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Urgency of Reviving Indian Rivers

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Abstract

Today, India is in serious need of solutions to its water issue. The country is confronted with a significant challenge: increasing the production of drinking fresh water. Without an uninterrupted supply of high-quality drinkable water, no socioeconomic progress or even political stability will be feasible. As a result, it is evident that river revitalization will need to be dispersed across the country. In other words, we will need to collect rainwater where it falls across broad swaths of the country in order to guarantee local water security and recharge every well. The current study looks at the existence of water resources in India from two perspectives: pollution in river basins and the necessity for river rejuvenation activities in India. This is based on the need for river rejuvenation in India and the impact on water resources caused by the dumping of various sources and forms of pollutants in river basins.

Keywords: - *Indian rivers, River ecosystem, Rainwater, Pollution*

INTRODUCTION

The river ecosystem is a complex mosaic of human interaction and the dynamic interplay of biotic (flora and fauna) and abiotic (hydrological, geomorphic, and so on) components (Shekhar and Prasad 2009, Das 2014). The biological function of a river is linked to hydrological changes in river flow (Jain & Kumar 2014). What is the maximum amount of sustainable water consumption from a river that will maintain the river's natural integrity as a perennial resource? (Soni et al. 2014).

River rejuvenation is an effort to enhance the health of dirty and overworked drivers.

It demands an understanding of the underlying causes of poor health as well as repair actions from source to sink (ICFR, 2014). River rejuvenation attempts to build a new, healthy, and sustainable river ecosystem based on the degree of degeneration. This can also be performed by returning the river's health to its previously acceptable historical level. Avoiding direct dumping of household sewage and industrial effluents into the river will unquestionably improve its health. The flow of a river, on the other hand, is its identity and the essential variable in a river system. Apart from performing several functions, it offers a river with self-cleaning and healing characteristics. As a result, river rejuvenation in general calls for adequate freshwater flow across the river system at various periods of the year. The greatest way to regenerate a river is to maintain its environmental flow. Sinha et al. (2013) also emphasise river recovery potential and route calculation, as well as threshold criteria for sustainable management of the Ganga River basin's river systems.

OBJECTIVES:-

This project's principal aims are to explore the need for river rejuvenation in India, which includes the following:

1. Is it important to examine river rejuvenation and the causes for it in India?

2. Contamination, causes of pollution in river basins and surrounding river networks.

3. The Indian government's planned water conservation measures and river repair legislation.

METHODOLOGY

The current study is based on secondary data acquired from a variety of sources, including publications, monthly research magazines, research institutes, Non-Governmental Organisations (NGOs), different websites, and research papers. The water index in India is based on data from India's water resources information system (Table-1) and estimated per capita annual water availability in river basins from the Central Water Commission for 2010. (Table-2). In 2019, the Central Pollution Control Board compiled data on the most contaminated rivers in India 2018. (See Figure 1). The central water commission documented the availability of water in the major Indian River basins (Fig. 2). The quantity of water available in major Indian rivers has decreased between 1900 and 2012—source: Government of

India, Ministry of Water Resources, 2013. (Fig.3). Extrapolate per capita water availability and future forecasts in India from the Ministry of Water Resources of the Indian government (Table-3).

According to figures from the National Commission for Integrated Water Resources Development, water use and estimated future demand in Billion Cubic Meters (BCM) in India (Table-4). According to data from the Ministry of Water Resources on per capita freshwater availability, India would face water scarcity and water stress (Fig. 4). The Ministry of Water Resources and the Central Ground Water Board have extracted the value of rainwater collection for groundwater recharging in India (Fig. 5), which has been reinforced by altered forms of data consumption, such as tables, diagrams, and figures.

DISCUSSION

The current study relied on secondary sources to determine the need for river rejuvenation in India. Figure 1 depicts India's most polluted rivers in 2018. Table 2 displays the per capita annual water availability in Indian River basins in 2010, and Figure 2 depicts the availability of water in significant Indian River basins. Figure 3 depicts the percentage decrease in water availability in major Indian rivers between 1900 and 2012. Table-3 depicts per capita water availability in India as well as future water availability estimates. Table 4 shows India's water consumption in billion cubic metres (BCM) as well as future water demand forecasts. Figure 4 displays per capita freshwater availability in India, as well as future water shortages and water stress, whereas Figure 5 depicts the significance of rain collection for groundwater recharging in India.

