

Climate Change and India's Water Crisis: Legal Frameworks and Policy Strategies for Sustainable Management and Restoration

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Abstract

Water resource which is a sustainer of life and an economic good is facing issues like rise in temperature, flood, drought, diminishing of quality etc. Every living being, not just humans, has a basic right to exist in a pollution-free environment. Fresh air, pure water, and a clean environment which is the blessing of nature is now becoming a dream due to the adverse effects on nature owing to the different human activities. Numerous unplanned and shortsighted actions have resulted in the release of greenhouse gases, which remain in the Earth's atmosphere, causing climate change, including global warming and climate variations such as water scarcity. Significant challenges that jeopardize sustainability and hinder India's development include excessive groundwater extraction, water pollution, inefficient distribution, climate change, poor water management, and water-related conflicts. For an affluent and water-scarce nation like India, preserving water sustainability and overall sustainability has proven to be extremely difficult due to limited and declining water resources as well as rising demand for water resources from various sectors. The need to preserve water sustainability is more crucial than ever before due to overexploitation and climate change. The study focuses on the challenges that India faces regarding water resource management and the legal measures and policy measures adopted for sustainable utilization and restoration. Since Water is a state subject as per Entry 17 of the State List of Seventh Schedule of the Indian Constitution, all the states have enacted their own legislations for water conservation aimed at achieving sustainability.

Keywords: *India's water resource, Climate change, Legal measures for the protection, Policy measures, Awareness on water conservation.*

Introduction

The right to live in an environment devoid of pollution is a fundamental right of every human being. Fresh air, pure water, and a clean environment which is the blessing of nature are now becoming a dream due to the adverse effects on nature owing to the different human activities. The flora and fauna that maintain the balance of the world entirely depend on water availability.

The emission of greenhouse gases, largely resulting from unplanned and inadequately foresighted human activities, has become a persistent issue in the global atmosphere. This has contributed to climate change, manifesting in phenomena such as global warming and climate variability, including challenges like water scarcity. Climate change has a greater impact on water resources. Climate change is paving the way for two extremes i.e. high rainfall in some areas and severe droughts in some areas.

India's water resources.

India possesses only 4% of the world's renewable water resources whereas India's population is 17.76 % of the world's population¹. The major source of water is rainfall. Receiving of rainwater is an average of 1,170 millimetres of rain per year, which equates to around 4,000 cubic kilometers (960 cu miles) of rain per year i.e 1,720 cubic meters (61,000 cu feet) of freshwater per person².

The surface water resources are rivers, lakes, ponds, and tanks. From 8 major river systems with more than 400 rivers and their tributaries, India owns flow in river basins which is estimated to be 1,999.20 cubic kilometres. Out of which only roughly 690 cubics (37%) kilometers of accessible surface water is usable.

According to the Dynamic Ground Water Resources Assessment conducted by Central Ground Water Board (CGWB) and State Governments in 2023, the total annual groundwater recharge in the country is assessed as 449.08 BCM³. The extractable groundwater resource is assessed as 407.21 BCM. The annual groundwater extraction (as in 2023) is 241.34 BCM.

¹ Amruta Patil, "Water Resources in India - Geography Notes", PREEP (Nov 6, 2023), available at : <https://prepp.in/news/e-492-water-resources-in-india-geography-notes>

² Amruta Patil, Water Resources in Ind

³ National Compilation on DYNAMIC GROUND WATER RESOURCES OF INDIA, 2023, Central Ground Water Board Department of Water Resources, River Development & Ganga Rejuvenation Ministry of Jal Shakti Government of India, September 2023, available at: <https://cdnbbsr.s3waas.gov.in/s3a70dc40477bc2adceef4d2c90f47eb82/uploads/2023/12/20231206209724415.pdf>.

The major part of the ground water is used for irrigation sector, which accounts for 87% of the total annual groundwater extraction. The average stage of groundwater extraction for the country is about 59.26 %. Out of the total 6553 assessment units (Blocks/ Mandals/ Talukas) in the country, 736 units in various States/ UTs (11.23%) have been categorized as ‘Over-exploited’. i.e groundwater extraction exceeds the annually replenishable groundwater recharge⁴

India’s Water Export

India is one of the largest water exporters in the world. On February 3, 2021, Union Minister of State in the Ministry of Commerce and Industry Hardeep Singh Puri testified in the Lok Sabha that India exported 3,850,431 liters of water between 2015–16 and 2020–21 (April–November)⁵.

