



## Fresh Water Resources in India and Its Management for Better Future

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**ABSTRACT;** Fresh water, correctly termed as “Blue Gold” is an exhaustible resource. Water is fundamental to the living world on the earth. All the major terrestrial ecosystems and human population depends on fresh water for their existence. Water is a renewable resource. Hydrological cycle continuously resupplies the resource on earth surface. Any disturbance in the normal hydrological cycle has disturbed the fresh water distribution on earth. Hydrological cycle is a natural purification system through which salt and waste water are transformed into pure water.

India is wealthy with fresh water. About 16% of the total population of the globe reside in India and possess only 2.45% of the total land surface of the earth. India is fortunate enough to get huge annual rainfall and water of perennial rivers. But the uneven geographical distribution of fresh water causes severe regional and temporal shortages in India. There is big disparity in the availability of safe water. 8% of the country's total population has only 1% of the country's water resources. With the ever increasing human population, increasing rate of agriculture, industrialization, urbanization, severe negligence on the preservation, lack of knowledge of the restoration of fresh water and over-exploitation of ground water resource, fresh water is becoming a depleting commodity in India. Proper planning and management is necessary to save the resource immediately.

The main objective of this work is to discuss on the nature of availability, types of utilization, ignorance to restore the 'ubiquitous' but exhaustible fresh water resources which are going to be deficient by the overuse and misuse by the ever increasing population of the country. This work also focuses on the suitable measures for conservation of these limited resources in India.

**Key words;** Fresh Water, Misuse, Management, Sustainable utilization.

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### I. INTRODUCTION:

1.4 billion cubic kilometers of water covers 71 percent of the earth's surface. 97% of which is salt water comprises of ocean and seas. Remaining about 3% is fresh water that has a salt content of less than 0.01% (100 parts per Million). Existences of entire terrestrial and sweet waters biomes are directly dependent on this 3% of fresh water. Water is needed for the livelihood of human being, ensure food security, industrial production, feed livestock, to conserve the biodiversity and environment.

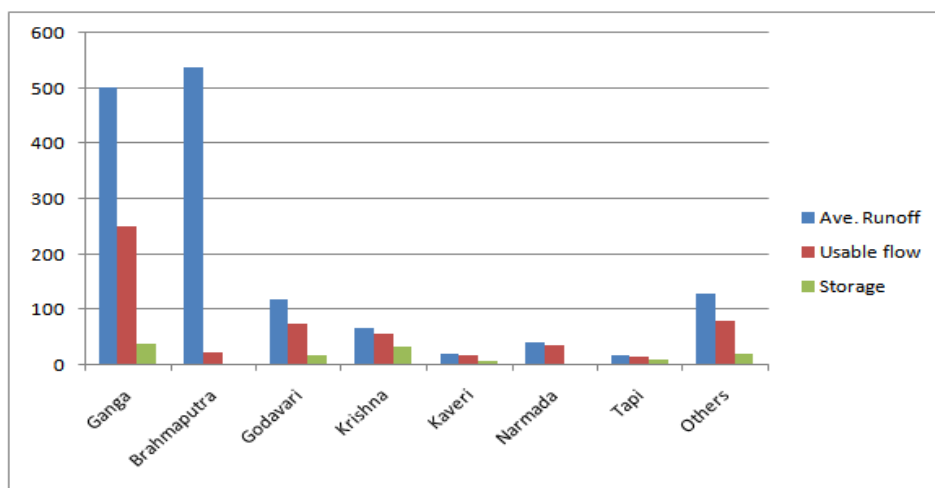
India is rich in freshwater. The country approximately receives 300–650 millimeters of average annual rainfall. But is very unreliable and southwest monsoon accounts for most precipitation in India. Generally it is estimated that about 17.5% of which evaporate immediately after rainfall and about 54% absorbed directly by the land. 41% of the absorbed water is retained as soil moisture remaining 12.5% percolate through the soil and touch the ground water deposit. Remaining 28.75% of the rain water retained as surface water in India. Besides, about 200 cubic km of surface flow comes from outside of India.

### Uneven Distribution of Fresh Water:

More than 75% of fresh water of India is collected during rainy season. Winter is generally dry all over the country except few places of north India like Jammu Kashmir, Himachal Pradesh, Uttarakhand, some portion of Uttar Pradesh and the Tamilnadu plain. Arunachal Pradesh and Assam also receives around 50 mm rainfall in winter season. Apart from the seasonal character there is uneven distribution of rainfall over different regions of the country. Meghalaya is the wettest state, receives over 9,000 mm of rainfall in a year. On the contrary Rajasthan receives very little rainfall throughout the year. It rarely exceeds 100 mm of monsoon rainfall in a year. In National level there are huge disparities in Annual Average Runoff, Usable flow and

Storage from basin-to-basin and region to region. The ground water as well the stored waters supplements the shortage of water in the dry periods.

