

Water Governance in Uttarakhand: A Critical Review of Laws, Policies, and Institutional Frameworks

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Abstract

Effective water governance is crucial for the sustainable development of a state. This study presents a comprehensive literature review of the legal, policy, and institutional frameworks governing water resources in the state of Uttarakhand. Uttarakhand has a diverse hydro-geographical topography. Still, the state faces severe water challenges, including declining water quality, seasonal scarcity, over-extraction, and climate-induced variability. The review explores the various national and state-level water laws, such as the Water (Prevention and Control of Pollution) Act, 1974, and state-specific regulations such as the Uttarakhand Ground Water (Regulation and Control of Development and Management) Act, 2016. The policy landscape is assessed through documents like the National Water Policy (2012), State Water Policy (2013), and river rejuvenation schemes, including the Namami Gange Programme. Despite the presence of policy frameworks, overlapping responsibilities and poor coordination among institutions significantly hinder effective implementation and efficient delivery of water-related services in the state. Panchayati Raj Institutions and community-based water user associations show promise but remain underutilized due to capacity and awareness constraints.

Overall, this study underscores the pressing need for an integrated water resource management (IWRM) approach, enhanced inter-agency coordination, increased community participation, and updated legal instruments that reflect the realities of climate change and socio-economic transitions. The paper also identifies critical gaps in policy enforcement, data transparency, and decentralized decision-making. This review aims to contribute to the ongoing discourse on water governance reforms in Himalayan states and provides policy-level insights for more equitable, resilient, and sustainable water management in Uttarakhand.

Keywords: Uttarakhand, Water Governance, Policy Review, Institutional Framework, Sustainable Water Management

1. Introduction

Uttarakhand is a Himalayan state with a diverse hydrological network that relies on glacier-fed rivers, perennial tributaries, and groundwater sources. Some common traditional resources, such as small streams (Gadheras), Naulas, and springs (Dharas), are often used for collecting and storing rainwater in the state (Kumar et al., 2019). Many of these community-owned and managed systems are still functioning today. However, deforestation, unplanned development, increased demand for irrigation, and climate change have adversely impacted these vital water sources in Uttarakhand. Furthermore, the uneven distribution of water across different regions of the state throughout the seasons poses a serious concern. For instance, the hilly regions are mainly dependent on fragile sources, such as Naula, Gadhera, and Rivulets (48.02%), whereas wells are the common water source in the plains (Kumar et al., 2019). Climate change is further exacerbating these challenges. It is affecting rainfall patterns and glacial melt, thus increasing risks of floods and droughts. Furthermore, the growing tourist influx, in-migration, and inadequate urban planning have resulted in a large gap (20% to 70%) between water demand

and supply in the Himalayan regions (Singh et al., 2024). These challenges underscore the urgent need for the development of a sustainable water resource management plan and the integration of policies across sectors to ensure long-term availability of water and safeguard the unique ecological heritage of Uttarakhand.

Effective water governance is crucial for sustainable water management. It is defined as, “a range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society.” (Rogers and Hall, 2003). In India, states are primarily responsible for water resource management. Although the funding is provided by national authorities, the water resources are managed by various institutions, including irrigation departments, gram panchayats, and public departments (Ahmed and Araral, 2019). Similarly, there are different authorities responsible for managing water in rural and urban areas. For example, the Panchayat system serves as a governing agency in rural areas, whereas various bureaucratic and political bodies, like municipalities and districts, manage water resources in urban areas. A systematic representation of water governance is illustrated in Fig. 1.

Uttarakhand has a fragmented water governance system, resulting in overlapping responsibilities, inadequate coordination, inefficiency, and delays in decision-making by the authorities. Private institutions play a dominant role at the local level, whereas formal state institutions primarily manage water governance at the regional and national levels. However, the limited cooperation among these institutions remains a major concern in mitigating water-related challenges in the state. Therefore, considering the socio-economic vulnerability of mountain communities, coupled with climate-induced risks such as erratic rainfall and accelerated glacial melt, robust water governance mechanisms are necessary in the state.