River Rejuvenation Factors

During the research, two types of reasons were discovered for the current studies: environmental and anthropogenic. The following is a detailed description of the causative study:

(A) Environmental causes:

Over time, a river develops a usually smooth, lengthy profile. This is the most effective river profile for transporting water and sediment. It denotes a condition of equilibrium with the environment. The national and state Population Control Boards (SPCB) are monitoring water quality in 2500 areas. Figure 1 displays some of India's most polluted river basins. Climate change (changes in rainfall, temporal dynamics, and carbon emissions),

drought, and dying river systems, among other factors, are key contributors.

(B) Anthropogenic Pollution:

Deforestation, millions of litres of raw sewage discharged, millions of litres of untreated wastewater discharged, thousands of tonnes of non-biodegradable solid waste dumped, pulp and paper industry is the largest contributor by volume, and thousands of grossly polluting industries along the main stem. One of the primary causes of pollution in the Indian River is sewage. The 650 cities in India that are located near contaminated rivers discharge 62,000 ml/d (million litres per day) of sewage as the principal contaminant (source: SOE in 2016).

River Rejuvenation is Required in India

The process of returning a river to its prior state in order to make it new again is referred to as river rejuvenation. When it comes to bridging the gap between demand and availability of drinking water, rising temperatures, little rainfall, and diminishing water resources create a terrifying situation. The growing pollution of water, whether in rivers or groundwater, is worsening the scarcity. A recent river-related study provides an insight into what is genuinely wrong within the country. The number of contaminated rivers in the country climbed from 121 to concerning in 2009, but presently (2019), 275 of the monitored 445 rivers are polluted (Fig. 1). There were 302 polluted river lengths in 2019, up from 150 in 2009. Table 1 depicts India's water index. No environmental project would be complete without a focus on rivers and other water sources. All other areas of conservation require portable water to be successful. Because water is a need for life, the efforts and techniques should be orders of magnitude greater than the obstacle. The demand-supply imbalance is becoming worse by the day. As a result, both sources are currently jeopardised. The goal is to protect the rivers while making the best use of the limited water supplies.

Table 1:- Table 1 shows the current state of India's water index

Water index in India	Parameters
Fresh water availability in India	1545 m^3 per capita
Total Contribution in world fresh water	4%
Fresh water quality index	120 out of 122 Country
Fresh water availability index	133 out of 180 Country
Total safe and pure water availability	18 % Villages
Total population 18% villages	about 833 million people
WHO report affected by water related disease	38 million people

(source: water resources information system of India- 2019).

Indian River - the Lifeline

Even before the human race existed, rivers were the most ancient source of water. River networks have supported civilization after civilization from time immemorial. Table 2 illustrates the number of people living in river basins for drinking water, agriculture, animal farming, and other purposes, as well as the yearly availability of water per capita. The availability of water in the major Indian River basins is seen in Figure 2. All rivers and their tributaries are a traditional and dynamic source of livelihood for people involved in the following drinking and domestic uses, occupation/trade/tradition: agriculture, power generation, fisheries, navigation, transport, and tourism, poultry and livestock farming, pottery, sand-mining, art and craft, several small and medium scale industries, such as apiculture, sericulture, and jute, and several large scale industries, such as leather.

Table 2: Annual water availability per capita in main Indian river basins (source: central water commission, an estimate for 2010).

River basin	Per capita annual water availability (m^3)	Estimated population (million)	River basin	Per capita annual water availability (m^3)	Estimated population (million)
Mahanadi	1826	37	Brahmani	2113	13
Ganga	1062	494			
Brahmaputra	13407	40	Indus	1271	58
Sabarmati	263	14	Pennar	472	13
Godavari	1486	74	Mahi	761	14
Krishna	933	84	Brarak	5667	9
Cauvery	530	40	Narmada	2253	20
Subernarekha	958	13	Tapi	731	20

The State of Indian Rivers

River water is essential for transportation, electricity, habitat, civilization, and industry, as well as being the major supply of human physiological needs and agriculture. Figure 3 depicts a report from the Government of India's Ministry of Water Resources. The drop in the proportion of available water in major Indian rivers from 1900 to 2012 was given in 2013. In 2019, the Central Pollution Control Board (CPCB) identified 302 contaminated rivers, up from 121 in 2009, indicating a significant increase in the number of polluted river bodies. Organic pollutants in rivers are mostly generated by the discharge of partly and untreated sewage, as well as industrial effluent. Municipal wastewater generation (61948 million litres per day) and installed sewage treatment capacity (23277 million litres per day) are drastically different.

