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INDIGENOUS PRACTICE OF WATER GOVERNANCE AMONG THE MIZO COMMUNITY IN JAMPUI HILLS, TRIPURA

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ABSTRACT----------

Indigenous systems of water governance have long shaped relationships between communities and their environments in the hill regions of Northeast India, where springs are the main source of water for daily livelihoods. In the Jampui Hills of Tripura, the Mizo community has maintained distinctive ways of governing springs and water resources through customary institutions, shared labour, cultural norms, and indigenous ecological knowledge. This paper explores how indigenous governance of water functions among the Mizo of Jampui Hills, paying attention to everyday practices through which access, care, and responsibility are organised at the community level.

Drawing on secondary literature, ethnographic writings on Mizo society, and selected government and policy documents, the paper begins by situating indigenous water governance within the ecological and hydrological setting of the Jampui Hills. It highlights the dependence of local communities on spring-based water systems and examines indigenous understandings of springs, including knowledge of seasonal flows, recharge patterns, and the protection of surrounding catchment areas. Such knowledge continues to guide everyday practices of water use and conservation.

At the heart of indigenous water governance in Jampui Hills are village-level Mizo institutions and customary authorities that oversee the collective management of springs. Access to water, maintenance of sources, and the resolution of disputes are regulated through shared norms, moral expectations, and cultural beliefs, including taboos against pollution and misuse. Springs are thus treated as communal resources rather than as privately owned assets. Hnatlang (regular collective labour), organised within the village, plays a crucial role in cleaning, protecting, and sustaining water sources, reinforcing a strong sense of shared responsibility.

The paper also considers how recent changes in land use and livelihoods, particularly the gradual shift from shifting cultivation to horticulture and other commercial practices, have affected local water systems and increased pressure on springs. These changes are further complicated by climate variability and deforestation, which have altered rainfall patterns and contributed to the drying of once-perennial springs. While various development initiatives have been introduced to address emerging water shortages, indigenous practices of governance continue to play a central role in everyday water management in the Jampui Hills.

The paper argues that indigenous governance of water among the Mizo represents a resilient and context-specific approach to water management, rooted in long-standing social relations, cultural values, and ecological knowledge. By giving importance to indigenous practices and perspectives, the study contributes to wider discussions on water governance, commons management, and indigenous knowledge systems. It also highlights the importance of recognising and strengthening community-based approaches to water governance in ecologically fragile hill regions such as Tripura.

KEYWORDS: *Indigenous Water Governance, Springs, Commons Management, Mizo Community, Jampui Hills, Tripura, Customary Institutions, Collective Labour, Traditional Ecological Knowledge----------*

1. INTRODUCTION

Water governance in mountain regions presents distinctive challenges that conventional state-centric approaches often fail to address adequately. In the hill regions of Northeast India, where springs constitute the primary source of water for domestic use, agriculture, and cultural practices, communities have developed systems of water governance that operate outside formal state frameworks.[1] These indigenous governance systems embody centuries of accumulated

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ecological knowledge, social organisation, and cultural values adapted to specific hydrological and topographical conditions.

Jampui Hills of North Tripura district provide a compelling case for examining indigenous water governance among the Mizo community. Rising to approximately 3,000 feet above sea level and often called the "Eternal Hills of Spring," Jampui Hills represent the highest hill range in Tripura.[2] The region experiences a tropical monsoon climate with heavy rainfall between June and September, averaging 2,000 to 2,500 mm annually.[3] Despite this apparent water abundance, the hill communities increasingly face seasonal water scarcity, particularly during the post-monsoon months. This paradox of water scarcity in a water-abundant region highlights the critical importance of understanding how indigenous governance systems manage spring-based water resources.

Indigenous water governance systems differ fundamentally from state-managed water infrastructure in their underlying principles and operational logic. While modern water governance emphasises technical efficiency, centralised control, and commodification, indigenous systems prioritise reciprocal relationships, collective responsibility, and the sacred nature of water.[4] Indigenous water governance principles emphasise that water is a sacred gift requiring human care and protection in a reciprocal relationship where water meets present and future needs of all living beings.[5] These contrasting worldviews have profound implications for how water is accessed, managed, and conserved at the community level.

The Mizo community in Jampui Hills maintains customary institutions and practices that govern springs as common resources. Village councils, traditional authorities, and collective labour arrangements form the institutional architecture through which water access, maintenance, and conservation are organised. Cultural norms, including taboos against pollution and moral obligations toward water sources, reinforce these institutional mechanisms. Therefore, indigenous ecological knowledge guides practical decisions about spring protection, catchment area management, and sustainable water use patterns.

However, indigenous water governance in Jampui Hills now operates within a context of accelerating change. Climate variability has altered rainfall patterns and spring discharge rates across Northeast India.[6] Rising temperatures, increased rainfall intensity, reduced temporal spread of rainfall, and marked decline in winter rain have contributed to dying springs across the Indian Himalayan Region.[7] Simultaneously, livelihood transitions from shifting cultivation (*jhum*) to commercial horticulture have transformed land use patterns and increased pressure on water resources. Development interventions by state agencies and non-governmental organisations introduce new governance arrangements that sometimes complement but often complicate existing indigenous systems.

This paper examines how indigenous governance of springs functions among the Mizo community in Jampui Hills, how it responds to contemporary pressures, and what implications emerge for sustainable and socially inclusive water governance in ecologically fragile hill regions. The study contributes to broader scholarly discussions on commons management, indigenous knowledge systems, and polycentric governance by documenting a specific case of community-based water governance that has sustained itself over generations while adapting to changing conditions.

