

# WATER SCARCITY IN INDIA: CAUSES, EFFECTS AND SOLUTIONS

**Dr.R.Balaram and Dr.S.V.Lingeswara Rao**  
**Department of Geology, S.V.University**  
**TIRUPATI – 517 502, ANDHRA PRADESH, INDIA**  
**Mobile:9849889229 Email Id:svlrao12@gmail.com**

## ABSTRACT

Water is the basic necessity of every human being, but water scarcity is a prime issue rising very rapidly in India. The problem has become so severe that in many states the groundwater has almost dried up and people have to depend on water supply from other sources. Moreover, water is one of the copiously misused natural resources and central point of our lives. But unfortunately it is not our priority concern. Earlier, people understood the value of water and planned their lives around it. Moreover, many civilizations were born and lost around water, but today, in spite of having knowledge, we still fail to understand the value of water in our lives. This paper explores what water scarcity is, the causes of water scarcity in India, and how it affects communities and the environment, highlighting the urgent need for responsible water management.

**Key Words: Water Scarcity, Causes, Effects and Practical Solutions, India**

## INTRODUCTION

Water is a basic necessity for every living being. Life without water is impossible, not just for us humans but for all plants and animals too. Water scarcity is an issue of grave concern these days as water scarcity has become very common. Water is one of the most wasted natural resources and corrective measures should be taken before the water scarcity situation becomes further worse. In spite of being aware of the implications, not much is being done today. It has been recorded in India that about half a billion people face an acute water shortage for about six months annually.

Water is the cornerstone of life, development and sustainability. Nevertheless, access to clean and sufficient water remains as a conundrum. Every year, millions of Indians face the dire consequences of dwindling water resources. From parched farmlands to dry taps in urban households, the effects of water scarcity are becoming increasingly visible and alarming. Water is fundamental to life, sustaining human health, agriculture, industries and ecosystems. However, water scarcity, pollution and mismanagement pose deleterious threats to global water stability. The Sustainable Development Goal (SDG) - 6 aims at ensuring water and sanitation for all by 2030, but population explosion, rapid urbanization, climate change and excessive consumption make achieving this goal increasingly challenging. The physical shortage of water leads to water scarcity and lack can lead to many challenges. Demand for water can lead to scarcity that often comes from an immensely inadequate infrastructure.<sup>1</sup>

Water covers about 70 per cent of the planet, making people assume it's plentiful, but the 30% left includes mostly deserted areas. What's more, the freshwater we drink and use every day only includes 3% of the water on earth, and two-thirds of that is glaciers or otherwise not available for use. Because of this, over a billion people around the world are without water and another two billion-plus have scarce access for over a month every year. Add inadequate sanitation, and over two billion people are left with diseased water that kills millions of people every year.<sup>2</sup> Furthermore, pollution further worsens the health of water and can even cause them to dry up, including lakes, rivers, and wetlands. For these reasons, around 20 per cent of the world's population lives with water scarcity. The water is much more scarce and looming large than originally expected as most of the water available is saltwater and not the freshwater we need<sup>3</sup>

About 70 per cent of Earth's freshwater is stored in the glaciers, which becomes a source of drinking water, industry, and clean energy production. Owing to rising global temperatures, glaciers in areas like the Himalayas, Andes, Alps and Arctic are shrinking at an alarming rate, human settlements and endangering ecosystems. This makes glacier preservation an important survival strategy to take immediate action. The focus of World Water Day 2025 is to reduce greenhouse gas emissions, implement sustainable water management

practices, and promote international cooperation to safeguard glaciers and the freshwater reserves they provide. Water scarcity in India significantly impacts public health through waterborne diseases, devastates agriculture leading to food insecurity and poverty, strains the economy by disrupting industries and reducing GDP, and causes environmental degradation like land subsidence and ecosystem loss. Social tensions and conflicts arise over limited water resources, while women and girls often bear the increased burden of water collection, affecting their education and safety.

## **WATER STATUS IN INDIA**

India, home to 1.4 billion people, faces a severe water crisis. Around 35 million people lack access to safe drinking water, while 678 million people lack access to proper sanitation. The country's growing population, urban expansion, and erratic rainfall patterns contribute copiously to worsening water scarcity. Despite having 18 per cent of the world's population, India has only 4 per cent of global freshwater resources. The water status in India is at an alarming rate to severe groundwater depletion, pollution of surface and groundwater sources, unequal water distribution, with some areas facing floods while others experience droughts. The Key Water Challenges in India include groundwater depletion is worsening, especially in states like Punjab, Haryana, and Rajasthan, poor water quality, with 70 per cent of India's water being contaminated inefficient irrigation methods lead to excessive water wastage and climate change impacts, causing erratic monsoons and prolonged droughts.