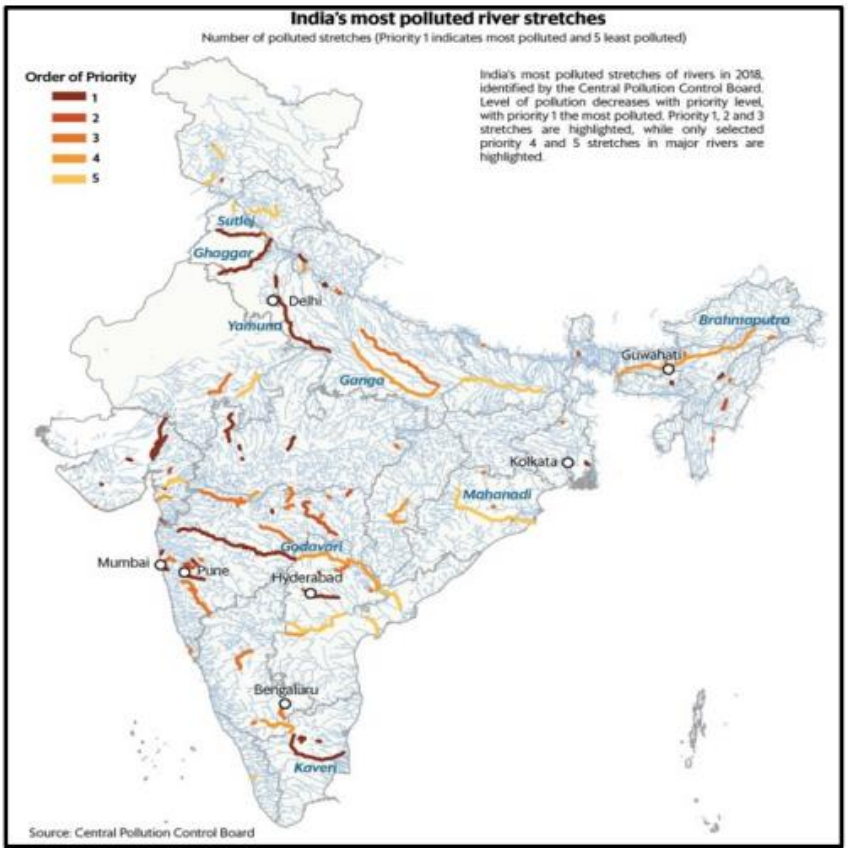

Figure 1:- The geographical distribution of India's major contaminated rivers in 2018 (source: Central Pollution Control Board, 2019)

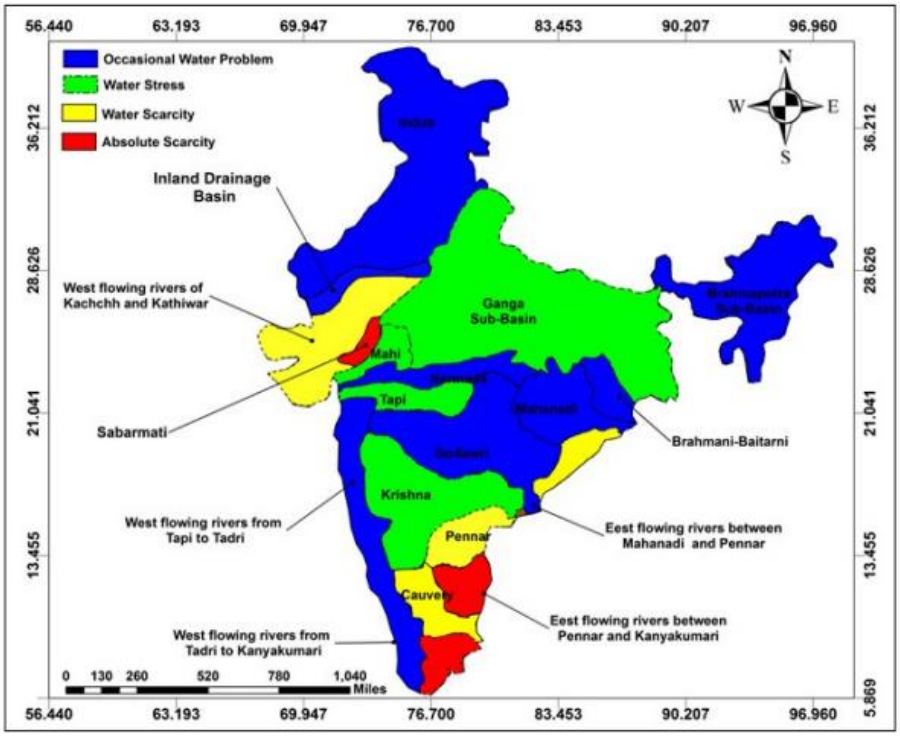

Figure 2:- Geographical distribution of the major Indian River basins in relation to water supply (source: Central Water Commission).