**River Basin wise Water Resources in India. (Cubic Km/ year)**



Source India 1992

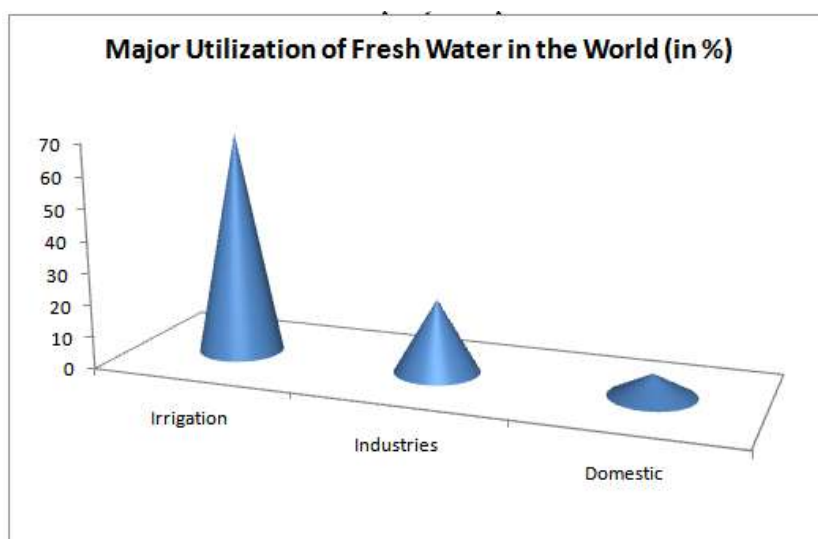
**Types of Fresh water:** Fresh Water is two types- 1) **Quantitative-** water of any kind that meet the human need. And 2) **Qualitative-** the quality or standard water for the human use. Quality of drinking water depends on the quantity of harmful elements present in it. Drinking water should be clear, odorless, and tasteless and the pH value should be within the range 7 to 8.5. Above one billion People of India need access to clean drinking water.

**Utilization of Fresh water;**

There are two types of utilization of water. (I) Consumptive type and (ii) Non- consumptive type.

(I) **Consumptive use** - Through the consumptive use water is lost from further human use. It can percolate through the soil or return to the atmosphere by evapo-transpiration. Irrigation water is a good example of consumptive use.

(ii) **Non- consumptive.** Most of the water used in homes, industries for washing, flushing away undesirable materials, domestic activities are termed as Non – consumptive use because these water remain available to the humans for the same or the other uses if its quality is adequate or be treated to remove undesirable materials.