### **Groundwater Depletion in India**

India is the highest consumer of groundwater, extracting more than the United States and China both. The overuse of groundwater for industrial and domestic reasons leads to water-shortage, in agricultural states like Rajasthan, Haryana and Punjab. As per of Central Groundwater Board 17 per cent of groundwater blocks in India are overexploited, 5% are critical, meaning they are on the verge of depletion and 14 per cent are semi-critical, requiring immediate conservation measures.

## **WATER SCARCITY IN INDIA**

Water scarcity occurs when the water demand exceeds its availability in a particular region over a specific period due to either physical scarcity (insufficient natural water sources) or economic scarcity (lack of infrastructure to access existing water). In India, both types of water scarcity are present, affecting rural villages, agricultural zones, and major cities alike. The lack of proper Water management systems and proper drainage systems in India, especially in the urban areas is a major cause too. Kitchen wastewater should be able to be recycled but due to a poor drainage system, this is not possible. An efficient water management system is required in order to distribute water in urban areas.

Another major issue is deforestation. Areas with more greenery and plants are known to have good rainfall. Industrialisation and urbanization are two major factors here. Due to deforestation and cutting down of trees, rainfall has become an issue too. Rivers are a major source of fresh water in India. Today we see a lot of industries which have come up and all of them are mostly near the rivers and these rivers become highly polluted as a result of all the industrial waste. Water scarcity is particularly acute in regions like Rajasthan, Gujarat, and parts of southern India owing to low rainfall and arid conditions.

## **TYPES OF WATER SCARCITY**

Water scarcity comes in two forms, i.e. economic scarcity and physical scarcity. The effect of a region's demand exceeding its finite water resources is physical or absolute water shortage. Around 1.2 billion people live in areas of physical scarcity, according to Food and Agricultural Organization (FAO). Most of these people live in arid or semi-arid regions. Physical water scarcity can be seasonal and an estimated two-thirds of the world's population lives in locations where physical water scarcity occurs annually. Both the growing population and disrupted weather patterns succumb people for experiencing water scarcity<sup>4</sup>.

Economic water scarcity stems from a lack of water support or infrastructure. According to the FAO, around 1.6 billion people deal with water shortages due to a lack of infrastructure to get water to their location. Areas with water scarcity due to their economic conditions often have enough water but it's the access to the water is limited. Accessible water may be polluted or unfit for human consumption due to mismanagement or underdevelopment. Unrestricted water use for agriculture or industry, frequently at the expense of the general public, can also lead to economic water scarcity. Finally, large inefficiencies in water use can contribute to water scarcity, mainly due to an economic undervaluation of water as a finite natural resource.

## CAUSES OF WATER SCARCITY

Mismanagement of water and the growing population in our country are the two main reasons for water scarcity. There are also a number of other man made disturbances which continue to rise. Water scarcity comes from three sources, i.e. pollution, population, and agriculture. While humans have built dams, wells, irrigation systems, and other water maintenance structures, these three areas are severely stressing out rivers, lakes and aquifers. A few other factors can affect water scarcity, too, including droughts, natural disasters, government access, distance to water, climate change, illegal dumping and overuse of water.<sup>5</sup> Moreover some of the reasons for water scarcity are:

### Pollution Explosion

Many sources can pollute water, including pesticides, fertilizers, wastewater, and industrial wastes. Pollution affects groundwater too, as it seeps into aquifers causing harmful bacteria to contaminate the water and endanger health. Industrial discharge, untreated sewage, and agricultural runoff have turned many rivers and lakes into toxic zones, further reducing the availability of clean water. Eventually, pollution can take years to build up and cause an effect, but those effects are detrimental to health.

### Population

With a population of over 1.4 billion, India's water demand is growing exponentially. Rapid urbanization has exerted simmering pressure on already-stressed municipal water systems, leading to shortages in cities and towns. As the population grows, more humans need water, and rapid growth increases economic development, agriculture needs and even pollution. The growth process results in damages to water ecosystems and loss of biodiversity. Over 40 per cent of the world's population lives in areas with stressed water systems. Water usage continues to grow rapidly to unsustainable levels as more people add pressure to the quantity of fresh water.