2. THEORETICAL FRAMEWORK: INDIGENOUS GOVERNANCE AND THE COMMONS

2.1. Elinor Ostrom and the Governance of Common-Pool Resources

Understanding indigenous water governance in Jampui Hills requires engaging with theoretical frameworks developed for analysing common-pool resources. Elinor Ostrom's pioneering work challenged the prevailing assumption that common resources inevitably face depletion through overuse which is referred to as "tragedy of the commons".[8] Through extensive empirical research across diverse contexts, Ostrom demonstrated that communities successfully govern common-pool resources when certain institutional conditions are met.

Ostrom identified design principles characteristic of long-enduring common-pool resource institutions: clearly defined boundaries; congruence between appropriation and provision rules and local conditions; collective-choice arrangements; monitoring; graduated sanctions; conflict-resolution mechanisms; minimal recognition of rights to organise; and nested enterprises for larger systems.[9] These principles provide an analytical framework for examining how the Mizo community governs springs in Jampui Hills.

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Central to Ostrom's framework is the concept of polycentric governance – a system with multiple centres of semi-autonomous decision-making that interact to address collective action problems.[10] Polycentric governance allows for diversified approaches, enabling adaptive, learning, and scattered governance at different levels.[11] This conceptualisation resonates with indigenous governance systems that typically involve overlapping authorities, flexible rules, and adaptive capacity responding to local conditions rather than rigid bureaucratic hierarchies.

Springs in Jampui Hills function as common-pool resources exhibiting both subtractability (one person's use reduces availability for others) and difficulty of exclusion (preventing access is costly). These characteristics create potential for conflicts over access and sustainability challenges from overuse. Indigenous governance institutions address these challenges through mechanisms that regulate access, organise collective maintenance, monitor use patterns, and resolve disputes – which are precisely the functions Ostrom identified as essential for successful commons governance.

2.2. Indigenous Water Governance: Principles and Practices

While Ostrom's framework provides valuable analytical tools, indigenous water governance operates according to distinctive principles that extend beyond instrumental resource management. Recent scholarship on indigenous water governance emphasises several core principles that distinguish it from dominant colonial or state-centric approaches.[12] First, indigenous water governance treats water as sacred rather than merely utilitarian. Water is understood as a gift from the creator that demands reciprocal care.[13] This spiritual dimension imbues water management with moral obligations that transcend economic calculations. Among the Mizo, traditional beliefs also associate springs with spirits.[14]

Second, indigenous governance emphasises relational rather than proprietary approaches to water. Springs are not "owned" by individuals but belong to the community, with rights and responsibilities collectively shared by the community. This relational approach contrasts sharply with modern water rights regimes that treat water as property subject to individual ownership and transfer.

Third, indigenous governance integrates water management within broader cultural, social, and ecological systems rather than treating it as a separate technical domain. Water governance intertwines with agricultural cycles, seasonal festivals, kinship obligations, and land management practices. The Mizo festival of *Chapchar Kut*, celebrated in March after the arduous work of *jhum* farming, exemplifies this integration of water, agriculture, and cultural life.[15]

Fourth, indigenous governance relies heavily on intergenerational transmission of ecological knowledge. Understanding of spring behaviour, catchment protection, seasonal variations, and sustainable use patterns is accumulated over generations through observation, practice, and oral tradition. This knowledge base differs from scientific hydrology in its grounding in specific places and long-term observation rather than generalised principles.
Fifth, indigenous governance centres community participation and collective decision-making rather than expert-driven or bureaucratic management. Authority resides in village councils and traditional leaders who make decisions through consultation and consensus rather than hierarchical command. This participatory approach ensures that governance rules remain contextually appropriate and socially legitimate.

2.3. Polycentric and Adaptive Governance for Water Commons

The intersection of Ostrom's commons theory with indigenous governance principles points toward polycentric and adaptive governance as a productive framework for understanding water management in Jampui Hills. Polycentric governance acknowledges that effective natural resource management often involves multiple authorities operating at different scales, with overlapping jurisdictions and interconnected decision-making processes.[16]

In the context of indigenous water governance, polycentricity manifests in the coexistence of village-level customary institutions, district-level administrative bodies, state water agencies, and non-governmental development organisations. Each operates with distinct authority, rules, and objectives. However, their interactions shape actual water governance outcomes. Understanding this complexity requires moving beyond simplistic dichotomies of "traditional" versus "modern" or "state" versus "community" governance.

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Adaptive governance emphasises the capacity of governance systems to respond to change, learn from experience, and adjust rules and practices based on evolving conditions.[17] This adaptive capacity proves particularly crucial in the context of climate change, and livelihood transitions affecting water availability in Jampui Hills.

Recent research on indigenous water governance networks highlights how indigenous communities strategically engage with multiple governance forums while maintaining distinct knowledge systems and management approaches.[18] This strategic positioning at the "confluence" of different governance streams allows communities to access resources, influence policy, and protect their water rights.

2.4. Challenges and Tensions in Indigenous Water Governance

While celebrating the effectiveness of indigenous governance systems, scholarly literature also identifies persistent challenges. Colonial legacies of dispossession, exclusion, and marginalisation continue to undermine indigenous peoples' rights and responsibilities to water.[19] State-centric governance frameworks routinely override indigenous authority, impose external rules, and appropriate water resources without adequate consultation or compensation.

Development interventions sometimes disrupt indigenous governance systems by introducing new authorities, changing incentive structures, or undermining traditional knowledge. Technical management approaches that prioritise engineering solutions over social institutions may inadvertently weaken collective action mechanisms. Recognition of indigenous water rights in formal legal frameworks remains uneven, with many national water governance systems failing to adequately protect indigenous authority over customary water sources.[20]

Climate change and environmental degradation pose existential threats to spring-based water systems that indigenous governance cannot address through community-level action alone. As springs dry up, indigenous knowledge and collective labour become insufficient without broader watershed protection, reforestation, and climate adaptation measures requiring resources and authority beyond village-level institutions.

