

Policy Frameworks and Interventions in Indian Groundwater Management

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ABSTRACT

Groundwater, a vital freshwater resource, is crucial for domestic, agricultural, and environmental needs. India is the largest user of groundwater, using 230 cubic kilometres annually for irrigated land and drinking water. Post-Green Revolution agricultural practices have led to depletion and contamination, with water-intensive crops like rice and wheat straining the resource. India's outdated groundwater regulation complicates sustainable management. Recent government initiatives aim to improve water use efficiency and promote sustainable farming. However, effective groundwater management requires stronger laws, coordinated policies, and community participation for long-term sustainability.

INTRODUCTION

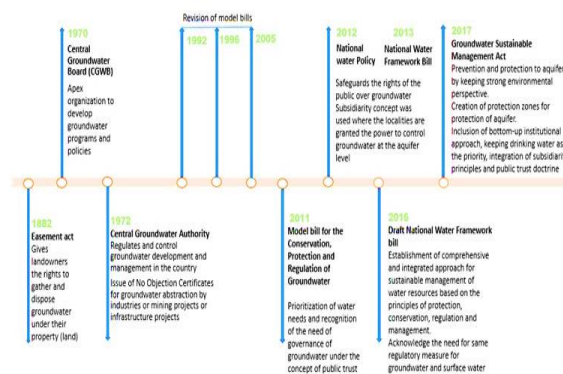
Groundwater is a vital source of freshwater for domestic, agricultural, and environmental purposes. Globally, groundwater is the primary source of water supply for both rural and megacities (Lavapuro et al. 2008). India, the largest user of groundwater, uses approximately 230 cubic kilometres of groundwater annually which is

about a quarter of the world's total reserve. More than 60 % of the irrigated land and 85% of the drinking water sources are dependent on the groundwater. In the recent years, due to intensive agriculture, the reliance on groundwater has increased substantially which has adversely affected the groundwater resource. Water-intensive crops *viz.*, rice,

wheat, and sugarcane exacerbate the issue, causing the water table to drop by 1-1.5 meters annually (Dhawan, 2017 and Saha and Ray, 2018). Further, government policies such as Minimum Support Price (MSP) and Public Distribution System (PDS) encourage the cultivation of these crops, intensifying groundwater use. Moreover, the process of providing electricity at subsidized rate for groundwater extraction has led to the decline in groundwater level. Further, the legal framework granting landowners the exclusive right to groundwater beneath their property challenges the sustainable use of water. Apart from groundwater depletion, groundwater contamination is a growing concern, with pollutants *viz.*, fluoride, arsenic, nitrate, and salinity threatening water quality. Despite rising pollution levels, there has been limited action by central and state governments to address groundwater contamination and implement restoration measures. Across the nation, different states have witnessed different water crisis making it imperative for the need of effective measures both at ground level and at policy level.

Evolution of groundwater bills in India

In India, presently the law that regulates groundwater is patchy with the Indian Easement Act of 1882 allowing landowners to collect and dispose of groundwater within their property limits (ELR, 2013). This makes it difficult to regulate groundwater extraction, causing inequitable distribution and violating the fundamental right to water and life (Suhag, 2016). The constitution allows state legislative assemblies to enact water laws pertaining to water supply, irrigation and canals, water storage, drainage and embankments and water power including groundwater. However, this does not eliminate the central government's mandate to regulate groundwater concerns, which also addresses disputes over interstate rivers and encourages water conservation and recharge (GoI, 2010 and GoI, 2024).