### Wasteful Use of Water for Agriculture

Agriculture consumes nearly 80 per cent of India's freshwater. Traditional irrigation methods like flood irrigation are rather inefficient and waste oodles of water. A shift towards water-intensive crops, even in arid regions, worsens the issue. Agriculture consumes 70% of all available freshwater on the planet but 60% of squandering is owed to leaky irrigation systems, poor application methods and the growth of crops that are too thirsty for the environment in which they are cultivated. Rivers, lakes and subterranean aquifers are drying up as a result of this inefficient use of water. As a sequel, many food-producing countries have reached their water resource limits or even surpassed the limits.

As an agricultural country, India produces a huge quantity of food to feed its population. The surplus that is left gets exported outside. It is not unknown that producing this much food requires a lot of water too. The traditional method of irrigation wastes a lot of water due to evaporation, water conveyance, drainage, percolation and the overuse of groundwater. Besides, most of the areas in India use traditional irrigation techniques which stress the availability of water. However, the technique of irrigation has changed during modern times and we provide water to plants using a sprinkler or drip irrigation.

### Reduction in Water Recharges Systems

India is the largest extractor of groundwater in the world. Excessive and unregulated use of groundwater for irrigation and domestic needs has led to rapidly falling water tables in states like Punjab, Haryana and Tamil Nadu. Rapid construction that uses concrete and marbles may not let the rainwater get absorbed in the soil, but still, we install some mechanism in our houses so that we can hold the rainwater and recharge the groundwater.

### Lack of Water Management and Distribution

There is a dire need for an efficient system to manage and distribute the water in urban areas. The Indian government also needs to enhance its technology and investment in water treatment. Besides, optimization at the planning level must be ensured.

## EFFECTS OF WATER SCARCITY

Water scarcity leads to reduced agricultural productivity, health issues due to inadequate sanitation and myriad conflicts over water resources. The major effects of water scarcity in India are as follow:

## **1. Public Health**

### **Waterborne Diseases**

Lack of access to clean and safe drinking water leads to the prevalence of diseases like cholera, dysentery and typhoid.

### **Sanitation Issues**

Poor sanitation and hygiene practices, often linked to water scarcity, exacerbate health issues.

### **Fatalities**

Inadequate water supply results in deaths, with reports suggesting a significant number of annual fatalities due to insufficient water access, particularly among children, according to a NITI Aayog report.<sup>6</sup>

## **2. Agriculture & Food Security**

### **Reduced Productivity**

Inadequate water for irrigation results in lower crop yields and crop failures.

### **Loss of Livelihoods**

Farmers face debt and loss of income, especially in drought-prone regions, impacting their ability of eking out a living.

### **Food Insecurity**

Lower agricultural output leads to increased food prices, jeopardizing the food security of the nation and increasing poverty.

## **3. Economic Impact**

### **Industrial Disruption**

Water shortages can hinder industrial production in water-intensive sectors like textiles and power generation.

### **GDP Decline**

The World Bank estimate projects a significant decline in India's GDP by 2050 due to water scarcity.

### **Reduced Tourism**

Water scarcity can negatively affect tourism in affected regions, impacting local economies.

## **4. Environmental Degradation**

**Groundwater Depletion:** Overuse of aquifers leads to groundwater depletion.

**Land Subsidence:** Depleting groundwater can cause land to sink.

**Loss of Biodiversity:** Drying up of wetlands, rivers and lakes threatens ecosystems and wildlife.

## **5. Social and Political Consequences**

### **Social Tensions**

Competition for scarce water resources can lead to conflicts and social unrest among communities.

### **Migration and Displacement**

People may be forced to migrate from water-scarce areas to find water and employment.

### **Gender Inequality:**

Women often bear the increased burden of fetching water from far distances, affecting their health, safety, and productivity.

### **Education Disruption**

Children, especially girls, may miss school to help with water collection.

Both humans and the environment are heavily dependent on water. As water becomes scarce, the wetlands will disappear along with all the animals they support, including mammals, birds, fish and much more. Furthermore, wetlands provide rice, which is half of the world's population's main food source. As water becomes scarce, our natural landscape will change as water shrinks; we will be left with more pollution covering the world. In turn, these lead to food shortages and decreased life spans. The less food and

water lead to energy shortages too and then economic slowdowns start from the severe stress. Diseases will become rampant owing to poverty and sanitation issues.