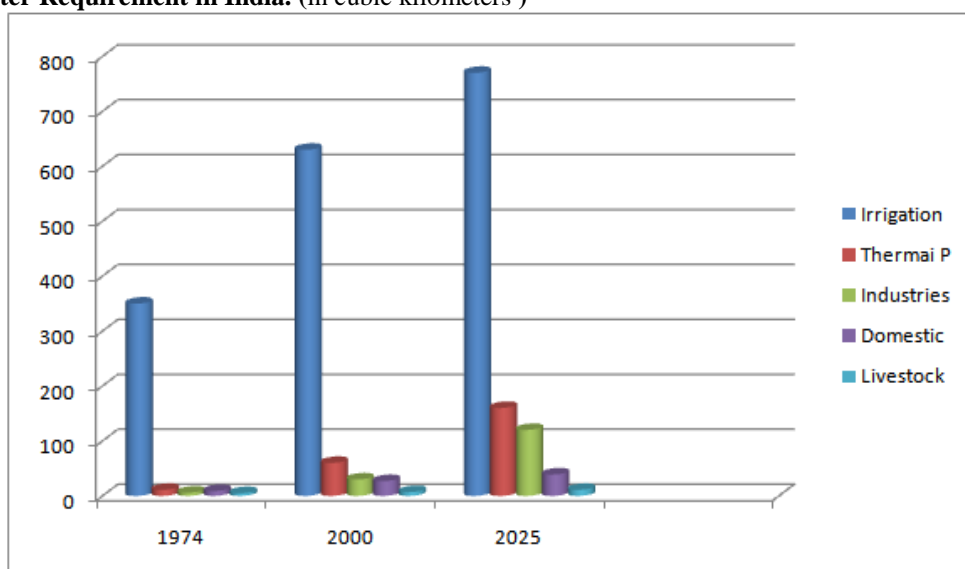


Source: Nebel & Wright

**Indian Scenario:-**

Indian characterized by seasonality of rainfall. Agriculture is major economic activities of the country. Indian agriculture is largely dependent on irrigation. The agricultural sector currently uses about 85% of total water resources. Ground water is the major sources of Indian Irrigation. That caused tremendous ground water depletion.. Ground water covers about 80% of the country’s irrigation. Besides, agriculture ground water is an important source of industrial and construction sectors of India. Heavy industries and thermal power plants use huge amount of fresh water for their production processes. Textile industries needed water specially as a coolant for machines. Cheap water that can be rapidly pumped from underground aquifers has been a major source for this purpose. So ground water depletion is a major environmental problem in India. Depletion is speedily going on without proper measures of its replenishment of the resources throughout the country. Groundwater is the major source of drinking water in both urban and rural India. According to the Central Ground Water Board assessment there were 431.9 BCM (Billion Cubic Metres) of replenishable ground water resources in1996. The utilizable ground water resources had been assessed at 395.6 BCM. Out of which 82% goes to irrigation and other primary activities, remaining 18% is divided between domestic and industrial units. As water scarcity becomes a bigger Problem not only in rural but also in urban areas of dry regions of India.

**Fresh Water Requirement in India. (in cubic kilometers )**

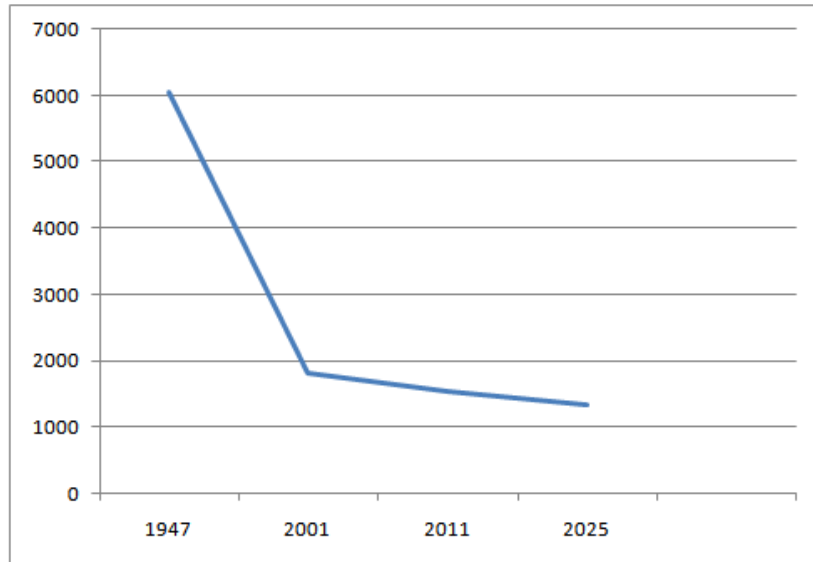


Source: CGWB 2010

The Delhi Jal Board estimates that water tables are dipping Delhi and adjoining areas by an average of .4 meters a year ] Apart from that untreated agricultural, and industrial and municipal wastes effluents gradually deteriorates the qualities of surface water as well as ground waters of India. Groundwater crisis is becoming an alarming environmental factor not only in rural areas but in urban areas also. Unfortunately ground water crisis is not associated with natural factors in the country; rather it is the contribution of the irrational human intervention into the nature During the past two decades, the water level in several parts of the country has been falling rapidly due to an increase in extraction. The number of wells drilled for irrigation of both food and cash crops have rapidly and indiscriminately increased the rate of depletion of ground water.