Overall, this study presents a detailed literature review of the water governance framework in Uttarakhand. The goal is to examine the coherence and adaptability of legal instruments at both the state and national levels, and to identify institutional overlaps and potential avenues for integration. The study also examines the impact and feasibility of traditional water management systems, emerging adaptive governance models, and community engagement practices.

2. Legal and Policy Foundations

2.1 National Legislation

2.1.1 The Water (Prevention and Control of Pollution) Act 1974

This act is a foundational statute for water pollution control in India. Its major objectives are the prevention and control of water pollution, the preservation and restoration of water bodies (CPCB, 1974). This act authorized the central and state governments to establish the regulatory bodies, i.e., the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) at the respective national and state levels. These boards set standards for effluent discharge, prevent persons and industries from discharging effluent into water bodies without prior consent from the respective SPCB. Although this act primarily addresses pollution control, it does not regulate water resource management. Still, it is an important legal pillar in India for maintaining water quality.

2.2 State-Level & Regional Policies

2.2.1 The Uttarakhand Water Management and Regulatory Act, 2013

This law established the Uttarakhand Water Resources Management and Regulatory Commission to manage sustainable water resource management and to set water use charges, wherever applicable (Uttarakhand Act, 2013). Through this institutional mechanism, the state

aimed to integrate the regulation of water allocation, distribution, conservation, and management under a unified umbrella, thereby reducing fragmentation and improving accountability. However, despite its enactment, the Act has faced delays in full implementation, particularly in rolling out regulatory and monitoring mechanisms across all districts. This shortfall has limited its effectiveness, particularly in responding to hydrological stresses, climate-induced variability, and the growing demands resulting from population growth, tourism, and agricultural expansion.

Therefore, while the Uttarakhand Water Management and Regulatory Act, 2013 represents a major step towards holistic water governance, its partial implementation underscores the challenges in translating policy into on-the-ground outcomes.