These challenges suggest that sustainable water governance in regions like Jampui Hills requires neither abandoning indigenous systems in favour of state management nor romanticising indigenous governance as sufficient on its own. Rather, the challenge lies in developing genuinely collaborative arrangements that respect indigenous authority, incorporate indigenous knowledge, and provide necessary support without displacing indigenous community-based governance.

3. CONTEXTUALISING WATER GOVERNANCE IN NORTHEAST INDIA AND TRIPURA

3.1. The Hydrological Paradox of Northeast India

Northeast India presents a striking hydrological paradox. The region experiences abundant rainfall but faces increasing water scarcity, particularly in hill areas during post-monsoon seasons. This paradox stems from the specific characteristics of mountain hydrology, climate patterns, and the critical role of springs in regional water systems.

The northeastern region receives some of the highest rainfall in India, with certain areas exceeding 10,000 mm annually. Yet this apparent abundance masks seasonal and spatial variability. Rainfall concentrates in the monsoon months (May to September), leaving prolonged dry periods when surface water sources diminish rapidly. The mountainous terrain means that rainfall quickly runs off steep slopes rather than infiltrating to recharge groundwater. Sandy soils in valley areas have low water retention capacity, exacerbating water availability challenges.[21]

Springs constitute the hydrological lifeline of hill communities across Northeast India. In Sikkim, over 94% of villages depend on mountain springs; in Meghalaya, Mizoram, and Manipur, the proportions are 55.7%, 54.6%, and 54.4% respectively; in Nagaland and Arunachal Pradesh, 44.7% and 37.3% of villages rely on springs.[22] These springs contribute substantially to the base flow of large Himalayan rivers – like the Brahmaputra – more than glaciers, ice, and snow contribute.[23] Mountain springs thus affect not only hill communities directly dependent on them but also downstream populations in plains regions.

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3.2. Spring Systems Under Stress: Climate Change and Human-Induced Changes

The drying of springs across Northeast India has emerged as a critical challenge with multiple interacting causes. Climate change manifests in altered rainfall patterns: increased intensity but reduced temporal spread, marked decline in winter rain, and rising temperatures.[24] These changes affect recharge patterns, with less water infiltrating to aquifers during shorter, more intense rainfall events.

Human-induced changes compound climate impacts. Deforestation removes vegetation cover that facilitates infiltration and protects catchment areas. Land use changes, particularly conversion of traditional *jhum* cultivation to permanent agriculture or commercial horticulture, alter surface and subsurface water flows. Unregulated construction and road building in hill areas disrupt natural drainage patterns and damage catchment zones. Population growth increases water demand while simultaneously expanding settlements into ecologically sensitive areas.

A 2022 study by the Central Ground Water Board on spring systems in Jampui Hills documented these pressures specifically in the research area.[25] The study identified declining discharge rates in several springs, drying of seasonal springs, and increased vulnerability of spring-dependent communities to water problem. Springs that once flowed year-round now cease during dry seasons, forcing communities to develop alternative strategies or suffer acute water shortages.

The problem extends beyond immediate water scarcity to affect agricultural productivity, health outcomes, and social relations. Water scarcity during critical agricultural periods constrains crop production. Women and children, who typically bear responsibility for water collection, face increased labour burdens traveling longer distances to water sources. Competition over diminishing water resources generates conflicts within and between villages. Development agencies and state governments struggle to respond effectively to rapidly evolving water challenges.

3.3. The Geography and Ecology of Jampui Hills

Jampui Hills form the highest hill range in Tripura, reaching elevations of approximately 3,000 feet (900 metres) above sea level. Located in North Tripura district, the hills stretch in a north-south orientation, creating a distinctive landscape of ridges, valleys, and slopes covered with dense forests.

Over half the area remains under forest cover, including tropical evergreen and moist deciduous forests. Vegetation includes bamboo, cane, and diverse medicinal plants. The moderate elevation creates a temperate microclimate often described as perpetual spring, making the area suitable for horticultural crops, particularly oranges. Jampui Hills produces significant quantities of oranges, at one time even securing first position at the National Agriculture Fair conducted by All India Citrus Show Committee.[26]

The hydrological system of Jampui Hills consists of numerous springs emerging from hillsides, feeding into small streams that eventually join larger rivers including the Longai, and Deo rivers. These rivers are rain-fed and seasonal, with flow varying substantially between monsoon and dry seasons.[27] Springs emerge where underground aquifers intersect the surface, typically on slopes or at the base of hills. The geological structure of weathered rock and soil layers creates natural storage and filtration systems that regulate spring discharge.

Settlement patterns in Jampui Hills follow ridge-top and upper-slope locations, with villages positioned to access springs for water supply while maintaining proximity to agricultural lands. Villages typically range from 50 to 300 households, organised according to Mizo kinship and clan structures. Each village maintains a defined territory including residential areas, agricultural lands, forests, and crucially, springs that fall within customary boundaries.

3.4. The Mizo Community in Jampui Hills: History and Social Organisation

The Mizo people in Jampui Hills are part of the broader Mizo ethnic group predominantly inhabiting the neighbouring state of Mizoram. Historical migration patterns brought Mizo communities into Jampui Hills during the 19th and early 20th centuries, establishing settlements that maintained cultural continuity with Mizoram while adapting to the specific conditions of Tripura.[28]

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Mizo society traditionally organised around village-based polities with hereditary chiefs (*lal*) wielding administrative and judicial authority. The chief allocated land, settled disputes, organised collective labour, and maintained relations with neighbouring villages. Below the chief, councils of elders and young men's organisations performed various social functions. This hierarchical yet participatory structure enabled collective action while maintaining social cohesion.

