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RESEARCH ARTICLE

NEED OF RIVER REJUVENATION IN INDIA

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ABSTRACT

India today is desperately in need of answers to resolve its water crisis. The country faces a critical challenge is improve the productivity of drinking fresh water. No socio-economic development or even political stability will ever be possible without ensuring uninterrupted supply of quality potable water. It is therefore clear that river rejuvenation will need to be distributed across the country. In other words, we will need to capture rain water, where it falls, over vast parts of the country so that we can provide local water security and recharge every well. Present study examines the presence of water resources in India from two perspectives: pollution in the river basins and need of river rejuvenation work implemented in India. This is based on river rejuvenation needed in India and water resources affected by dumping many sources and types of pollutions in River basins.

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Introduction:-

The river ecosystem is a complex mosaic of interaction of human and interrelationship of the biotic (flora and fauna) and abiotic (hydrological, geomorphic etc.) components in dynamic equilibrium (Shekhar and Prasad 2009, Das 2014). The ecological function of a river is linked to the hydrological variations in the river flow (Jain & Kumar 2014). What is the maximum sustainable water use from a river that will maintain the ecological integrity of a river as a perennial resource (Soni et al. 2014).

River rejuvenation is an effort aimed at restoring poor health of overexploited and polluted rivers. It requires an understanding of the causes for the poor health and the restoration efforts from source to sink (ICFR, 2014). Depending on the level of deterioration, river rejuvenation aims at a new sustainable healthy river ecosystem. This can also be achieved by restoring the river health back to an accepted historical state of the river. Avoiding direct entry of domestic sewage and industrial effluents into the river will certainly improve the river health. But flow of a river is its identity and the most significant variable of a river system. Besides performing various functions, it gives self cleaning and healing powers to a river. Thus, the river rejuvenation broadly calls for optimal fresh water flow through the river system during different seasons. The rejuvenation of a river is best achieved by ensuring environmental flow in the river. Sinha et al. (2013) also emphasize on estimation of river recovery potential and path along with threshold conditions for sustainable management of the river systems in the Ganga River basin.

“Any river is really the summation of the whole valley, to think of it as nothing but water is to ignore the greater part” - Hal Borland

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Objectives:-

The fundamental objectives of the present investigation to study need of river rejuvenation in India, which incorporates the follows:

1. Study about river rejuvenation and causes of river rejuvenation needed in India?
2. Pollution, sources of pollution in river basins and near the river networks.
3. Proposed water conservation steps and bills for river rejuvenation by Indian government.

Methodology:-

Present study based on secondary data which is collected from different books, monthly research magazines, research institutes, Non Government Organizations (NGOs), various websites and research articles etc. Data source of water index in India is water resources information system of India (*Table-1*). Per capita annual water availability in river basin data extracted from central water commission, estimate for 2010 (*Table-2*). Major polluted river in India 2018 extracted from central pollution control board 2019 (*Fig. 1*). Water availability in major Indian River basins recorded from central water commission (*Fig. 2*). Water availability decreased in percentage of in major Indian rivers since years 1900-2012 government of India, ministry of water resources, 2013 (*Fig. 3*). Extract per capita water availability and projected for future in India from government of India, ministry of water resources (*Table-3*). Demand of water and projected for future demand in Billion Cubic Meter (BCM) in India data received from national commission for integrated water resources development (*Table-4*). Per capita fresh water availability, future water scarcity and water stress in India data received from ministry of water resources (*Fig. 4*). Extract important of rain harvesting for ground water recharge in India from ministry of water resources, central ground water board (*Fig. 5*). Which are added with converted form of data uses i.e. tables, diagram and figures.

Discussion:-

For the present study need of river rejuvenation in India was based on secondary data. In the year 2018 major polluted river in India are depicts in *Figure 1*. Per capita annual water availability in Indian River basins in year 2010 is presented in *Table-2* and *Figure 2* is depicts water availability in major Indian River basins. *Figure 3* depicts water availability percentage decrease in major Indian rivers from years 1900-2012. Per capita water availability and projections for future water availability in India is presented on *Table-3*. *Table-4* depicts the demand of water in Billion Cubic Meter (BCM) in India and projected for future water demand. *Figure 4* depicts per capita fresh water availability, future water scarcity and water stress in India and *Figure 5* depicts important of rain harvesting for ground water recharge in India.