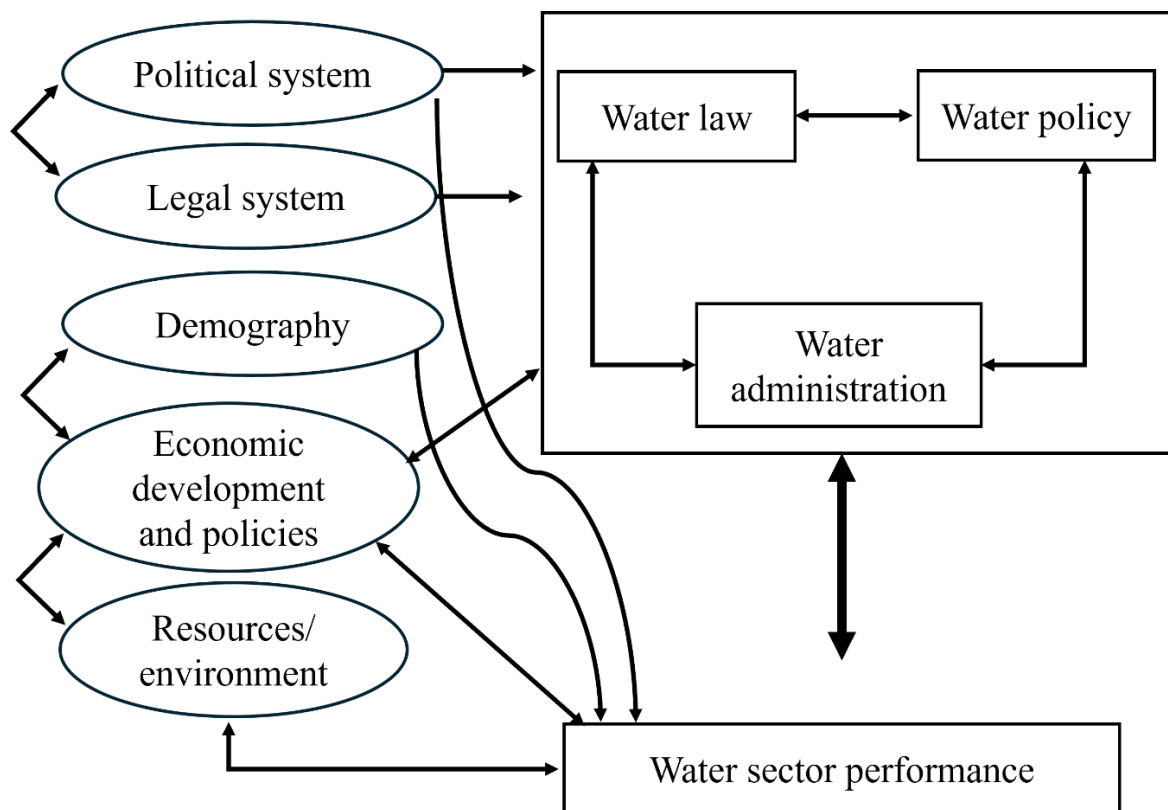


Fig. 1: Flow diagram showing water governance. Adopted from (Ahmed and Araral, 2019).

2.2.2 The Uttarakhand State Water Policy, 2019

In 2019, Uttarakhand adopted its first comprehensive water policy, designed to conserve water resources in its Himalayan setting. The policy highlights protection of traditional water sources such as springs, glaciers, and local streams, along with rainwater harvesting, groundwater recharge, and rejuvenation of rivers and glaciers (Bhandari et al., 2025). The policy prioritizes water allocation for drinking water and domestic needs, followed by sanitation, then agriculture, hydropower, forestry, tourism, and industry in that hierarchical order. By doing so, it seeks to safeguard human needs and ecological balance before allowing exploitation for economic ends.

Additionally, the 2019 policy mandates monitoring of all glaciers and river systems in the state, including the 917 Himalayan glaciers identified under the policy. In addition to sustainable

management, it is also aiming to keep them pollution-free. It also promotes decentralized, community-driven water management, such as village-level rainwater harvesting and spring recharge, discouraging arbitrary diversion or overextraction of water, and regulating new development projects to ensure ecological integrity.

2.2.3 Groundwater Regulation and Supply Laws

Given the critical state of groundwater resources, especially in the plains and foothill regions of Uttarakhand, the state has also attempted to regulate the use of groundwater through legal means. The Uttarakhand Ground Water (Regulation and Control of Development and Management) Act, 2016, was introduced to regulate groundwater extraction and promote sustainable use (Uttarakhand Act, 2016). However, it was repealed in 2017 through an amendment act, raising concerns about continuity in groundwater governance. As a result, the regulation of groundwater, particularly in terms of recharge and abstraction limits, as well as monitoring of water levels and licensing, remains weak or inconsistent in many areas.

In parallel, the Uttarakhand Jal Sansthan continues to oversee water supply and sewerage services, particularly in populated areas. However, the limited reach of formal supply infrastructure, especially in remote, hilly terrain, means that many communities still rely on springs, natural streams, or groundwater, underscoring a gap between policy aspirations and rural realities. Thus, while state-level laws exist to regulate groundwater and ensure a stable supply, their effectiveness is undermined by repeal, lack of enforcement, and geographical challenges, indicating the need for renewed, context-sensitive institutional efforts.

2.2.4 Climate Change Adaptation & Watershed Management Initiatives

Recognizing that climate variability, glacier retreat, erratic rainfall, and the impact on Himalayan ecology pose significant threats to water security, the state has attempted to integrate water management with climate adaptation and watershed conservation. The Uttarakhand State Action Plan on Climate Change water resources as a critical sector requiring adaptation, promoting spring recharge, protecting catchments, integrating forest-water linkages, and safeguarding water source quality (Government of Uttarakhand, 2024). Furthermore, the establishment of the Watershed Management Directorate in Uttarakhand reflects institutional recognition of the need to treat watershed conservation, soil stability, forest cover, and water harvesting as interlinked.