Traditionally, Mizo livelihoods centred on shifting cultivation (*jhum*), hunting, and forest product gathering. *Jhum* involves clearing forest patches, burning vegetation, cultivating crops for 2-3 years, then leaving land fallow for 7-10 years to regenerate. This land use system shaped settlement patterns, social organisation, and relationships with natural resources including water. The annual *jhum* cycle structured community labour, with festivals like *Chapchar Kut* marking transitions in the agricultural calendar.

In recent decades, government policies promoting sedentary agriculture, combined with population pressure and market integration, have driven transitions away from *jhum* toward permanent cultivation, particularly horticulture. Orange and areca nut cultivations have become economically significant in Jampui Hills, providing cash income but also changing land use patterns and water demand. Some households now engage in wage labour, government employment, or commercial activities, diversifying livelihoods beyond subsistence agriculture.

Contemporary Mizo communities in Jampui Hills thus navigate multiple identities and institutional contexts. They maintain cultural distinctiveness through language, customary practices, and social organisation while participating in state administrative structures, market economies, and development programmes. This positioning between tradition and modernity, autonomy and integration, shapes how water governance operates in practice.

4. INDIGENOUS WATER GOVERNANCE INSTITUTIONS AND PRACTICES

4.1. Customary Institutions and Village-Level Authorities

Indigenous water governance in Jampui Hills operates primarily through village-level institutions rooted in Mizo customary law and social organisation. The village council functions as the central decision-making body for water and other community resources. The council meets periodically to address community issues, resolve disputes, plan collective activities, and maintain social order.

For water governance specifically, the village council exercises several key functions. First, it determines access rights to springs within village territory. Springs are classified as communal property belonging collectively to the village rather than to individual households. All village members hold rights to access and use spring water for domestic purposes, drinking, cooking, washing, and small-scale agriculture. The council may impose restrictions during water scarcity, prioritising drinking water over other uses and allocating water according to household needs.

Second, the council organises collective labour (*hnatlang*) for spring maintenance, cleaning, and protection. In Mizo tradition, *hnatlang* represents obligatory community work, typically involving all male household heads and sometimes female members for specific tasks. The council sets dates for *hnatlang* related to water sources, usually before monsoon season and during post-monsoon months when springs require cleaning. Participation is mandatory, with fines or social sanctions imposed on non-participants.

Third, the council establishes and enforces rules governing water use. These rules include prohibitions against polluting springs, requirements to maintain cleanliness around water sources, restrictions on destructive activities near catchment areas, and norms for equitable water collection. The council may designate specific springs for particular uses (drinking water versus washing).

Fourth, the council serves as the primary forum for resolving water-related disputes. Conflicts may arise over access rights, alleged pollution, unequal distribution, or damage to water infrastructure. The council hears grievances, investigates circumstances, and renders decisions based on customary norms, precedent, and community consensus. This dispute resolution mechanism operates informally but effectively, with social pressure ensuring compliance with council decisions.

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Beyond the village council, other institutions contribute to water governance. The Young Mizo Association (YMA), a pan-Mizo civic organisation with village branches, mobilises youth for community development activities including spring protection and water infrastructure construction.[29] Women's organisations increasingly participate in water management, particularly regarding hygiene and domestic water use.

4.2. Indigenous Ecological Knowledge of Springs

Indigenous water governance in Jampui Hills rests on accumulated ecological knowledge passed intergenerationally through observation, practice, and oral tradition. This knowledge encompasses understanding of spring behaviour, catchment area ecology, seasonal patterns, and sustainable use practices.

Village elders possess detailed knowledge of individual springs, including their locations, historical discharge rates, seasonal variations, and reliability. Communities recognise that different springs require different management approaches based on their hydrological characteristics.

Indigenous knowledge identifies critical relationships between springs and their catchment areas. Community members understand that springs emerge from underground aquifers recharged by rainfall infiltrating upslope forest areas. Protection of catchment forests thus becomes essential for spring sustainability. Traditional land use practices like *jhum* cultivation incorporated fallow periods allowing forest regeneration, inadvertently maintaining catchment area integrity.

Seasonal knowledge guides water use patterns. Communities know when springs flow most abundantly (monsoon months) and when discharge decreases (post-monsoon dry season). Traditional practices adjusted water use intensity according to seasonal availability, with conservation measures intensifying during dry periods. This temporal adjustment represents adaptive management based on long-term observation of spring behaviour.

Communities also maintain knowledge of indicators for spring health. Changes in water taste, colour, flow rate, or temperature signal potential problems requiring investigation. Appearance of certain plant species around springs indicates good water quality, while other species suggest degradation. This observational knowledge enables early detection of spring stress, allowing timely intervention.

Traditional beliefs and taboos reinforce spring protection. Certain springs were considered sacred sites where disturbing vegetation, defecating, or loud behaviour would offend spirits and potentially cause springs to dry up. While animistic beliefs have largely diminished, residual reverence for water sources persists in modified forms. Elders emphasise moral obligations to protect springs for future generations, framing conservation in terms of stewardship responsibility rather than purely utilitarian resource management.

However, indigenous ecological knowledge faces erosion as younger generations pursue education, migrate for employment, or adopt lifestyles less dependent on traditional resource management. Climate change introduces variability that exceeds the range of historical experience encoded in indigenous knowledge, challenging its predictive capacity. Development interventions sometimes dismiss indigenous knowledge as "unscientific," undermining its legitimacy and discouraging intergenerational transmission.