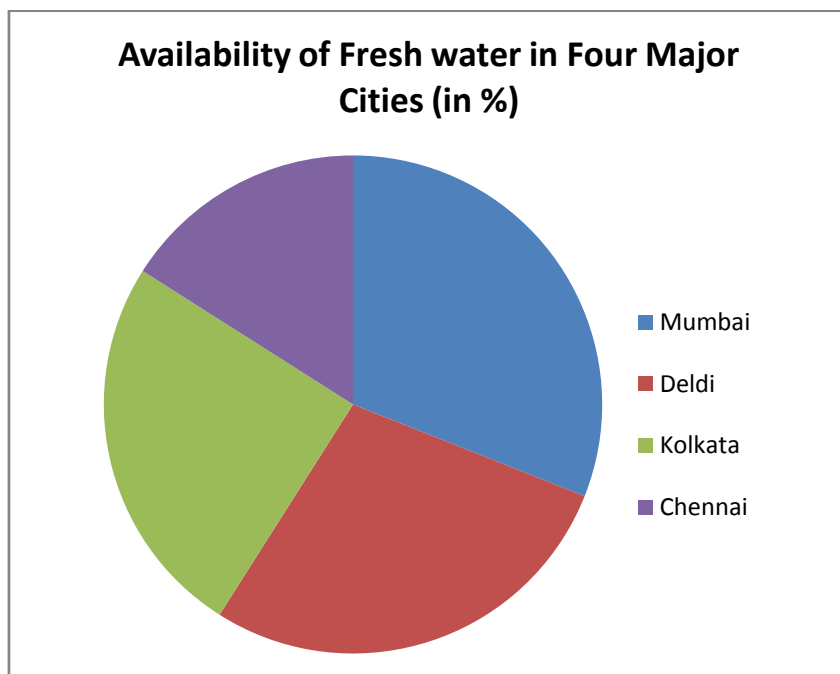
In terms of state level potential ground water exploitation it stands as Punjab (94%), Haryana (84%), Tamilnadu (60%), Rajasthan (51%), Gujarat (41%), Uttar Pradesh (38%), Maharashtra (30%), West Bengal (24%), Andhra Pradesh (24%) are ranked in descending order. Assam, Bihar, Jharkhand, Orissa, Madhya Pradesh, Chhattisgarh etc have not utilized even one fifth of their potential.(Goutam)

**Decreasing Trend of Annual Per Capita Availability of water (Cubic meter) in India since 1947 -2025**



Source. Ministry of Water Resource. Govt. of India..

One estimate of 2006 showed that domestic, agricultural, and industrial sectors of India used approximately 829 billion cubic meters of water every year. By 2050 this demand is expected to be double. So India is going to face severe shortage of fresh water in future decades. Ever increasing population will give additional pressure fresh water storage. The water requirement of the manufacturing sector has increased in proportion to the increase in the sector's share in GDP. It increased from about 12% in 1950s to 20% in 1990s.



Source: CGWB 2010

#### Climate Change and Availability of Fresh Water:

Climate change has a far reaching impact on the availability of fresh water. According to the IPCC report, global temperatures have warmed by .76 Celsius over the last 100 years. As the climate warms, the Himalayas and the Tibetan Plateau glaciers would disappear . In subsequent years, there will be shortage of glacial melt water in the Indian rivers. Nearly 70% of discharge to the River Ganga and other perennial rivers comes from the glaciers of Himalaya and Tibetan Plateau glaciers. With the disappearance of the glaciers the Snowfed Rivers would be died up.. Shortage of water in the main rivers, tributaries and distributaries would have drastic consequences for a huge population of India. The glaciers, which regulate the water supply to the

Ganga, Indus, Brahmaputra, Mekong, Yangtze and Yellow Rivers, are believed to be retreating at a rate of about 33-49ft each year.

Climate change also has an effect on rainfall patterns, but, how it will affect them is still uncertain. Nonetheless, scientists agree that climate change will ultimately make rainfall more erratic and cause unpredictable weather. There is possibility to increase the average water temperature in oceans. This will increase the probability and intensity of monsoons during the summer, generate severe Cyclones, droughts etc. India is one of the largest emitter of Green House Gases. But for the sake of development she does not reduce GHGs emission under the Kyoto protocol. We must cautious in this matter.

### **National Water Policy;**

For the optimum utilization and management of water resources of the country Government of India has framed a national policy. Major features are as follows:

1. Planning of the surface water resources of the country on the basis of a hydrological unit, for example drainage basin. This will ensure optimum utilization of the water resources.
2. To meet the ever increasing demand of water, suitable measures for proper management and conservation of water resources are to be taken.
3. Possibility of rotational distribution system for the existing and new projects, formulation and monitoring of irrigation programmes for different regions.
4. Proposals for adequate maintenance of canals and distribution systems by allocating adequate finances.
5. Suggests detailed surveys and investigations for new projects on priority basis for special areas.
6. Emphasises adequate supply of pure drinking water to rural and urban areas.
7. Attention on devising suitable strategies for problems like water logging, Salinization deteriorating water quality, over exploitation of ground water resources and rehabilitation of uprooted families due to development projects.

**Measures of Fresh water Management:** Around 263 million people live in drought prone areas of India. 90 % of waste water of the country discharged into the rivers or other fresh water bodies, 65% rainwater runoff goes into the sea, both of which creates a major wastage of fresh waters. Environmentalists and experts are consistently pitching for the implementation of proper water conservation measures for the sake of the nation. . Water is considered a cheap readily available resource in India. Illiterate and literate People both are unable to realize just how much stresses they exert on the natural ecosystem with the misuse and overuse of such a life promoting resources of the earth. The stress on water resources is from multiple sources and the impact of which led to the overcharging of the carrying capacity of our water bodies to assimilate and decompose wastes. Deterioration in water quality and contamination of lakes, rivers and ground water aquifers has therefore resulted in serious ecological imbalance.