Causes Of River Rejuvenation

During the study two types of causes found for the present studies which are environmental and anthropogenic. Detailed of the causing study is presenting below-

(A) Environmental causes:

Over a long period a river assumes a generally smooth long profile. This is the most efficient profile for a river to have in order to transport water and sediment. It represents a state of balance with the environment. The central and State Population Control Boards (SPCB) is monitoring the quality of water bodies across 2500 locations. Figure 1 is depicts of major polluted river basins in India. Climate change (changes in rainfall, temporal dynamics and carbon emission), drought and dying river system etc are major causes.

(B) Anthropogenic Pollution:

Deforestation, million liters of raw sewage discharged, untreated million liters of waste water is discharged, thousands of tones of non-biodegradable solid waste dumped, pulp and paper industry is the highest contributor by volume and thousands of grossly polluting industries along the main stem. Sewage is being one of the main reasons of pollution in the Indian River. 62,000 ml/d (million liters per day) of sewage as the main pollutant is dumped by the 650 cities situated along the polluted rivers in India (source: S.O.E. in 2016).

River Rejuvenation Needed in India

River rejuvenation means to restore to a former state to make new again. Rising temperatures, scanty rainfall and resultant depleting water resources present a scary scenario, so far as bridging the gap between demand and supply of potable water is concerned. The fast rate of water pollution is adding to the scare, be it the rivers or the groundwater. An index of what is really going wrong was presented by a recent study focused on the state of rivers

in the country. The number of polluted rivers in the country has risen from earlier 121 to alarming in 2009 but in the present (2019) 275 rivers are polluted out of the monitored 445 rivers (*Fig. 1*). 302 the number of polluted river stretches in 2019, it was 150 in 2009. *Table-1* depicts the water index of India. No effort for environment protection would be complete without focusing on rivers and other means of water supply. Portable water is a key to success in conserving all other areas. The efforts and plans should be of magnitude greater than the challenge since water is a life sustaining essential commodity. The demand and supply gap has been widening day by day. As a result both the sources are currently in danger. The solution lies in protecting the rivers and harnessing the available water resources optimally.

Table 1:- Status of water index in India (*source: water resources information system of India- 2019*).

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

Indian River as a Lifeline

The most ancient source of water, even before the human race came into being, was the rivers. The river systems have sustained civilizations after civilizations since time immemorial. *Table-2* is depicted number of people living in river basins for drinking water, agriculture, live stock farming etc. and water availability per capita annual basis. *Figure 2* depicted to water availability in the major Indian River basins. All the rivers and its tributaries are conventionally and dynamically the source of livelihood for the people involved in the following drinking and domestic uses, occupation/trade/tradition: agriculture, power generation, fisheries, navigation, transport and tourism, poultry and live stock farming, pottery, sand-mining, art and craft, several small and medium scale industries, such as, apiculture, sericulture and jute etc. also large scale of industries, such as leather industries, pharmaceuticals, electronics, textile, paper, tanneries, fertilizer and oil refineries and priest hood.

Table 2: Per capita annual water availability in major Indian river basins (*source: central water commission, 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

Status Of Indian Rivers

Apart from being the major of human physiological needs and agriculture, river water is an important aspect with respect to transport, energy, habitat, civilization and industry. *Figure 3* depicted the Govt. of India, ministry of water resources report 2013 was presented decrease of water availability Percentage in major Indian rivers from years 1900-2012. Based on the magnitude of organic population, Central Pollution Control Board (CPCB) identified 302 polluted rivers in 2019 which is 121 in 2009, a significant increase in number of polluted river bodies. Discharge of partially treated and untreated sewage and discharge of industrial wastewater are major reasons of organic pollutants in rivers. A significant difference exists between the volumes of municipal wastewater generation of 61948 million liter per day against the installed sewage treatment capacity of 23277 milion liter per day.