4.3. Collective Labour and Spring Maintenance

Collective labour of the community locally called *hnatlang* is a common practice among the Mizo community. In indigenous water governance, *hnatlang* manifests communal ownership and shared norms into concrete maintenance practices that sustain spring functionality. The *hnatlang* system organises community labour through village-level coordination based on principles of reciprocity and mutual obligation.

Spring maintenance activities include several tasks performed collectively. Cleaning involves removing debris, leaves, and sediment from spring sites, clearing vegetation that might contaminate water, and ensuring unobstructed water flow. This typically occurs before monsoon season to prepare for heavy rains and during post-monsoon months when springs need clearing after seasonal growth. Construction and repair work includes building or maintaining structures

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for water collection, installing or repairing pipes for water distribution, constructing storage tanks, and creating protective barriers around spring sites.

Catchment area protection involves restricting cutting of trees in recharge zones, and controlling grazing or cultivation that might damage catchment integrity. Path maintenance ensures access routes to springs remain passable for water collection, particularly important during monsoons when paths erode.

The village council designates dates for *hnatlang*, typically coordinating with agricultural cycles and weather patterns. Work notification occurs through village announcements. Normally, adult males from each household typically participate. Women participate in certain tasks like cleaning but are often exempted from heavy work.

Work organisation involves dividing labour according to tasks and capabilities. The council may appoint coordinators to supervise specific work groups, ensuring efficiency and quality. Tools and materials are provided collectively, either from community resources or through contributions from each household. Work typically begins early morning and continues until tasks complete.

The *hnatlang* system extends beyond practical labour to serve important social functions. Collective work reinforces community solidarity and shared identity. It provides opportunities for socialising, information exchange, and strengthening social bonds. Elders transmit knowledge to younger participants during work activities, teaching spring protection techniques and community history. The system embodies principles of equity and reciprocity – everyone contributes labour and everyone benefits from maintained water sources.

4.4. Cultural Norms, Taboos, and Water Ethics

Indigenous water governance operates not merely through institutions and labour but through cultural norms and moral frameworks that shape attitudes, behaviours, and values regarding water. These norms create social cohesion around water governance while defining boundaries of acceptable conduct.

Central to Mizo water ethics is the principle that springs belong to the community collectively rather than individuals. This communal ownership carries reciprocal obligations: the community must maintain and protect springs, while individuals must use water responsibly without depleting or polluting sources. Selfish or wasteful behaviour violates community norms and attracts social disapproval.

Respect for elders' authority regarding water management represents another core norm. When elders or council members establish rules, make decisions, or organise collective action, compliance demonstrates proper social conduct. Challenging elder authority regarding water governance often risks social marginalisation. This hierarchical yet consultative approach maintains order while allowing community input through proper channels.

Norms of mutual assistance operate in water access. Households facing difficulty collecting water – due to illness, elderly members, or other constraints – receive help from neighbours or the community. Denying water to those in need violates community solidarity principles. During water scarcity, equitable sharing takes precedence over individual accumulation.

Traditional taboos reinforced spring protection. Prohibitions included - no defecating near springs; no washing dirty clothes at spring sites; no cutting trees or disturbing vegetation in spring catchment areas; no loud or disruptive behaviour at springs. Certain taboos persist as hygiene practices or environmental conservation norms.

Gender norms shape water governance participation. Women primarily bear responsibility for domestic water collection, transporting water from springs to households daily. This places women intimately familiar with spring conditions, water quality, and access challenges.

Contemporary challenges to traditional norms arise from multiple sources. Education and exposure to external values lead some young people to question customary practices. Market integration prioritises individual economic gain over

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communal obligations. Development discourse emphasising "rights" rather than "responsibilities" shifts ethical frameworks.

Despite these pressures, cultural norms retain significant influence over water governance behaviour in Jampui Hills. Community social cohesion, limited population mobility, and continued functioning of traditional institutions maintain normative frameworks even as they slowly evolve. The challenge lies in adapting cultural norms to contemporary conditions without losing the ethical foundations that sustain collective water governance.

5. PRESSURES AND TRANSFORMATIONS IN INDIGENOUS WATER GOVERNANCE

5.1. Livelihood Transitions and Changing Water Demands

Livelihood transformations in Jampui Hills over recent decades have profoundly affected water governance systems. The gradual shift away from traditional *jhum* cultivation toward permanent agriculture and commercial horticulture represents the most significant change.

Traditional *jhum* cultivation followed extensive land use patterns with long fallow periods allowing forest regeneration. This system had relatively low water intensity, relying primarily on rainfall with minimal irrigation. The dispersed settlement pattern associated with *jhum* meant water demand from any single spring remained modest. Multiple families might use the same spring, but demand rarely exceeded natural recharge rates.

Government policies from the 1970s onward actively discouraged *jhum* cultivation, labelling it environmentally destructive and economically inefficient. Development programmes promoted settled agriculture, particularly cash crop cultivation. In Jampui Hills, these policies converged with market opportunities for orange and other citrus fruits, and areca nut. Orange and areca nut cultivations expanded significantly, transforming landscapes from *jhum* fields and regenerating forests to permanent orchards.

Population growth compounds increased per-capita water demand. Improved health care, reduced mortality, and family formation patterns have increased village populations, though out-migration for education and employment partially offsets this growth. More households mean more people drawing from the same springs, increasing extraction rates. Larger villages also generate more wastewater and potential pollution, stressing spring water quality.