According to 2021 data India exported three categories of water at a quantity of 2,378,227 litres of mineral water, 602,389 litres of aerated water, and 869,815 litres of natural and other water. China received the major share of water in 2019–20, i.e 1,000 litres of aerated water, 20,000 litres of natural water, and 63,580 litres of mineral water. Maldives (38,380 litres), United Arab Emirates (35,510 litres), Canada (33,620 litres), Singapore (33,460 litres), United States (31,730 litres), Qatar (25,900 litres), and Saudi Arabia (29,020 litres) were among the other top destinations for Indian water imports.⁶

It is a contradictory fact that while India is a major exporter of water the Government is not able to meet its drinking water requirement.

Challenges And Issues Faced by India’s Water Resources.

India, with its vast population and reliance on agriculture, faces a significant threat from climate change's impact on its water resources. Being essential for human survival, water supply is also a vital component of many other industries, including manufacturing and agriculture. Economic progress depends critically on the preservation and wise use of this limited resource. India only possesses 4% of the world's water resources, although having

⁴ National Compilation on DYNAMIC GROUND

⁵ Ishan Kukreti, “India exported 3,850,431 litres of water since 2015, mostly to China: Govt, DOWN TO EARTH”, (Feb. 05,2021) <https://www.downtoearth.org.in/news/water/india-exported-3-850-431-litres-of-water-since-2015-mostly-to-china-govt-75411#:~:text=>

⁶ Ishan Kukreti, India exported

17% of the world's population, and many areas of the country already experience water scarcity.⁷

1. Impacts of climate change on Indian monsoon

Climate change has a huge impact on the Characteristics of the monsoon, by which the entire rainfall patterns, intensity, and frequency have been altered. With the increasing global temperatures, these changes are augmenting. Monsoons, which is the primary source of water, are becoming increasingly unpredictable, leading to periods of both intense rainfall and prolonged droughts. The monsoon circulation has been declining since 1951, particularly in areas like the Indo-Gangetic plains and the Western Ghats.⁸ The instances of localized hefty rainfall have increased. In the present-day monsoon, dry spells between rainy days have also increased. This disrupts water storage and planning, making it difficult to manage water resources efficiently.

2. Impact of global warming on water resources

Melting Glaciers: Himalayan glaciers, crucial sources for major rivers like the Indus and Ganges, are melting at an alarming rate due to rising temperatures. This reduces long-term water availability and disrupts river flow patterns.

Sea Level Rise: Coastal areas face the threat of saltwater intrusion, contaminating freshwater sources and affecting agricultural land.

3. Increase in demand for water for industrial and agricultural activities.

The need for water is rising across India as a result of both demographic shifts and quick economic expansion. According to estimates by the Union Ministry of Water Resources, India's water needs, which were 1,100 Billion Cubic Meters (BCM) annually in 2017, will increase to 147 BCM by 2050. Uncertain rainfall patterns and water scarcity threaten agricultural productivity, impacting the food security and livelihoods of millions.

⁷ "Climate Change Impacts on Water Resources in India", available at: <http://www.indiaenvironmentportal.org.in/files/india-climate-5-water-DEFRA.pdf> (last visited on Feb 17, 2024).

⁸ "Role of Climate Change in Indian Monsoon", available at: <https://www.iasparliament.com/current-affairs/roleofclimatechangeinindianmonsoon>, (last visited On Feb. 16, 2024).

4. Water scarcity

The frequency and intensity of droughts are increasing, leading to water shortages in many regions, impacting agriculture, drinking water availability, and hydropower generation.⁹ Along with that the Over-extraction of groundwater for irrigation and domestic use is exceeding recharge rates, leading to depletion of aquifers and impacting long-term water security.