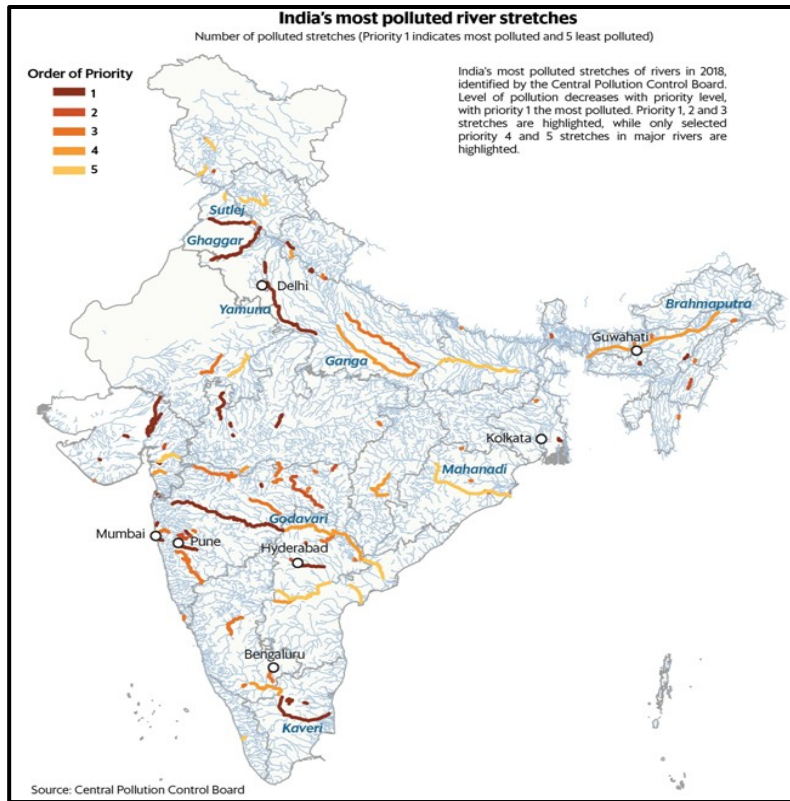


Figure 1:- Geographical distribution of major polluted river in India 2018 (source: central pollution control board, 2019).

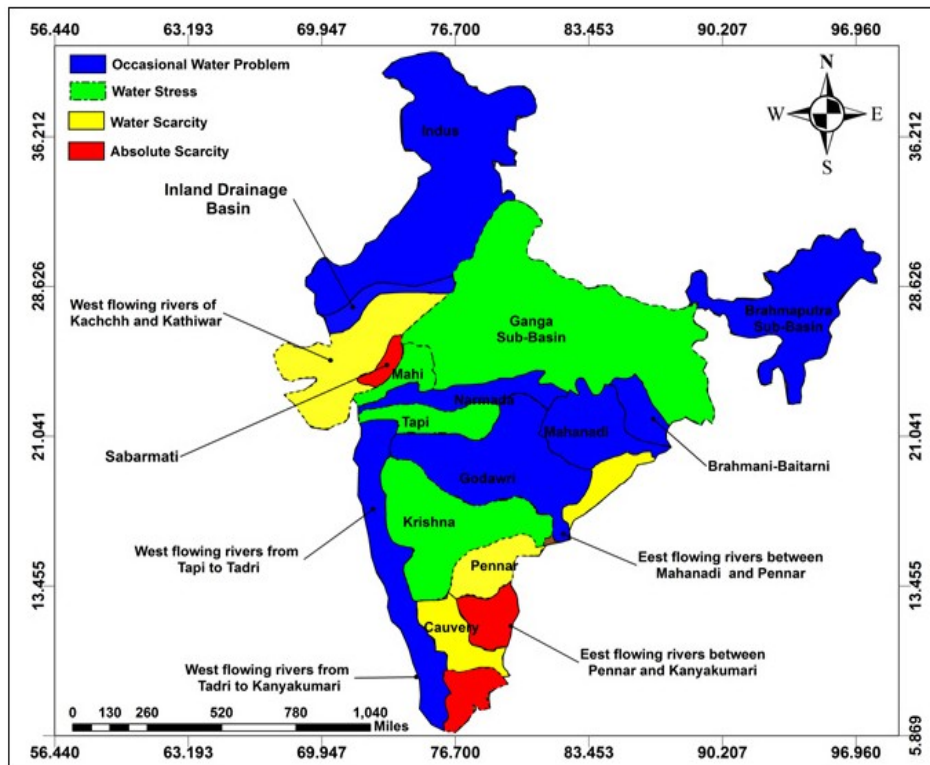


Figure 2:- Geographical distribution of major Indian River basins in context of water availability (source: central water commission).