Changing consumption patterns associated with economic development further increase water demand. Improved housing standards include water facilities like bathrooms and toilets requiring more water than traditional practices. Adoption of water-intensive technologies like washing machines increases domestic consumption. Livestock rearing for commercial purposes rather than subsistence requires water for animals.

These livelihood and demographic changes create temporal mismatches between water supply and demand. Dry season scarcity becomes more acute and prolonged. Indigenous governance mechanisms developed for managing traditional demand patterns prove inadequate due to these factors.

5.2. Climate Variability and Spring Vulnerability

Climate change manifests in Jampui Hills through altered rainfall patterns, increased temperature, and greater climate variability, all affecting spring hydrology and water governance.

Long-term climate data for Northeast India documents significant changes since the mid-20th century. Overall rainfall has not necessarily decreased, but temporal distribution has shifted dramatically. Rainfall increasingly concentrates in intense events during monsoon months, with longer dry spells between rainfall episodes.[30] This change in rainfall intensity and temporal spread reduces aquifer recharge efficiency, as rapid surface runoff from intense rainfall infiltrates less effectively than gentle, prolonged rain.

Winter rainfall, historically important for spring recharge in post-monsoon months, has markedly declined across the region. This decline extends dry season length and reduces spring discharge during critical periods. Some springs that historically flowed perennially now cease flowing during extended dry spells, forcing communities to seek alternative water sources or suffer scarcity.

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Rising temperatures increase evapotranspiration rates, resulting in more rainfall lost to atmosphere rather than infiltrating to recharge aquifers. Temperature increases also affect vegetation patterns in catchment areas, potentially altering infiltration. Warmer conditions also increase water demand for human consumption and agriculture.

Climate variability – year-to-year unpredictability in rainfall timing, amount, and distribution – challenges indigenous governance systems relying on seasonal regularity. Traditional knowledge accumulated over generations assumes relatively stable climate patterns. When rainfall deviates from historical norms, predictive capacity of indigenous knowledge diminishes. Communities face uncertainty about when rains will arrive, how much will fall, and consequently when springs will flow strongly.

The Central Ground Water Board's 2022 study documented specific impacts on Jampui Hills springs. Several springs showed declining discharge rates compared to historical accounts. Some seasonal springs that once flowed for 8-9 months annually now flow only 5-6 months. Water quality in certain springs degraded, possibly due to reduced flushing during dry periods. Communities reported increased conflict over water access during dry seasons when springs fail to meet demand.[31]

Loss of forest litter and soil compaction on cleared land reduce water retention capacity. Degraded catchment areas generate more surface runoff and less groundwater recharge, directly affecting spring discharge. Indigenous communities recognise these changes and attribute them to both climate change and local environmental degradation. Elders report that springs that flowed strongly in their youth now barely trickle during dry months. They observe that deforestation has reduced rainfall and dried springs. However, their capacity to respond remains constrained by the scale of problems extending far beyond village-level control.

5.3. State Development Interventions and Hybrid Governance

Government agencies and development organisations have implemented various water supply programmes in Jampui Hills, introducing new governance arrangements that interact with indigenous institutions in complex ways.

The Jal Jeevan Mission, India's flagship rural water supply programme, aims to provide piped water connections to all rural households by specific target dates. In Jampui Hills, implementation involves constructing infrastructure to tap springs, install pipelines, build storage tanks, and extend household connections. This infrastructure brings water closer to homes, reducing women's labour burdens for water collection.

However, Jal Jeevan implementation sometimes bypasses indigenous governance institutions. External contractors construct infrastructure with limited community consultation. Springs selected for tapping may not align with customary allocations. Pipeline routes may traverse lands without proper community negotiation. Infrastructure ownership and maintenance responsibility remain ambiguous. When systems break down, neither traditional *hnatlang* mechanisms nor state maintenance reliably repair them.

Other development initiatives include spring rejuvenation programmes attempted by various agencies. These programmes typically involve hydrological surveys, catchment area treatment, tree plantation, and structural interventions like recharge pits. While potentially beneficial, these programmes operate through technical experts making decisions rather than community-driven processes. Local ecological knowledge receives minimal incorporation. Sustainability depends on external funding rather than community ownership.

NGO interventions, including partnerships with organisations like TATA Trusts, bring resources and technical expertise to water security initiatives.[32] These partnerships can strengthen indigenous governance by providing resources communities lack while respecting local authority. However, they also introduce new actors, priorities, and accountability structures that complicate governance. Projects may pursue donor priorities rather than community-identified needs.

Political dynamics further complicate hybrid governance. Elected officials seek visible development achievements during their tenures, sometimes prioritising infrastructure construction over sustainable governance strengthening.

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Political patronage may influence which villages receive development attention. State administrative boundaries sometimes divide traditional village territories, creating jurisdictional confusion over spring management.

The result is layered governance arrangements combining indigenous institutions, state administrative structures, development projects, and NGO interventions, each operating with different authority bases, rules, and objectives. These arrangements can be complementary when external actors respect indigenous governance and provide supportive resources. They become conflictual when external interventions undermine community authority, impose inappropriate rules, or create dependency.

Communities demonstrate agency in navigating these hybrid governance arrangements. Village councils negotiate with government officials to influence project implementation. They selectively adopt external resources while maintaining customary practices. They assert indigenous authority when state actions threaten community interests. This strategic engagement reflects resilience and adaptability of indigenous governance systems.

5.4. Emerging Adaptive Responses and Governance Innovations

Facing pressures from livelihood change, climate variability, and development interventions, Mizo communities in Jampui Hills demonstrate adaptive responses that innovate upon traditional governance while maintaining core principles.