These initiatives aim to buffer the state's water supply against disasters, such as landslides, flash floods, and drying springs, by preserving catchments, recharging aquifers, preventing erosion, and maintaining ecological integrity. In theory, they provide a multi-sectoral, integrated framework for sustainable water governance in a fragile mountain environment. However, on-ground challenges remain substantial: uneven implementation, resource constraints, lack of technical capacity, especially in remote terrain, and institutional fragmentation continue to hamper effectiveness. This disconnect between policy design and field reality underscores the need for stronger enforcement and community participation.

2.3 Evaluation: Gaps and Implementation Challenges

While Uttarakhand has developed a robust legal and policy architecture for water governance, including the Water Management and Regulatory Act (2013), the State Water Policy (2019), groundwater regulation laws, and climate-adaptive watershed programs, significant gaps remain between policy intent and real-world outcomes. Several factors contribute to this discrepancy:

- **Implementation delays and partial enforcement:** key laws like the Uttarakhand Water Management and Regulatory Act remain underutilized, and the Ground Water Act was repealed shortly after enactment.
- **Institutional fragmentation and overlapping responsibilities:** resulting in poor coordination among water supply agencies, watershed departments, and regulatory authorities.
- **Geographical and hydrological complexity of the Himalayan terrain:** renders conventional governance models built around plains less effective. Springs and seasonal streams, typical of mountain hydrology, often escape formal regulation.
- **Socio-economic constraints and resource limitations:** many remote villages lack infrastructure, technical support, or financial resources to implement recharge, conservation, or modern water supply initiatives.
- **Insufficient community participation and local governance integration:** impedes the bottom-up adoption of conservation and sustainable practices.

These gaps suggest that while state-level legislation and policies provide a foundation, achieving effective water governance in Uttarakhand will require dedicated efforts to strengthen institutional capacity, ensure policy implementation, promote community participation, and tailor governance to the specific ecological and social context of the Himalayan region.

3. Institutional Framework and Governance Mechanisms

Uttarakhand's water governance comprises an intricate web of agencies and institutions, both state-level and local, each responsible for different aspects of water supply, resource management, sanitation, watershed conservation, groundwater monitoring, and pollution control. This institutional pluralism is designed to address the varied hydrological, ecological, and socio-economic conditions across the Himalayan terrain. Key actors and their roles are outlined below.

3.1 Uttarakhand Jal Sansthan

- Uttarakhand Jal Sansthan (UJS) is the primary state-level body responsible for water supply, sewerage, and sanitation services across most parts of Uttarakhand. It was formed in 2002 by merging the earlier "Garhwal Jal Sansthan" and "Kumaon Jal Sansthan."
- Its jurisdiction spans the entire state (excluding cantonment areas) and its administrative structure comprises a Chairman (the Secretary of the state's Pey Jal Vibhag), a Managing Director, a Chief General Manager, finance and planning secretaries, and representatives of local bodies (including Nagar Nigam or municipal corporations).
- UJS is mandated to plan, promote, and execute water supply schemes; operate sewerage and wastewater treatment where feasible; and ensure "wholesome water" supply.
- It also oversees the extension of services, including new connections, billing, and maintenance, through zonal and division-level offices spread across the state.

3.2 Watershed Management Directorate, Uttarakhand

- The Watershed Management Directorate (WMD) is mandated with the sustainable management of watershed areas across the state. It emphasizes integrated watershed

development, soil and moisture conservation, water harvesting, groundwater recharge, flood protection, and catchment protection.

- Given Uttarakhand's fragility with steep slopes, mountain catchments, numerous springs, and glacial-fed streams, WMD plays a vital role in preserving hydrological integrity, preventing soil erosion and landslides, maintaining forest-water linkages, and safeguarding natural drainage systems.
- The Directorate also acts as a nodal body to coordinate among communities, local stakeholders, and other government departments for participatory watershed programs, and to disseminate guidelines and data regarding watershed conservation.