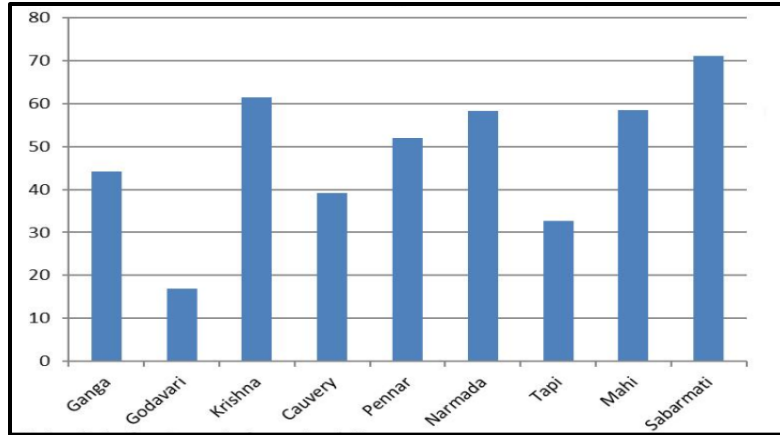


Figure 3:- Percentage decrease of water availability in major Indian rivers from years 1900-2012 (source: government of India, ministry of water resources, 2013).

Hurdles In River Rejuvenation

Study found mainly three types of hurdles in river rejuvenation in India which are presenting below-

(A) Lack of enforcement practices:

According to law, industries are expected to set up common effluent treatment plants and install new technologies to ensure zero liquid discharge into rivers, but the enforcement has been lax.

(B) Lack of infrastructure:

The states having more than 50% population viz. Uttarakhand, Uttarpradesh, Bihar, Jharkhand, and West Bengal can only treat 45% of the sewage they produce. This figure is actually even more severe considering the fact that large portion of many cities i.e. Kanpur and Allahabad are not even connected to sewage network and their waste remains uncounted for.

(C) Lack of Proper Maintenance:

Even though government set up plants for sewage treatment, lackadaisical state governments and lack of maintenance by municipal corporations have made these plants inefficient. Many of these plants are not even in functioning stage.

Water Conservation Steps By Indian Government

Due to growing population in India faced many environmental problems. There were laws for protection of environment in India even before independence. However, the laws existing before independence did not deal with environment protection exclusively, rather with public health that concerned water, air etc. accessed by everyone as a public resource. A well developed framework came into existence only after the UN's conference on human environment held in Stockholm in 1972. There are different statutes and acts implemented in India for environmental protection. The Act or statutes for regulation in India of water pollution in chronological order are as follows-

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

Water conservation and river rejuvenation project by “JAL JAGRUTI ABHIYAN”, 2013-2016. Jal Jagruti Abhiyan 17 River rejuvenated between above mention years in India. 13 Rivers (Benitura, Manjara, Vena, Rajegavi, Narola, Terna, Gharni, Tawarja, Rena, Jana, Waghur, Mudgul and Mann) in Maharastra state, 3 Rivers (Vedavathi, Kumudvathi and Palar) in Karnataka state and 1 River (Naganadhi) in Tamil Nadu state.

History Of Water Availability And Projected For Future

Present study based on river rejuvenation provides the present status. Table-3 depicts the historical changes i.e. 1951, 1955, 1991, 2001 and projected i.e. 2025, 2050 of the water availability in India. Table-4 depicts the demand of water in 2010 for various parameters and projected for years 2025 and 2050 demand of water in Billion Cubic Meter (BCM) in India.

Table 3:- Per capita water availability and projected for future water availability in India (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:- Demand of water and projected for future demand in Billion Cubic Meter (BCM) in India (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

After above mentioned recorded data river rejuvenation is most needed for future fresh water resource because of rivers networks are very useful source for fresh water in India. Because of India started suffering with the water crisis and zero days of water availability.

Problems And Suggestions:-

According to the 2030 water resource group 40% of Indian population may not have drinking water, if no effective measurement including river rejuvenation is executed. This can be extrapolated from national per capita annual availability of water that has reduced. Some recent and future problems and suggestions are presenting blow-

(A) Problem:

After the report of National Institute for Transforming India (NITI) 2017, India is suffering from the worst water crisis in its history with some 600 million people facing water shortage. Figure 4 depicts per capita (m³/year) fresh water availability, fresh water scarcity and fresh water stress in India which is affected by temperature rise. The crisis will worsen as demand is projected to be twice the available supply by 2030. In 21 cities, which includes big cities are i.e. New Delhi, Banglore, Chennai and Hyderabad likely to run out of groundwater by 2020. 6% of GDP will likely to be lost by 2050 due to water crisis. Around 2, 00,000 Indians are dying every year because they have no access to clean water. 30% sites have polluted River water of the 222 sites monitored by the central water commission for water quality between 2012 to 2013 and 2016 to 2017, water quality at 67 locations was beyond the permissible limits. Out of the 67 sites, 14 sites fell in category 1 (severely polluted) and 12 Sites fell under category 2 (extremely polluted). This excludes Ganga and Brahmaputra, the two most important and polluted river basin systems. After World Health Organization (WHO) report 2019 use the word ‘ZERO DAY’ (where water level is

going totally lost in whole year) for 21 Indian cities and metro city which names are Shimla, Delhi, Meerut, Guru gram, Faridabad, Jaipur, Kanpur, Dhanbad, Jamshedpur, Anshan shoal, Amravati, Mumbai, Sholapur, Vijayawada, Haidrabaad, Bengluru, Chennai, Koyambtoor, Kochhi and Madurai. After the studying many annual reports and work on fresh water availability finding so many problems which are originate by lack of fresh water in India is above mentioned in this paragraph.