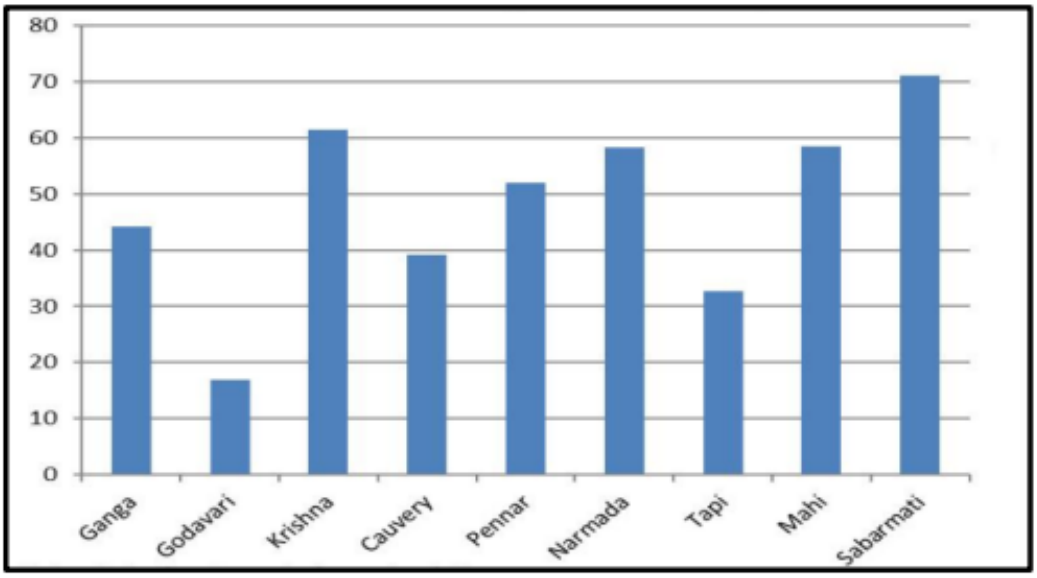

Figure 3:- Percentage reduction of water in prominent Indian rivers from years 1900-2012 (source: government of India, ministry of water resources, 2013).

River Rejuvenation Obstacles

The research identified three categories of barriers to river rejuvenation in India, which are stated below:

(A) Enforcement issues: While industries are obligated by law to construct common wastewater treatment plants and employ innovative technologies to achieve zero liquid discharge into rivers, enforcement has been low.

(B) Inadequate infrastructure: States with more than half a million people, such as Uttarakhand, Uttarpradesh, Bihar, Jharkhand, and West Bengal, can barely treat 45 percent of the sewage they create. This number is even more disturbing when you consider that several cities, like as Kanpur and Allahabad, are not even connected to a sewage network, and their rubbish goes uncounted.

(C) Inadequate Maintenance: Despite the government's construction of sewage treatment plants, incompetent state governments and local corporations have left these systems unusable. Many of these factories aren't even up and running.

The Indian government is implementing water conservation measures

The growing population of India has resulted in a plethora of environmental challenges. There were environmental rules in India even before independence. However, prior to independence, the laws dealt with public health, which included

water, air, and other resources that were available to everyone as a public resource. A well-developed framework did not exist until the 1972 United Nations Conference on the Human Environment in Stockholm. Many laws and actions are in existence in India to protect the environment. The following Acts or Statutes control water pollution regulation in India, in chronological order:

1. The water (prevention and control of pollution) act, 1974.
2. The water (prevention and control of pollution) act, 1978.
3. The environment (protection) act, 1986.
4. Hazardous wastes (management and handling) rules, 1989.
5. National environmental tribunal act, 1995.
6. National environment appellate authority act, 1997.
7. National green tribunal act, 2010.
8. The national water framework act, 2016 (Proposed Act).
   A. Right to water for life
   B. Water is shared resource
   C. River rejuvenation
   D. Re usage of water
   E. Water quality and
   F. Flood mitigation and management
   G. Involvement of people in water management

"JAL JAGRUTI ABHIYAN" water conservation and river revitalization project, 2013-2016. Jal Jagruti Abhiyan 17 River regenerated in India between the aforementioned years. There are 13 rivers in Maharastra (Benitura, Manjara, Vena, Rajegavi, Narola, Terna, Gharni, Tawarja, Rena, Jana, Waghur, Mudgul, and Mann), three rivers in Karnataka (Vedavathi, Kumudvathi, and Palar), and one river in Tamil Nadu (Naganadhi).

