousand large dams will be roughly 50–years–old in 2025 and such aging structures pose a growing threat, according to a United Nations (UN) report which notes that by 2050, most people on Earth will live downstream of tens of thousands of dams built in the 20th century. Upgrading and maintaining such large number of aging water infrastructure is costly and logistically challenging.

Climate Change:
Altered precipitation patterns and rising temperatures due to climate change have led to shifts in water availability. Some regions are experiencing more prolonged droughts, while others face an increased risk of flooding. It has been affecting water resources in India, leading to shortage of water in several regions. The crisis has especially worsened in recent years due to climate change, which results in delayed monsoons, consequently drying out reservoirs in several regions. The consumption of water would escalate further with pressure from industrialization and urbanization. Climate change could lead to extreme weather events like floods, droughts, heavy rains, unseasonal rains, hail storms, etc., which have impacted the Indian economy adversely. Rising temperature are causing Himalayan glaciers to retreat, threatening the flow rate of the Ganga, Brahmaputra, Yamuna, and other major rivers; the drinking water supply of millions of people and livelihoods of farmers depend on these rivers.

Strategies for Water Source Management

Implementing effective water source management strategies is crucial for ensuring the sustainable availability of clean and safe water. Effective water source management requires collaboration, transparency, and a shared commitment among all stakeholders, ensuring that clean and safe water remains accessible for present and future generations. Some of the key strategies could be:

Conservation of Resources:
Water conservation is important for several reasons. Freshwater is a very limited resource, essential for human survival. It is also necessary to ensure continuous water supply to future generations, protect us from health hazards caused by water pollution, and keep water pure and clean while protecting the environment.

Freshwater accounts for only 3% of our surface water. And most of the fresh water on our planet is not available for use since it is locked away in various forms of storage. Such forms include ice, glaciers, and groundwater. Usable water is already a scarce resource in many parts of the world, becoming an increasing concern. Encouraging water conservation practices at the individual, community, and industrial levels are critical. This includes fixing leaks, using water–efficient appliances, and reusing treated wastewater for useful purposes.

Improved Infrastructure:
Investment in building robust and climate

resilient water infrastructure, such as dams and storage, water treatment facilities and pipelines, can help reduce water losses, improve water quality, reduce contamination, while also generating a number of economic, environmental, and social benefits.

Excellent water infrastructure helps keep the public safe from health problems that can arise due to a lack of it. While making water available for drinking and commercial activities, it also provides a lasting legacy to water utilities as it will serve future generations too.

Wastewater Treatment:
Ensuring that wastewater is adequately treated before being discharged back into natural water bodies is crucial to prevent pollution. In a circular economy, wastewater is treated and reused as a resource that can improve the availability of water for people, industries, and irrigation. Wastewater reuse can reduce the need for water withdrawals, while decreasing the volume of effluents discharged into water bodies. In India, only about one–third of total generated wastewater is being treated and reuse is almost negligible due to lack of implementing norms. The agriculture sector that uses 80% of fresh water mostly extracted from groundwater sources could be provided reclaimed water to reduce their dependence on freshwater sources.

Technological Advancements:
Technological advancements have brought about several innovations in water resource management. The use of Artificial Intelligence (AI), Internet of Things (IoT) sensors, and advanced meters enable water quality and quantity control as well as remote asset management and responsible water use.

Protection of Watersheds:
Preserving natural watersheds through reforestation and land–use planning can safeguard the quality and quantity of water flowing into reservoirs and aquifers. Watersheds provide important support in drinking water supply, water for agriculture and industries, offer opportunities for recreation, and provide habitat to numerous plants and animals. Unfortunately, various forms of pollution, including runoff and erosion, can interfere with the health of the watershed. Therefore, it is important to protect the quality of our watersheds.

Dam: Vital Water Storage Infrastructure

Climate Resilience:
Developing water management strategies with climate resilience are essential to ensure the availability of water resources in the face of climate change. Climate–resilient water management approaches such as adopting efficient irrigation practices and implementing water recycling systems, among other strategies are essential for mitigating climate change effects and protecting the ecosystems as well.

Fostering Transformational Change

TS Advisory Service is actively engaged in the field of water advisory, offering expertise and guidance in various aspects of water resource management, conservation, and sustainability. The services include a wide range of activities and initiatives aimed at addressing water–related challenges and optimizing water use across different sectors. The team of skilled professionals having diverse industry experience with a pragmatic approach to solving complex challenges provide strategic advice for water conservation and resource management, implementing sustainable practices, and assisting clients in navigating water regulations and policies. TS Advisory Service's commitment to water advisory reflects the dedication to promoting responsible water management practices and ensuring the availability of clean and safe water resources for communities and industries.

With a distinguished clientele consisting of prominent water companies in India, TS Advisory Services has established itself as a reliable partner in the water sector. The company has the honour of collaborating closely with well–known water firms, offering them specialized advice, inventive strategies, and customized marketing solutions. Drawing on extensive industry expertise and experience, TS Advisory Services is well–equipped to comprehend the distinct challenges and prospects encountered by water companies in India.

Way Forward:
Water source management is not just a matter of environmental concern; it is a matter of human survival and well–being. The challenges we face regarding water availability and quality require immediate attention and proactive actions at all levels. By embracing sustainable practices, conserving water resources, and adopting responsible policies and regulations, we can ensure that the lifeline of our planet remains intact. The time to act is now, as responsible water source management is not only a necessity but a moral obligation towards our planet and its inhabitants. It is our collective responsibility to protect and preserve our lifeline – water.