5. Decrease in water quality.

70 % of surface water resources are polluted. Climate change can exacerbate water pollution by increasing the intensity of storms, causing soil erosion, and promoting the growth of harmful algae.¹⁰ More intense and frequent storms carry pollutants like fertilizers, pesticides, and sewage from land into rivers, lakes, and oceans, contaminating them.¹¹ This further reduces water quality and its usability. The droughts increase dust storms, further adding sediment and contaminants to water bodies.

6. Unequal distribution of water resources.

It is very contrast that some areas in India have surplus water which is even being exported while some regions face severe water scarcity. The challenge lies in efficient management and equitable distribution, often hampered by infrastructure limitations and governance issues. Unsustainable practices like excessive groundwater extraction in certain regions exacerbate water scarcity and contribute to the export-scarcity paradox. Climate change can disproportionately impact water-scarce regions, pushing them closer to crisis while potentially increasing water stress in areas with higher baseline availability.

7. Effects of alteration in traditional water resources.

Altered water regimes disrupt aquatic ecosystems, affecting biodiversity and impacting fisheries and tourism. Reduced water availability can limit hydropower generation, impacting energy security and forcing reliance on alternative sources.

⁹ “Climate change” https://www.who.int/health-topics/climate-change#tab=tab_1(last visited on 17th Feb. 2024).

¹⁰ “How Climate Change Impacts Water Access” <https://education.nationalgeographic.org/resource/how-climate-change-impacts-water-access/> (last visited on 17th Feb. 2024).

¹¹ “Water Topics” United States Environmental protection Agency, <https://www.epa.gov/environmental-topics/water-topics> (last visited on 17th Feb. 2024).

Legal Measures for The Protection of Water Resources.

Since water is a fundamental resource for the subsistence of life on earth Sustainable development and efficient management of this scarce resource is very significant in this era. India has established a robust legislative framework to safeguard its water bodies to combat the challenges.

Provisions under the Constitution of India.

Water is a state subject. Entry 17 of State List - Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage, and water power subject to the provisions of Entry 56 of List I.

Entry 56 of List I - Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest.

The Indian Constitution, while making water a state subject, empowers the Centre in specific situations. This dual framework allows states to manage water within their boundaries while enabling the Centre to intervene in inter-state water disputes and environmental protection.

National Legislations

As per the power granted under Article 252 of the Constitution of India, the Parliament enacted **the Water (Prevention and Control of Pollution) Act, 1974**, which was last amended in 2003. The objective of the Act was to provide for the prevention and control of water pollution, and for the maintaining or restoring of wholesomeness of water in the country. The Act empowers the Central and State Pollution Control Boards to monitor water quality, set standards, and take action against polluters. The act provides provisions for the control of discharges into various water bodies from a wide range of industries and pollutants, The Act created institutions for monitoring and enforcement. Provisions for inspections, penalties, and closures for non-compliance, offering potential deterrents against pollution were also included.

Despite its existence, water pollution remains a significant problem in India, raising questions about the act's effectiveness in achieving its goals. Inadequate resources, and capacity, often hinder effective enforcement of regulations and penalties. Concerns exist about the adequacy

and stringency of current effluent standards in light of evolving environmental needs and technological advancements.

The Environment (Protection) Act, 1986

The Act grants broad powers to tackle environmental issues, including water pollution. The Act focuses on preventing, controlling, and abating environmental pollution, which inevitably contributes to water preservation by tackling various sources of contamination. Schedule I of the EPA Act Lists various industries and their permissible limits for effluent discharge, acting as a regulatory tool for water pollution control.

Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 Implemented under EPA, regulates hazardous waste disposal, indirectly protecting water resources from contamination.

Although the Environmental Protection Act, introduced in 1986, plays a vital role in environmental conservation, its implementation and enforcement remain challenging. Inadequate monitoring, limited manpower, and insufficient penalties create loopholes for offenders. The Act's centralization raises concerns about potential arbitrariness and limited State autonomy in decision-making. The Act needs to be strengthened to effectively address climate change mitigation and adaptation strategies. Integrating sustainable development principles within the Act could enhance its effectiveness in achieving long-term environmental goals.