Water Supply in the Past and Projected for the Future

A study on river rejuvenation provides the present condition. Table 3 depicts historical changes in water availability in India from 1951 to 1955, 1991 to 2001, and expected changes from 2025 to 2050. Table 4 shows the demand for water in 2010 by characteristic, as well as the expected demand for water in Billion Cubic Meters (BCM) in India for the years 2025 and 2050.

Table 3: Water availability per capita in India and forecasts for future water availability (source: government of India, Ministry of water resources, 2009)

Year	Population (in millions)	Per capita water availability (m^3/year)
1951	361	5177
1955	395	4732
1991	846	2209
2001	1027	1820
2025	1394	1341
2050	1640	1140

Table 4 shows the current water demand in India as well as the projected future demand in billion cubic metres (BCM) (source: national commission for integrated water resources development, 2010)

S.N.	Parameters	2010 (in BCM)	2025 (in BCM)	2050 (in BCM)
1	Irrigation	557	611	807
2	Drinking Water	43	62	111
3	Industry	37	67	81
4	Energy	19	33	70
5	Others	54	70	111
6	Total	710	843	1180

According to the figures above, river rejuvenation is most essential for future freshwater supplies since river networks are a very valued source of fresh water in India. Because of India's water shortage and zero days of water availability.

PROBLEMS AND SUGGESTIONS

According to the 2030 water resource group, if appropriate measures such as river rejuvenation are not undertaken, 40 percent of the Indian population may lack access to clean drinking water. This can be predicted based on the decreased national per capita annual water availability. Some present and forthcoming concerns and initiatives are discussed more below -

(A) Issue: According to a 2017 research by the National Institute for Transforming India (NITI), India is undergoing the worst water crisis in its history, with 600 million people facing water scarcity. Figure 4 depicts the availability, scarcity, and stress of freshwater per capita (m3/year) in India as a function of temperature rise.

By 2030, demand is predicted to outstrip available supply, exacerbating the situation. By 2020, 21 cities, including major metropolises like New Delhi, Bangalore, Chennai, and Hyderabad, are predicted to run out of groundwater. By 2050, water shortage is predicted to cost the country 6% of its GDP. Over 200,000 Indians die each

year as a result of a lack of access to adequate drinking water. Thirty percent of the sites were polluted. The river water was determined to be over permissible levels at 67 of the 222 locations investigated by the Central Water Commission for water quality in 2012 and 2013, as well as in 2016 and 2017. 14 of the 67 sites were classed as category 1 (very polluted) and 12 as category 2 (mildly polluted) (extremely polluted). This removes two of the most significant and polluted river basin systems, the Ganga and the Brahmaputra. The phrase "ZERO DAY" (when the water level is zero) was coined in response to the World Health Organization (WHO) report 2019.

Among the 21 Indian cities and metropolises are Shimla, Delhi, Meerut, Gurugram, Faridabad, Jaipur, Kanpur, Dhanbad, Jamshedpur, Anshan shoal, Amravati, Mumbai, Sholapur, Vijayawada, Haidrabaad, Bengaluru, Chennai, Koyambtoor, Kochi, and Madurai. After reviewing multiple yearly reports and working on freshwater availability, it was determined that there are various problems in India caused by a lack of fresh water, as indicated above in this paragraph.

Recommendations (B) River Rejuvenation Steps:

1. Identifying the key difficulties and concerns related to river health.
2. Developing Therapy Stages (first, second, etc.).
3. Assessment of the biophysical characteristics of the watershed and valley area
4. Highlight the ridge-to-valley strategy (microstructures importance).
5. Treatment from the top ridge to the lower valley, as well as promotion of Ghat, river, and tributary cleansing, rain harvesting, groundwater recharge (Fig. 5), recharge wells, injection wells, tanks, tree planting, and illegal logging in forest regions, among other things.
6. Consultation and road map development, as well as the formation of a core team made of management, technical, and communication experts, among others.
7. River site surveying and measuring, as well as the creation of a comprehensive project report (technical and financial).
8. Priority is given to measurement and implementation.
9. Monitoring of implementation and documentation
10. Assessment and consultation.