Some villages have modified water allocation rules to address intensified demand. Priority hierarchies allocate scarce water first for drinking and cooking, then for essential domestic uses. This prioritisation maintains household water security while limiting commercial extraction that might deplete springs.

Water user scheduling emerges as another adaptation. Villages establish times when different households or village sections can collect water, preventing congestion at spring sites and ensuring equitable access. During severe scarcity, councils may impose collection limits per household, enforced through monitoring and sanctions. These adaptive rules demonstrate governance flexibility responding to changing conditions.

Some communities combine traditional collective labour with modern technologies and external resources. *Hnatlang* provides labour for infrastructure construction and maintenance, while development programmes contribute materials like pipes, cement, and tanks. This hybrid approach leverages traditional social capital while accessing resources beyond village capacity. Community ownership of infrastructure remains through *hnatlang* participation, even when materials come externally.

Community-led sustainability initiatives like spring-shed development partnership with Tata Trusts for springshed development in Jampui Hills has improved groundwater recharge in the area.[33] According to a news report,

> Under this project, almost all key springs across Jampui Hill range, carefully selected by geologists and engineers have been rejuvinated by digging of contour trenches, feeder canals and ponds which will serve as barrier structures that retain the rain water and feed these spring water sources. With this intervention, not only the existing springs will discharge more quantities of water but it is also expected that even the dry springs will come to life again, experts opined.[34]

This kind of initiative allows focused attention on water governance without displacing traditional authority.

Youth and women's increasing participation represents social innovation in governance. Education and changing gender norms enable younger people and women to contribute perspectives traditionally excluded from decision-making. Youth organisations mobilise for environmental conservation activities. Women's groups advocate for domestic water needs and hygiene improvements. These emerging voices enrich governance while potentially generating tensions with traditional hierarchical authority.

Engagement with research and policy processes allows communities to influence broader governance contexts affecting them. Participation in studies like the Central Ground Water Board assessment provides opportunities to document community conditions and priorities. Advocacy through civil society organisations brings indigenous voices into policy discussions. Strategic use of legal frameworks, like constitutional protections for tribal autonomy, defends community water rights against external appropriation.

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These adaptive responses demonstrate that indigenous governance systems are not static traditions but dynamic institutions capable of innovation. Adaptations retain core principles – communal ownership, collective responsibility, participatory decision-making – while adjusting operational rules and practices to changing contexts. The challenge lies in supporting this adaptive capacity without overwhelming indigenous institutions or appropriating their authority.

6. DISCUSSION: IMPLICATIONS FOR WATER GOVERNANCE THEORY AND PRACTICE

6.1. Indigenous Governance as Polycentric and Resilient Commons Management

Water governance among Mizo communities in Jampui Hills illustrates key principles of effective commons management identified by Ostrom while also extending theoretical understanding of polycentric governance in indigenous contexts.

Mizo water governance exhibits most of Ostrom's design principles for enduring common-pool resource institutions. Boundaries are clearly defined – villages demarcate territorial spring rights, and community membership determines access. Appropriation rules show congruence with local conditions – customary norms regulate extraction according to seasonal availability and household needs. Collective-choice arrangements operate through village councils where affected members participate in modifying rules. Monitoring occurs through community surveillance and designated coordinators during collective labour. Graduated sanctions address violations through social and material penalties. Conflict resolution mechanisms function through council deliberations. Minimal recognition exists through customary law and constitutional protections for tribal governance.

However, the indigenous governance system also reveals dimensions less emphasised in Ostrom's framework. The sacred and relational understanding of water introduces motivations beyond instrumental resource management. Moral obligations, spiritual reverence, and cultural values shape behaviour in ways not fully captured by rational choice models underlying commons theory. The integration of water governance within broader cultural systems means that water management cannot be isolated as a discrete technical domain.

The polycentric character of contemporary governance in Jampui Hills extends beyond indigenous institutions alone. Multiple overlapping authorities – customary councils, state agencies, development organisations, NGOs – interact to shape actual governance outcomes. This polycentricity creates both opportunities and challenges. Opportunities arise when different governance levels complement each other. Challenges emerge when authorities conflict.

The resilience of indigenous governance despite significant pressures demonstrates adaptive capacity central to sustainable commons management. Communities modify allocation rules, adopt new technologies, incorporate external resources, and engage strategically with state actors while maintaining institutional continuity. This resilience derives from deep social embeddedness, cultural legitimacy, and flexible operational rules even as core principles persist.

However, resilience has limits. Climate change and spring depletion exceed community-level adaptive capacity. When springs physically dry up, no amount of institutional innovation at village level can restore them without broader watershed restoration. External political and economic forces can overwhelm indigenous governance through land appropriation, resource extraction, or policy impositions. Resilience requires not just community adaptive capacity but also political recognition, legal protection, and supportive policy environments.

6.2. Indigenous Knowledge and Adaptive Management

Indigenous ecological knowledge about springs in Jampui Hills demonstrates sophisticated understanding accumulated through long-term observation and intergenerational transmission. This knowledge exhibits several characteristics distinguishing it from formal scientific knowledge while proving valuable for adaptive water management.

First, indigenous knowledge is place-based and contextually specific. It concerns particular springs in specific locations with unique hydrological characteristics. This specificity enables unique and dynamic management responding to local conditions rather than applying generic approaches. However, it also means indigenous knowledge may not easily transfer across locations or scales.

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Second, indigenous knowledge integrates multiple dimensions – ecological, hydrological, social, cultural – rather than disciplining into separate domains. Understanding of spring behaviour intertwines with land use practices, seasonal patterns, and cultural meanings. This holistic integration enables coordinated management across interconnected systems but may challenge modern expert frameworks preferring disciplinary specialisation.