National Commission for Integrated Water Resources Development (NCIWRD) (1999)

They reviewed the country's institutional and legislative structure for the water sector and found that many of the important issues that have emerged in the area of water resource development need legal support. It underlined the necessity of creating an all-encompassing National Water Code—that is, an integrated body of water laws rather than a single, complete statute.

The National Water Policy of 2012

The NWP 2012 aimed to address India's growing water challenges through a comprehensive framework. The policy rightly acknowledges the growing demand, mismanagement, and pollution issues impacting water security. It emphasizes river basin-level planning, considering all water sources and users within a holistic framework. Rainwater harvesting,

water conservation, and demand management are prioritized over solely supply-side solutions. The policy strives for fair allocation between states, sectors, and users, including environmental needs. It encourages stakeholder involvement in planning and decision-making.

Despite strong principles, the policy suffers from weak implementation due to insufficient funding, complex institutional structures, and lack of political will. While advocating equity, the policy doesn't explicitly prioritize basic needs like drinking water over other uses, leading to potential conflicts. Though advocating alternatives, the policy continues to emphasize large dams, raising concerns about their sustainability and social impacts. The policy lacks clear mechanisms for cost recovery and incentives for water conservation, hindering efficient resource management. Climate change adaptation strategies should be further strengthened for effective outcomes.

State Legislations

Several major state legislations have been enacted across India to address water preservation and management. While the specifics may vary from state to state, here are some key legislative measures implemented to conserve water resources:

Water resource preservation in Kerala is governed by various state legislations, policies, and initiatives aimed at sustainable water management and conservation.

Kerala Irrigation and Water Conservation Act, 2003 (Act No. 31 of 2003).

The Act provides for the consolidation of the laws pertaining to the construction of irrigation works, conservation and distribution of water for irrigation, and the imposition of water cess on lands benefited by irrigation works in the State of Kerala. It secures the involvement of farmer participation in water utilization systems. The prime importance is given to adopt measures for water conservation, adequate maintenance of the irrigation system, efficient and economical utilisation of water to optimise agricultural production.¹² The act also includes provisions for the establishment of the Kerala Dam Safety Authority for the surveillance and inspection of dams.

¹² Kerala Irrigation and Water Conservation Act, 2003 (Act 31 of 2003) UN ENVIRONMENT PROGRAM, <https://leap.unep.org/en/countries/in/national-legislation/kerala-irrigation-and-water-conservation-act-2003-act-no-31-2003>(last visited Dec. 20, 2023).

Kerala Groundwater (Control and Regulation) Act, 2002

This legislation regulates the extraction and use of groundwater in the state. It aims to prevent over-exploitation of groundwater resources and ensure their sustainable management. The Act requires permits for the installation of wells and boreholes and empowers authorities to monitor and regulate groundwater extraction activities.

In Karnataka: The Karnataka Groundwater (Regulation and Control of Development) Act, 2011, aims to regulate groundwater extraction and prevent overexploitation. It mandates permits for well drilling and imposes fees based on water usage.

Tamil Nadu: The Tamil Nadu Groundwater (Regulation and Control of Development) Act, 2002, is similar to Karnataka's law but goes a step further by establishing groundwater protection zones and restricting industrial activities in these areas.

Himachal Pradesh: The Himachal Pradesh Private Forests (Acquisition and Vesting) Act, 1972, recognizes the vital role of forests in watershed management and soil conservation, indirectly contributing to water security.

Uttar Pradesh Ground Water (Management and Regulation) Act, 2019: This legislation focuses on the management and regulation of groundwater resources in Uttar Pradesh. It aims to prevent over-exploitation, promote sustainable use, and regulate the extraction of groundwater through permits and licenses.

Punjab Preservation of Subsoil Water Act, 2009: Enacted by the state of Punjab, this law aims to regulate the use of groundwater for agricultural purposes. It prohibits the sowing of paddy before a specified date to conserve groundwater levels and encourages the adoption of alternative crops that require less water.

Haryana Water Conservation and Management Act, 2009: This legislation emphasizes the conservation and efficient management of water resources in Haryana. It provides for the establishment of water user associations and mandates the preparation of water management plans at the local level to promote sustainable water use practices.