## **SOLUTIONS TO REDUCE WATER SCARCITY**

Addressing water scarcity requires a multifaceted approach. Implementing efficient water management practices, such as rainwater harvesting and watershed management, can help replenish water sources. Investing in water treatment systems and improving irrigation techniques can reduce wastage and pollution. Raising awareness about water conservation among the public and encouraging responsible water use is vital. Moreover, policies which promote sustainable water allocation and management are dire essential for long-term solutions. The solutions are broken down into four categories where changes need to happen to improve access to freshwater.<sup>7</sup>

### **Environmental Policies**

The first step requires environmental policies to help in preserving and restoring the ecosystems which collect, filter, store and release water naturally. This includes recycling and flood protection as there is a need for an undamaged system to continue using freshwater and the nutrients it provides. To start, there is a need of respecting natural areas by stopping destructive and degraded practices to start seeing immediate benefits for the economy.

### **Engineering Technologies**

With technology, we can reduce resources quickly, including water, and these methods need to be addressed to provide rapid results. A very visible option to solve the problem is infrastructure repairs to find ways to lower the costs of installation and maintenance, especially for under-developed countries. Additionally, creating engineering solutions which will benefit the environment without adding to climate change can positively impact water scarcity. As around 70 per cent of all freshwater is allocated to agriculture, a smart solution would be to improve irrigation systems. While many agricultural needs are met by flooding and surface irrigation, flooding can overflow crops before being lost through evaporation. Farmers need additional education to reduce water loss with smart practices and funding meant to conserve water by reducing waste.

### **Economical Solutions**

Higher water prices reduce waste as people will naturally conserve to save on expenses. This in turn would reduce pollution and help to fund improved water infrastructure. However, many people cannot afford increased constraints on their budget. Policymakers have to consider the weight of leveraging water taxes and the effect it will have on the economy. Adding in cost benefits for those who take measures to conserve water could help to make higher prices more economical. A good sewage system is the foundation for safe drinking water. Without adequate sanitation, an area's water may become contaminated with disease and various other issues. We can prevent water shortage in these locations from worsening by strengthening the sewage systems in these areas.

### **Social Solutions**

Everyone can take measures to reduce water waste and scarcity. There are a variety of technologies which allow you to recycle rainwater and other types of water in home. Consider learning how to recycle water. It not only helps to prevent scarcity, but it can also help to save money. By simply reducing water usage, people can help to improve water. Furthermore, by recycling and reducing trash, people can help to reduce pollutants entering water. There are groups worldwide working to supply clean water to locations where it is currently unavailable. Consider donating to these organizations, whether it's with your time, skills, or money, whichever is within your means. Educate others whenever possible to make everyone aware of the problem to help reduce waste even further.

There are many smart steps one can take at home to help reduce water usage. One can take shorter showers, turn the water off when brushing teeth, install water-saving appliances, repair leaks, and flush toilets less. Water scarcity is a socio-economic difficulty that we must address and ameliorate as soon as possible. It is just one of many challenges that our modern world faces. Luckily, with growing awareness, collective effort, and advancements in technology, we are able to face these issues head-on with calculated solutions to relieve stress on the environment and its inhabitants.

Water scarcity is intrinsically linked to climate change, another deep-rooted obstacle that must be overcome for humanities' sake. One way to help mitigate the effects of climate change is by switching home to

renewable energy. By switching over to renewable energy, actively reduces home's carbon footprint while simultaneously submitting ethical vote to support a healthier planet.

### **Closing the Running Tap**

During dishwashing and hand washing people often let the tap run. These running taps waste thousands of liters of water per year. Closing the tap will reduce this problem.

### **Replacing Dripping Taps**

In India, it is commonly seen that most of the houses have taps or faucets that go on dripping water even when they are closed. This running tap wastes up to 30,000 liters of water that nobody bothers to change. So, we should replace these taps immediately.

### **Effect of Global Warming and Climate Change**

Global warming and climate change are also responsible for the scarcity of water. The melting of icebergs into the sea due to the rise in temperatures is a reason as to how salty water is increasing day by day instead of freshwater. The percentage of rainfall has decreased drastically these days. Climate change along with the decrease in rainfall percentage has greatly affected freshwater bodies. Water scarcity has become a major problem and an alarming issue these days, and we must consciously strive to work together to find some solution to this issue of water scarcity. The Indian government today has formulated and come up with many plans on how to tackle and solve this problem.