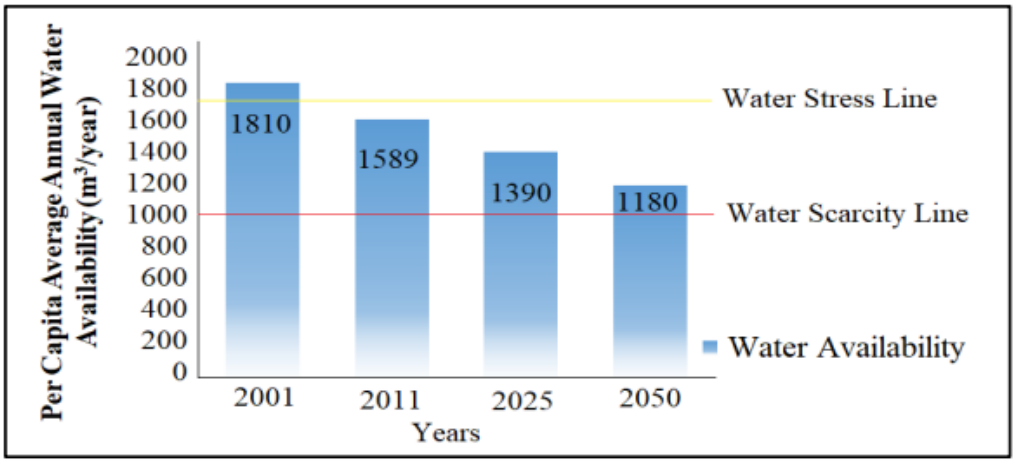

Figure 4 displays freshwater availability per capita in India, as well as future water shortages and water stress (government of India, Ministry of water resources, 2012).

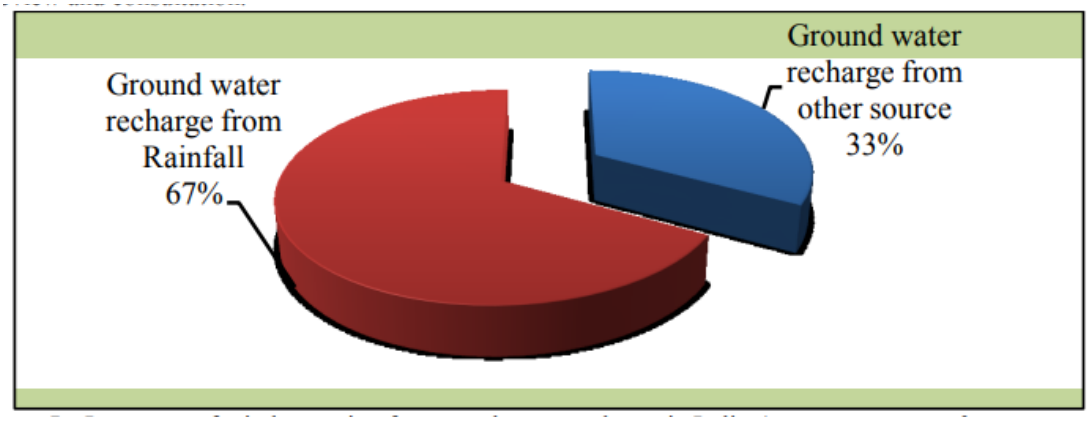

Figure 5: The significance of rainwater collection for ground water recharge in India (source: ministry of water resources, central ground water board, 2019).

CONCLUSION

According to the findings of the study, river conservation and revitalisation are now important for India, the world's second-most populated country. The ecologically sustainable development of natural water resources, such as springs, rivers, and groundwater. A process-based understanding of river basin ecology will enable for more sustainable use of water resources. The concept of environmental flow aids us in determining the long-term limits of river water resource development. Localised river revitalisation is a cost-effective method, and local water management–harvesting and recharging groundwater where it falls–can only be performed with community participation. The national government has issued a statewide order prohibiting the immersion

of idols in rivers or their tributaries during festivals like Dussehra, Diwali, Chhath, and Saraswati Pooja, including the cordoning off of Ghats and the enforcement of a Rs. 50,000 fine. The environmental flow must be incorporated into water resource development strategies by planners and regulators. The government recognises that all progress, including raising the people's health index, is contingent on a steady supply of high-quality water. That is why the renewals strategy was put in place to help with river conservation and revitalisation.

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