Source: Chandra and Janakiram, 2022 and authors compilation

Fig 1. Chronology of groundwater regulations in India

The Indian government has taken institutional and policy measures to address groundwater management, with some states enacting their own laws but with no effective results (ELR, 2013). Model bills were created to guide state governments for sustainable use of water, which had undergone multiple changes over the time period and are presented in Fig 1. The Central Groundwater Board (CGWB) was formed in 1970 to develop groundwater programs and policies (Chandra and Janakiraman, 2022), and the Central Ground Water Authority (CGWA) was formed in 1986 to regulate and control groundwater development and management (CGWB, 2024). CGWA issues guidelines considering regional water availability and hydrogeological conditions for groundwater abstraction, notifying areas where groundwater is overexploited or on the verge of overexploitation beyond the natural recharge rate (WGF, 2013). In non-notified areas, CGWA issues No Objection Certificates (NOCs) for groundwater extraction by industries, mining, or infrastructure projects. Decentralized regulatory measures are implemented with local/regional bodies of a state approving groundwater abstraction permissions. State-level Pollution Control Boards (PCB) are authorized to confirm actual requirements and abstraction demands and

provide guidance on rainwater harvesting structures. However, CGWA has limitations, such as focusing on hydrogeological assessments and restricting quantitative groundwater use, leaving other aspects behind, such as groundwater quality and education (WGF, 2013).

Prior to the establishment of CGWA, central government has proposed model bills since 1970 to streamline state groundwater legislation. With the passage of time, the model bill of 1970 was revised multiple times in 1992, 1996 and 2005 but the core framework of 1970 remains unchanged (Cullet, 2012). These bills focused on regulating groundwater by releasing permits for extraction, protecting drinking water sources, and involving local bodies in management. Each state/union territory was mandated to establish a groundwater authority, with its chairman appointed by the respective government. The 2005 revision added a Central Ground Water Board representative to these authorities. The groundwater authority recommended areas for regulation and designated the same as notified area with the option to de-notify these areas, if conditions improved starting from 1996. Permits were required to dig wells in notified areas, with small and marginal farmers exempted in 1992 and individuals using manual pumps since 1996. The decision period for permit approval was reduced from 90 days to 60 days in 2005. However, existing users of groundwater had to apply for permits within 120 days from the date of establishment of authority. The model bills emphasized rainwater harvesting and mandated buildings over 100 square meters to include a rainwater harvesting system. Penalties were issued for violations, including fines and imprisonment for up to 6 months. The introduction of model bills was an attempt to address groundwater depletion but land-to-groundwater connection remains unresolved. It failed to address overexploitation caused by

existing uses and could not establish comprehensive coordination between authorities *viz.*, pollution control boards and groundwater authorities.

In 2011, the model bill for the Conservation, Protection and Regulation of Groundwater (Groundwater Model Bill-2011) was created in response to the limitations of the model bills in context of increasing dependence on groundwater in the country. The bill prioritized basic drinking water needs while maintaining the aquifer and ecosystem for long-term sustainability. Other priorities included agriculture and municipal use (primary purpose) and industrial use (secondary purpose) with negative externalities likely caused by the secondary purpose assessed for social and environmental impact. Water pricing was also suggested for the bulk withdrawal of groundwater by the industries and the funds collected will be further used for groundwater augmentation and conservation activities. Groundwater protection zones based on technical data and aquifer mapping and security plans were proposed to protect natural recharge and discharge regions of aquifers from depletion or pollution. Groundwater extraction was ruled out in zone-1 except for basic needs and zone-2 suggested rules for sinking new wells. Groundwater security plan was created to improve and conserve groundwater, promote equitable distribution, and encourage conjunctive use of groundwater and surface water. Remedial measures such as adopting efficient irrigation technology, artificial recharge structures, energy-efficient pumps, recycling groundwater, recharging through afforestation and reforestation, water harvesting and providing incentives to stop water-intensive crop cultivation. The Bill also suggested decentralization of powers by creating groundwater committee at the gram panchayat level. The National Water Policy in 2012 was created emphasizing the importance