Rajasthan Water (Prevention and Control of Pollution) Act, 1974: Rajasthan has its own legislation to prevent and control water pollution, complementing the federal Water (Prevention and Control of Pollution) Act, 1974. This law empowers the state pollution

control board to regulate industrial and municipal discharges into water bodies and take measures to prevent pollution.

Delhi Water Board Act, 1998: The Delhi Water Board Act established the Delhi Jal Board (DJB) as the primary agency responsible for water supply and sewage disposal in the National Capital Territory of Delhi. The DJB plays a crucial role in water management, conservation, and distribution within the territory.

Uttarakhand Water Management Act, 2010: Uttarakhand enacted this legislation to address water management issues in the state. It aims to promote efficient water use, prevent pollution, and regulate activities impacting water resources, such as hydropower projects and tourism.

Jammu and Kashmir Water Resources (Regulation and Management) Act, 2010: This law governs the regulation and management of water resources in the Union Territory of Jammu and Kashmir. It provides for the sustainable utilization of water resources, protection of water quality, and equitable distribution of water among various users.

Policy Initiatives Adopted by India for The Preservation of Water Resources.

1. Lifestyle for Environment

It is a futuristic approach undertaken by the government for sustainable development and protection of the environment. The protection of natural resources can be achieved only by the efforts of the people. This project aims to create awareness among the people for the imminent measures each one has to adopt. This movement aims to adopt habits and practices that minimize water wastage, promote water conservation, and contribute to the sustainable use of water resources. some lifestyle changes individuals can make to preserve water are

Reduce Water Usage - Be mindful of water consumption in daily activities such as bathing, dishwashing, and laundry. Take shorter showers, turn off the tap while brushing teeth or shaving, and run full loads in the dishwasher and washing machine to maximize water efficiency.

Fix Leaks - Regularly check for leaks in faucets, toilets, and pipes, and promptly repair any leaks to prevent water wastage. Even small leaks can add up to significant water loss over time.

Collect and Reuse Water - Collect rainwater from rooftops using rain barrels or other containers and use it for watering plants, cleaning, or other non-potable purposes. Reuse greywater from activities like dishwashing or laundry for irrigation in gardens or flushing toilets (where regulations permit).

Choose Water-Efficient Appliances - When purchasing appliances such as toilets, faucets, showerheads, and washing machines, opt for models that are certified as water-efficient by organizations like the Environmental Protection Agency (EPA) in the United States or the Bureau of Energy Efficiency (BEE) in India.

Support Water Conservation Policies- Advocate for water conservation measures and policies at the local, national, and international levels. Support initiatives aimed at protecting water resources, promoting water efficiency, and ensuring equitable access to clean water for all.

Adopt native plants in your garden or landscaping. Native plants are adapted to local climate conditions and require less water, reducing the need for irrigation.

2. Atal Mission for Rejuvenation and Urban Transformation (AMRUT): This scheme promotes rainwater harvesting and other water conservation measures in urban areas.

3. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY): This flagship program focuses on improving irrigation efficiency through micro-irrigation techniques and watershed development.

4. Atal Bhujal Yojana: This initiative tackles groundwater depletion by incentivizing water conservation practices and promoting community-led aquifer management.

5. Model Building Bye-Laws: These guidelines encourage rainwater harvesting, greywater reuse, and water-efficient fixtures in new constructions.

6. National River Linking Project: While facing implementation challenges, this ambitious project aims to transfer surplus water from basins with abundance to water-scarce regions.

Role Of Judiciary in Preservation of Water.

*M.C. Mehta v. Kamal Nath & Ors.*¹³ In this landmark case, the Supreme Court of India addressed pollution of the Yamuna River. The court issued directives to control industrial pollution and ensure the safe disposal of effluents into the river. The judgment emphasized the right to clean and safe water for citizens and highlighted the responsibility of industries and governments to protect water resources.

*M C Metha v. Union of India*¹⁴ This case focused on pollution of the Ganges River and resulted in the Supreme Court's directives to address various sources of pollution, including industrial effluents and untreated sewage. The court emphasized the importance of maintaining the purity of the Ganges, considering its cultural and religious significance, and issued orders for the construction of sewage treatment plants and the regulation of polluting industries along the river.