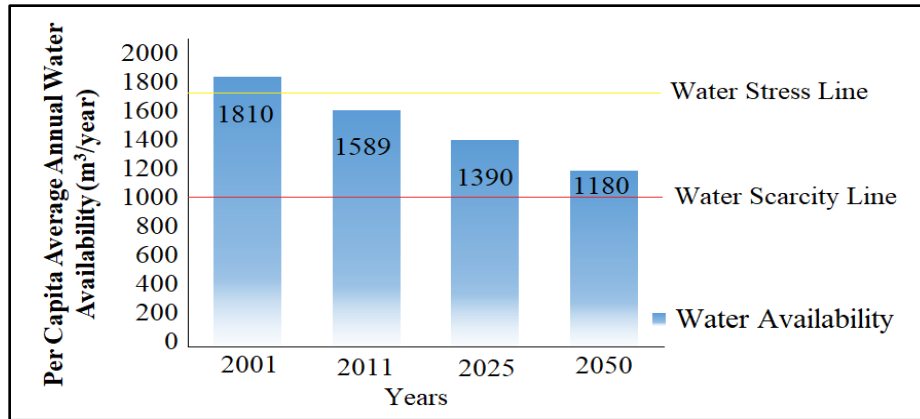


Figure 4:- Per capita fresh water availability, future water scarcity and water stress in India (*government of India, ministry of water resources, 2012*).

(B) Suggesting Steps for River Rejuvenation:

1. Identification of problem related to the river health- core issues and concerns.
2. Planning different phases for treatment (first, second....).
3. Assessment of catchment and valley area bio-physical properties
4. Focus on ridge to valley approach (micro structures importance).
5. Treatment from upper ridge to lower valley and promote measures for cleaning Ghats, rivers and tributaries, rain harvesting, ground water recharge (*Fig. 5*), recharge wells, injection wells, tanks, tree planting and illegal logging in forest area etc.
6. Consultation and development of road map and formation of core team like; management, technical, communication etc.
7. Survey of the river sites and measurement and preparation of detailed project report (technical and financial).
8. Prioritization of measurement and implementation.
9. Monitoring of the implementation and documentation.
10. Review and consultation.

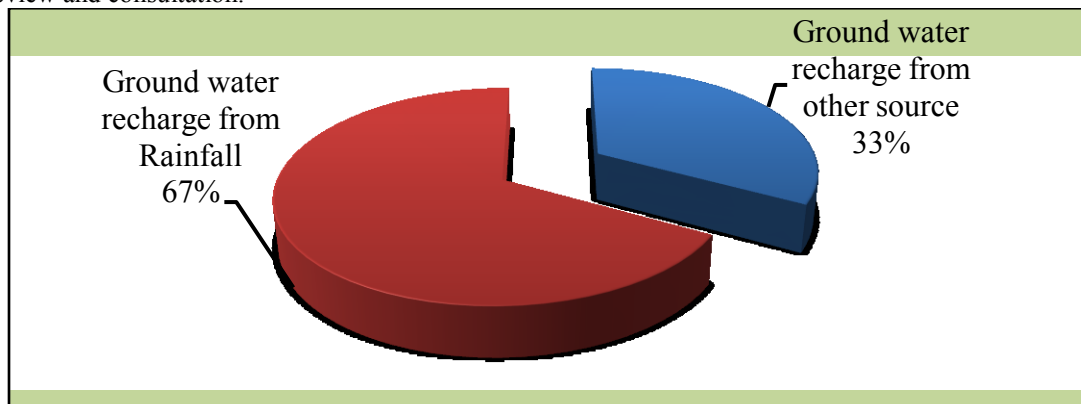


Figure 5:- Important of rain harvesting for ground water recharge in India (*source: ministry of water resources, central ground water board, 2019*).