of judicious groundwater resource management and conservation, with a focus on groundwater as a community resource owned by the state under the public trust theory. The policy suggested integrated watershed development activities and separate electric feeders for pumping groundwater for agricultural purposes. In 1987, first National Water Policy was adopted which was modified in 2002 and 2012 focusing on groundwater conservation and fair allocation (Jairaj,1997; GoI, 2002). As per the recommendation of policy in 2012, the National Water Framework Bill was published in 2013 safeguarding the rights of the public over groundwater, ensuring that resources intended for public cannot be changed into ownership by a private party. The 2013 draft recommended reducing groundwater over absorption through electricity regulation. One example is Jyotigram scheme launched in Gujarat from 2003-2006 where power subsidies to agriculture was reduced which increased the non-farm economic ventures, decreased groundwater overdraft and improved village life. (Shah et al. 2008). However, it negatively affected landless and marginal farmers who depend on water markets for irrigation, leading to increased water prices charged by tube well owners. In 2016, Draft National Water Framework bill was proposed with an aim to establish a comprehensive and integrated approach for the sustainable management of water resources based on the principles of protection, conservation, regulation and management to ensure water security, efficient use and equitable distribution of water and ecological integrity. The 2017 Groundwater Sustainable Management Act addressed current issues, focusing on aquifer damage prevention, protection zones, bottom-up institutional approach, drinking water priority, subsidiarity principles, public trust doctrine, and mining-water regulation. However, it failed to address the division between land ownership and groundwater usage.

Interventions taken by central/state government

The Central Ground Water Authority has advised chief secretaries of all states and UTs to implement rainwater harvesting in government buildings. Till now 30 states and UTs have implemented laws, rules, and regulations requiring rainwater collection, as well as bye-law provisions. Some of the interventions taken up by the government include the Per Drop More Crop (PDMC) scheme since 2015-16, Model Building Bye Laws (MBBL) formulated by the Ministry of Housing & Urban Affairs (MoHUA), Jal Shakti Abhiyan (JSA) and Atal Bhujal Yojana (ABY). The PDMC scheme focuses on water use efficiency at farm level through sprinkler and drip irrigation. The MBBL mandates that every building with a plot size of 100 sqm or more must incorporate rainwater harvesting as suggested in model bill of 2005. In 2019, the Government of India launched Jal Shakti Abhiyan (JSA) focusing on rainwater harvesting and groundwater recharge across rural and urban areas to combat groundwater over-exploitation. Initially, 256 water-stressed districts were targeted, using measures like artificial recharge structures, watershed management, and afforestation. This initiative was built on earlier policies, such as the model bill of 2005 and 2011, which emphasized groundwater recharge. It continued till 2022 and in 2023, JSA was launched with the theme "Source sustainability for drinking water". In 2020, the Central Ground Water Board (CGWB), in collaboration with states and UTs, developed a master plan for rain water harvesting and artificial groundwater recharge, aiming to construct 1.42 crore structures to harness 185 Billion Cubic Meters (BCM) of water. Additionally, various states introduced water conservation schemes, such as *Jal Hi Jeevan* in Haryana, *Pani Bachao Paise Kamao* in Punjab, *Jal Jeevan Hariyali* in Bihar, *Sujalam Sufalam Abhiyan* in Gujarat,

Mukhyamantri Jal Swavlamban Abhiyan in Rajasthan, *Jalyukt Shibar* in Maharashtra, *Mission Kakatiya* in Telangana, *Neeru Chettu* in Andhra Pradesh and *Kudimaramath* scheme in Tamil Nadu *etc* to support rainwater harvesting and groundwater recharge. In 2019, the central government in collaboration with state governments implemented Atal Bhujal Yojana (ABY) in water stressed areas of Haryana, Gujarat, Rajasthan, Uttar Pradesh, Madhya Pradesh, Karnataka, and Maharashtra. ABY emphasized demand side management of groundwater and encourages water saving practices like drip and sprinkler irrigation, low water intensive crop cultivation (model bill 2011), mulching and pipe irrigation. On 24th April 2022, the Amrit Sarovar Mission was launched, emphasizing the development and rejuvenation of 75 water bodies through rainwater harvesting/recharge.

CONCLUSION

Groundwater is vital for domestic, agricultural, and environmental needs. India faces pressure due to excessive water use and intensive agriculture. Despite legislative efforts, groundwater governance remains fragmented and ineffective. To ensure long-term sustainability, strengthening regulatory frameworks, public awareness, and community-based management practices are essential. Addressing demand and supply aspects, ensuring equitable access, and promoting sustainable agricultural practices can help secure water resources for future generations.

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