International Agreements:

United Nations Sustainable Development Goals (SDGs): Clear water and sanitation are the 6th Goal of sustainable development goals which is to be achieved by 2030. This goal includes targets related to water conservation, water quality improvement, water-use efficiency, and the protection and restoration of water-related ecosystems.

United Nations Framework Convention on Climate Change (UNFCCC): While not exclusively focused on water, the UNFCCC addresses climate change, which has significant impacts on water resources, including changes in precipitation patterns, melting glaciers, and increased frequency of extreme weather events affecting water availability and quality. By result of adopting and implementing various plans for water preservation inland waters and half of all freshwater ecosystems are now healthy, productive, and protected.¹⁵ This is necessary to reach Net Zero.

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention): This United Nations Economic Commission for Europe (UNECE) convention addresses the management and protection of transboundary

¹³ AIR ONLINE 1996 SC 711

¹⁴ AIR 1988 SC 1037

¹⁵ "Water - Climate Action Pathway", United Nations Climate Change, <https://unfccc.int/climate-action/marrakech-partnership/reporting-tracking/pathways/water-climate-action-pathway>(last visited on 17th Feb. 2024).

water resources. It promotes cooperation among riparian countries to prevent and resolve disputes over shared water bodies.¹⁶

Suggestions and Conclusion

Preserving water resources in India by reducing the impacts of climate change requires a comprehensive approach that addresses various challenges, including water scarcity, pollution, and inefficient use. Here are some suggestions for water preservation in India:

Promote Water Conservation Awareness: nationwide campaigns can raise awareness about the importance of water conservation and the need for individual and community action. Educate the public about simple water-saving practices like fixing leaks, using water-efficient appliances, and practicing rainwater harvesting.

Invest in Infrastructure: Upgrade and expand water supply and distribution infrastructure to reduce losses from leaks and improve access to safe drinking water. Invest in wastewater treatment plants to reduce pollution and promote reuse of treated wastewater for non-potable purposes.

Implement Rainwater Harvesting: Encourage the widespread adoption of rainwater harvesting systems in urban and rural areas to capture and store rainwater for groundwater recharge and non-potable uses like irrigation and sanitation.

Promote Efficient Agricultural Practices: Provide incentives for farmers to adopt water-efficient irrigation techniques such as drip irrigation and laser levelling. Promote the cultivation of less water-intensive crops and encourage the use of organic farming practices that improve soil moisture retention.

Regulate Groundwater Extraction: Enforce strict regulations on groundwater extraction, including the licensing of borewells and the implementation of groundwater recharge schemes. Encourage community-based groundwater management initiatives to ensure sustainable use and prevent over-exploitation.

Strengthen Water Governance: Improve water governance frameworks at the national, state, and local levels to ensure effective regulation, allocation, and management of water

¹⁶ “International Decade for Action ‘water for life’ 2005-2015” https://www.un.org/waterforlifedecade/transboundary_waters.shtml#:~:text=The%20UNECE%20Convention%20on%20the,transboundary%20surface%20waters%20and%20groundwaters (last visited on 17th Feb. 2024).

resources. Enhance coordination among government agencies, civil society organizations, and water user associations.

Invest in Research and Innovation: Support research and innovation in water conservation technologies, water treatment methods, and sustainable water management practices. Promote the development and adoption of innovative solutions tailored to India's diverse climatic and geographical conditions.

Address Climate Change Impacts: Integrate climate change considerations into water resource planning and management strategies. Invest in climate-resilient infrastructure and nature-based solutions such as afforestation, wetland restoration, and watershed management to enhance water security in the face of climate variability and extreme weather events.

Encourage Public-Private Partnerships: Foster collaboration between government agencies, private sector entities, and civil society organizations to mobilize resources and expertise for water conservation initiatives. Explore public-private partnerships for the development and maintenance of water infrastructure and services.

Empower Local Communities: Encourage the use of participatory approaches to water management, which provide local communities the authority to create local plans for water management, actively participate in decision-making processes, and take charge of water conservation initiatives.

India can address the challenges faced in water preservation and guarantee sustainable management of its valuable water resources for future generations by putting the above recommendations into practice and taking a comprehensive approach to water conservation.