Conclusion:-

After the study need of river conservation and rejuvenation now is very important for the second largest population country i.e. India. The need of the hour is environmentally sustainable development of natural water resources i.e.

springs, river and ground water resources. A process based understanding of the river basin ecosystem will facilitate sustainable exploitation of water resource. The environmental flow concept helps us in deciding the sustainable limits to river water resource development. Localized river rejuvenation is a cost-effective approach and more importantly local water management—harvesting and recharging ground water where it falls—can only be done through community participation. The central government has issued a many point in whole country directive, including cordoning off Ghats and imposing a fine of Rs. 50,000 to prevent the immersion of idols in the rivers or its tributaries during festivals, including Dussehra, Diwali, Chhath and Saraswati Pooja. The planners and policy makers should necessarily integrate the concept of environmental flow with water resources development strategy. The government too realizes that all developments including raising the health index of the people depend on availability of quality water. That is why the renewals approach to give fillip to protecting rivers and rejuvenating has been adopted.

References:-

1. Aquatic pollution in Mithi River of Mumbai: assessment of physicochemical parameters (2012): Interdisciplinary environmental review, Vol. 13 (4), 245–268.
2. Central pollution control board, Ministry of environment & forests, Government of India, 2005.
3. Central Pollution Control Board, India, Annual Report 2008–2009, (http://cpcb.nic.in/upload/AnnualReports/AnnualReport_37_ANNUAL_REPORT-08-09.pdf).
4. Central Pollution Control Board, Ministry of Environment & Forests, Government of India, 2009.
5. Das, Subhajyoti (2014): River Ganga needs informed debate. Journal of geological society of India, Vol. 84, pp.121-124.
6. Evaluation of operation and maintenance of sewage treatment plants in India- 2007, (http://www.cpcb.nic.in/upload/NewItems/NewItem_99_NewItem_99_5.pdf).
7. Ganga conservation efforts inspire thousands, (<http://www.thewaterhub.org/news/ganga-conservation-efforts-inspire-thousands>).
8. How India's cities came to drown in sewage and waste, (<https://www.theguardian.com/environment/2012/aug/01/india-cities-drown-sewage-waste>). The Guardian, 2012.
9. <http://mowr.gov.in/schemes-projects-programmes/programmes/ganga-rejuvenation>.
10. <https://www.thebetterindia.com/99349/environmentalist-foundation-of-india-fundraiser/>
11. <https://www.indiawaterportal.org/articles/groundwater-maps-india>.
12. <https://waterresources.assam.gov.in/portlet-innerpage/rejuvenation-of-river>.
13. ICFR. (2014): India charter for rivers adopted by delegates at India rivers week, 24-27 November 2014, New Delhi.
14. India Water Portal (<http://www.indiawaterportal.org/>).
15. IWMI (2005): Water policy briefing, environmental flows. Planning for environmental water allocation, report, international water management institute, Sri Lanka, pp. 8. http://www.iwmi.cgiar.org/Publications/Water_Policy_Briefs/PDF/wpb15.pdf.
16. Jain, S.K. and Kumar, P. (2014): Environmental flows in India: towards sustainable water management. Hydrological sciences journal, Vol. 59 (3-40), pp. 751-769.
17. National geographic society. 1995. Water: A story of Hope. Washington (DC): National geographic society.
18. Pollution control board, ministry of environment and forests, 2008.
19. Shekhar, S. and Prasad, R.K. (2009): The groundwater in Yamuna flood plain of Delhi (India) and the management options. Hydrogeology journal, Vol. 17(7), pp. 1557-1560.
20. Sinha, R., Jain, V. and Tandon, S.K. (2013): River systems and river science in India: major drivers and challenges, R. Sinha and R. Ravindra (editors), earth system processes and disaster management, society of earth scientists series-1, DOI 10.1007/978-3-642-28845-6_6, Springer-Verlag Berlin Heidelberg.
21. Soni, V., Shekhar, S. and Singh, D. (2014): Environmental flow for the Yamuna river in Delhi as an example of monsoon rivers in India. Current science, Vol. 106 (4), pp.558-564.
22. Status of Sewage Treatment in India, (<http://www.cpcb.nic.in/newitems/12.pdf>).
23. Wastewater production, treatment and use in India (http://www.ais.unwater.org/ais/pluginfile.php/356/mod_page/content/111/CountryReport_India.pdf) UN Water (publisher)."Water Quality Database of Indian rivers, MoEF" (http://cpcbenvnis.nic.in/water_quality_data.html#). Retrieved 15 September 2016.
24. WWF (2011): Assessment of environmental flows for the Upper Ganga basin, Report, WWF-India, New Delhi.