To mitigate the water crisis, it is immensely important to adopt sustainable water management practices, invest in water treatment and infrastructure, promote water conservation, and implement effective policies to ensure equitable water distribution. Collaboration among government, industries, and communities is crucial in this endeavour of saving precious water.

### **RECOMMENDATIONS TO TACKLE THE WATER CRISIS IN INDIA**

India's twelfth five-year plan (2012–17) has focused attention on all of these issues discussed. The plan puts great emphasis on aquifer mapping, watershed development, involvement of NGOs, and efficiency in developing irrigation capacity. Because water is a state subject in the federal constitution, state governments are expected to play a large role in these efforts. At the same time, many active NGOs are now able to enforce compliance with environmental obligations through the right to information act, active and competitive media, and growing awareness on water issues.<sup>8</sup> The following recommendations address the most important issues in India's water crisis.

First, the central and state governments should empower local groups with knowledge, understanding, and real-time information on the status of groundwater so as to manage extraction in a cooperative way. Since groundwater is an open resource, farmers extract as much as they can. But when everyone does this, it leads to extraction above a sustainable level. This problem can only be managed by a cooperative agreement among the users of the aquifer, who should know how much can be extracted without depleting the resource. The state can monitor and provide this information.

Second, India needs to promote watershed development. The examples of the state of Guajarat, as well as the efforts of Rajendra Singh and Anna Hazare, have also shown that this approach is cost effective and profitable. Moreover, it can be undertaken at the local level all over the country and can be accomplished in a relatively short-time. Third, India must educate people about the need for dams to store water. The environmentalists and other groups who oppose dams should be engaged in a dialogue to work out alternatives and build a common consensus.

Fourth, the government should strengthen state pollution control boards to enforce effluent standards. The technical and human resources currently available to the boards are inadequate to effectively monitor activities, enforce regulations, and convict violators. Moreover, adequate sewage treatment facilities must be constructed. Many cities treat only a part, and some no more than half of the effluent. Cities need to charge a proper price for water so that local sewage work operators have the income and resources to sufficiently maintain treatment plants. If necessary, India should work with private firms to modernize urban water-distribution systems.

India should adopt these recommendations at all levels—federal, state and local—it will be a great step toward addressing the most critical issues causing the country's water crisis ( Kirit S. Parikh,, 2013).<sup>9</sup>

## CONCLUSION

Water scarcity has become an alarming issue day-by-day. If the problem of water scarcity is not seriously taken-up now, our future generations are going to suffer severely and may even have to buy this necessity at a high cost. Water scarcity causes widespread negative effects, including increased disease rates owing to lack of sanitation, food shortages from reduced agricultural output, economic strain on communities, environmental damage like land subsidence and habitat loss, and social disruptions such as forced migration and conflict over resources. These impacts cascade across social, economic and environmental systems, threatening human health, livelihoods and the functioning of ecosystems. India stands at a critical juncture where every drop counts. The impact of water scarcity is not confined to drought-prone villages—it reaches cities, industries, and future generations. By addressing the root causes of water scarcity and taking decisive action across sectors, then India can secure a more resilient and water-abundant future.

## REFERENCES

1. Millennium Goals of India, No.6, Sustainable Development Goals
2. [worldwildlife.org/threats/water-scarcity](http://worldwildlife.org/threats/water-scarcity)
3. [fluencecorp.com/what-is-water-scarcity](http://fluencecorp.com/what-is-water-scarcity)
4. Food and Agricultural Organisation (FAO)
5. [seametrics.com/blog/water-shortage-consequences](http://seametrics.com/blog/water-shortage-consequences)
6. NITI Ayog Report
7. [conserve-energy-future.com/causes-effects-solutions-of-water-scarcity.php#Causes\\_of\\_Water\\_Scarcity](http://conserve-energy-future.com/causes-effects-solutions-of-water-scarcity.php#Causes_of_Water_Scarcity)
8. Twelfth Five Year Plan (2012-2017)
9. Kirit S. Parikh (2013), *India's Water Crisis: Causes and Cures*, Chairman of Integrated Research and Action for Development (IRADe), **August 12, 2013**