### **Conservation Methods of Fresh Water:**

**1 Drip irrigation—** . Drip irrigation systems contain network of plastic pipes and pinholes that that literally drip water at the base of the plants. In this system the loss of water is less than 5%. Drip irrigation method is widely practiced in United States and Middle East. By the traditional irrigation method about 60% of the water is wasted by evaporation, percolation and runoff. Drip irrigation systems can eliminate the loss. But the installation charge of this irrigation system is very high. So both the state and central Governments have to be more serious about the implementation of the irrigation method especially in the water shortage areas. Sprinkling also reduces the wastage of water through irrigation.

**2. Rain water Harvesting or Storm water Management:-** It is simply a pond which receives and holds the runoff of surrounding areas during the periods of heavy showers or storm waters. Water from this pond may be gradually infiltrated into the soil or it may be trickle out slowly through a standpipe mounted in the pond. Thus the pond plays a role imitating ground water storage and it may also create a pocket natural wetland habitat supporting wildlife.

Large storm water reservoir in addition act as recreational spot with the facilities of boating, fishing and others. Small trenches and well filled with rocks, sands and gravels get rain water from the nearby roof tops, parking zones, roads and other places allow to percolate the water through soil. This type of infiltration may recharge the ground water storage. Rain water Harvesting or Storm water Management is now practiced in experimental basis in India. This method is applicable specially in rural areas of scanty rainfall or where the other water sources are too far away.

**3. Desalting Ocean water-** Desalting method is remained in experimental level in India. It was estimated that the world production desalinated water was 4 billion gallons per day in 1996. Maximum desalinated water is produced by Soudi Arabia, Persian Gulf Nations and recently in USA. Cost of production is 3 to 6 time high

than the water collected from the traditional sources. Desalination, is negligible in India as it is not cost effective.

There are two processes are common for desalinization- **A)** Microfiltration or Reverse Osmosis. Small units are follow generally this process. In this process ocean water is forced under great pressure through a very fine membrane filter to remove the salt from the water. **B)** Large plant where particularly waste heat is available like electric power plants generally use the heat for distillation that is the process which include evaporation and recondensation.

**4. Xeroscaping:-** Planting of less water consuming over the bear surfaces, open lands, lawns of the houses specially drought prone areas is considered another useful water conservation method. These plants do not require additional watering where as consume less water from the soil but protect the soil erosion, loss of soil moisture and indirectly helps to recharge ground water.

**5.Increase of Dry farming practice:** Improvements of the dry farming practices will helps to decrease the demands of heavy irrigation in the drought prone areas.

**6. River linking or Inter Basin Transfer:** Government of India has formulated a national perspective plan to divert water from the surplus areas of eastern and north eastern India to drought prone peninsular India, the water deficit areas of the country with the help of canals and reservoirs. This is an ambitious project require huge investment for implementation. According to environmental experts it has a far reaching negative impact on the ecological balance of the area.

**7. Recycling Municipal and Industrial water:** proper recycling of municipal sewage and industrial effluents helps to maintain fresh water supply.

**8.Repairing the Municipal Systems:** Numerous cities all over the world are facing loss of water by leaking through the traditional old pipelines. Municipal authorities should have to be cautious in this matter and repair the the pipelines in time to save the precious water. Considerable number of cities have programming to repair the leaky faucets of water pipes and installed low- flow shower heads, water displacement devices in toilets etc.

**9.Reuse of Grey, water:.** Slightly dirty water collected from sink, showers, bathtubs, laundry tubs collected in a holding tanks and used for the other activities like flushing toilets, watering lawns, gardens, washing cars etc is consider the other measure to restore the fresh water reserve.

**Conclusion;** 22<sup>nd</sup> March is World's water Day. One day celebration is not enough to make aware the people about the proper utilization and conservation of the every drops of resources. This is a growing concern all over the world; Hydrologists estimate that 5 gallons of water per person per day is the minimum standard requirement of human being. In the arid, Semi- arid, drought prone areas and also in the dry seasons thousands of inhabitants of our country getting much lesser amount than the standard requirement of water. India is most vulnerable and may face severe shortage of sweet water soon because of the growing demand and in-disciplined lifestyle. This calls for immediate attention by the population to make sustainable use of the available water resources to ensure better quality of lives in future..

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