3.3 Uttarakhand Rural Water Supply & Sanitation Project

- Uttarakhand Rural Water Supply & Sanitation Project, under the banner "Swajal Uttarakhand," was implemented to improve rural water supply and sanitation services on a sector-wide, decentralized basis.
- The programme involves state-level agencies (e.g., UJS) working alongside Project Management Units and local self-governments (Gram Panchayats and Panchayati Raj Institutions), aligning with decentralized, demand-responsive service delivery.
- The objective is to ensure functional household tap connections (FHTC), provide safe drinking water to rural households, schools, health centers, and community buildings; cover water supply in drought-prone or quality-affected habitations; and improve sanitation coverage.

3.4 External and Supporting Institutions: Hydro-scientific & Regulatory Agencies

- Central Ground Water Board, under the national government, regularly assesses groundwater resources across Uttarakhand including plains, foothills, and Himalayan terrain (where groundwater often emerges as springs). The 2023 "Dynamic Ground Water Resources of Uttarakhand" report highlights the diverse hydrogeological conditions, decline in groundwater levels due to over-extraction, contamination, and increased demand driven by urbanization, population growth, and changing land use. The Uttarakhand Pollution Control Board is a statutory body responsible for pollution control, granting consents for wastewater discharge, monitoring water quality, and enforcing regulatory standards within the national pollution control framework.
- Research and capacity-building institutions, such as the National Institute of Hydrology (NIH), headquartered in Roorkee, play a critical role by conducting hydrological studies, groundwater modeling, flood/drought assessments, watershed hydrology, and impact analysis under a changing climate, providing a scientific basis for policy formulation and resource management.

These institutions regulatory, scientific, and environmental provide necessary data, oversight, and technical backup to the water governance system, though their effectiveness often depends on coordination with state and local bodies.

3.5 Institutional Challenges: Overlaps, Fragmentation and Coordination Gaps

- Despite the multiplicity of institutions, recent studies, for example, in the Western Himalayas have documented that institutional overlapping and lack of clear boundaries among agencies lead to governance inefficiencies (Singh et al., 2024). In one such

study, the authors noted that overlapping mandates and unclear institutional boundaries can hinder effective water management at the local scale.

- The existence of many agencies supply agencies (UJS), watershed management (WMD), rural water supply project agencies (Swajal), groundwater oversight (CGWB), pollution control, irrigation/water resources departments, and local self-governments often leads to fragmented authority, duplication of efforts, and confusion about responsibility for springs, streams, groundwater recharge, supply, quality, and sanitation.
- Particularly in mountainous zones, where water sources are often small springs or local streams, standard administrative divisions (urban/rural, supply zones, watershed boundaries) may not align well with natural hydrological units. This misalignment complicates effective governance, monitoring, and sustainable management, especially under climate change pressures (glacial melt, erratic rainfall, landslides).
- Moreover, local bodies (Gram Panchayats, community institutions) often lack the technical and financial capacity to manage complex water and sanitation systems or watershed interventions. Without effective decentralization, capacity building, and community participation, many policy objectives remain unmet.

Conclusion

Uttarakhand's water governance institutions cover a broad range of functions from water supply and sanitation to watershed protection, groundwater monitoring, pollution control, and scientific research. Bodies such as UJS and Watershed Management Directorate, Uttarakhand (WMD-UK) enable both centralized oversight and decentralized, local-level action, offering a flexible structure adapted to the state's complex Himalayan environment.

However, this multiplicity of agencies also brings significant challenges. Overlapping mandates, unclear institutional boundaries, and lack of coordination make it difficult to ensure holistic water security integrating quantity, quality, conservation, and supply. Moreover, in many remote or mountainous areas, weak infrastructure, limited resources, and inadequate community-level governance further hinder effective implementation. Hydrological realities (springs, glacial-fed streams, seasonal flows) often do not align with administrative boundaries, resulting in gaps in regulation and management.

In short, while Uttarakhand's institutional design offers considerable potential combining ecosystem-aware governance with both state-level oversight and local governance realizing sustainable water management requires clearer mandates, stronger coordination, improved capacity in remote areas, and alignment of institutions with actual hydrological and ecological realities.

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