Third, indigenous knowledge accumulates through long-term observation across generations, capturing variability and change over extended timeframes. Elders remember spring behaviour across decades, providing historical baselines against which to assess current changes. This temporal depth exceeds most scientific monitoring programmes. However, oral transmission risks knowledge loss when intergenerational learning breaks down.

Fourth, indigenous knowledge proves adaptive and experimental rather than fixed dogma. Communities adjust practices based on observed outcomes, incorporating new observations and techniques while maintaining core principles. This adaptive quality enables responses to gradual environmental change. However, rapid or unprecedented change may exceed the adaptive range of traditional knowledge.

The relationship between indigenous knowledge and scientific knowledge about spring hydrology need not be antagonistic. Indigenous observations of spring behaviour, catchment area relationships, and seasonal patterns can inform hydrological research by identifying relevant variables and providing long-term data. Scientific understanding of aquifer dynamics, climate impacts, and watershed processes can enhance indigenous management capacity.

However, power asymmetries typically favour scientific knowledge in policy and development contexts. Technical experts often dismiss indigenous knowledge as anecdotal, unscientific, or unreliable. Development interventions privilege engineering solutions over social-ecological approaches rooted in indigenous practice. This epistemic marginalisation not only wastes valuable knowledge but also undermines community authority and governance capacity.

Meaningful integration of indigenous knowledge requires institutional mechanisms ensuring respectful engagement. Community-based monitoring that documents indigenous observations in forms legible to scientific and policy audiences can bridge knowledge systems. Participatory research processes that involve indigenous knowledge holders as partners rather than subjects recognise their expertise. Policy frameworks that mandate indigenous consultation in water management decisions provide avenues for knowledge application.

6.3. Gender, Equity, and Participation in Water Governance

Gender dynamics in Mizo water governance reveal both inequities in traditional systems and emerging transformations toward more inclusive participation. Women's roles and experiences regarding water differ substantially from men's, yet formal governance authority has historically remained male-dominated.

Women primarily bear responsibility for domestic water collection, transporting water from springs to households daily. This labour-intensive task consumes time and energy, particularly when springs are distant or water heavy to carry. During water scarcity, women's burdens increase as they must travel farther or make more trips to collect sufficient water. Women develop intimate knowledge of spring conditions, water quality, and seasonal variations through daily interaction with water sources.

Despite this direct involvement and accumulated knowledge, women traditionally had limited voice in formal water governance decision-making. Village councils making allocation decisions, establishing rules, and organising collective labour consisted almost exclusively of men. Women's water-related concerns – domestic supply adequacy, convenience of access, hygiene needs – received secondary attention compared to agricultural and infrastructure priorities emphasised by male council members.

This gender inequity in governance authority despite gendered labour responsibilities reflects broader patriarchal structures in traditional Mizo society. However, several factors now contribute to gradual transformation. Education increasingly reaches girls, enabling informed participation in community discussions. Women's organisations provide forums for articulating gender-specific concerns and collective advocacy. Development agencies increasingly

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recognise women's central roles in water management and promote women's participation in water committees. Younger generations question traditional gender hierarchies, creating space for more equitable participation.

Beyond gender, equity concerns arise regarding wealth, age, and social status differentials within communities. Wealthier households may access private water sources or purchase water during scarcity, while poorer households depend entirely on communal springs. Younger adults may bear primary labour burdens while elders hold decision-making authority. These internal stratifications complicate assumptions about communities as homogeneous units with unified interests.

Inclusive water governance requires institutional mechanisms ensuring marginalised voices – women, youth, poorer households – can meaningfully participate in decision-making. Participatory approaches that actively solicit diverse perspectives rather than assuming traditional authorities represent all community interests prove essential. Therefore, equity in governance processes matters as much as equity in water access outcomes.

6.4. Policy Implications: Recognising and Supporting Indigenous Governance

The scenario of indigenous water governance in Jampui Hills suggests important implications for water policy in Northeast India and comparable regions globally.

First, policy frameworks should formally recognise indigenous water rights and governance authority. Current water legislation in India primarily operates through state-centric frameworks that grant government agencies authority over water resources, with limited recognition of indigenous or community rights. Constitutional protections for tribal self-governance provide potential legal foundations for indigenous water rights, but these remain underdeveloped in water-specific contexts. Explicit legal recognition of indigenous authority over customary water sources would protect community governance from external appropriation while providing secure foundations for sustainable management. Second, development interventions should adopt collaborative approaches that strengthen indigenous governance. Water supply programmes can work through existing customary institutions. Infrastructure projects can incorporate indigenous knowledge about spring selection, seasonal patterns, and management practices. Resources can support community-identified priorities. Participatory processes that engage communities as partners in design, implementation, and monitoring prove more sustainable than top-down delivery models.

Third, polycentric governance arrangements that coordinate across scales and authorities offer more promising approaches than either purely state-managed or purely community-managed systems. Indigenous institutions excel at local-level adaptive management but require support for challenges exceeding village capacity. State agencies and NGOs can provide technical expertise, financial resources, and coordination across villages while respecting indigenous authority over local operations.

Fourth, climate adaptation strategies must prioritise spring rejuvenation and watershed protection in hill regions dependent on spring-based water systems. Technical interventions addressing aquifer recharge, catchment area restoration, and spring infrastructure need scaling up with adequate funding. However, such interventions will only prove sustainable if indigenous communities participate centrally in planning and implementation.

Fifth, policy attention to livelihood transitions and their water implications proves necessary. As communities shift toward commercial agriculture, water demand patterns change in ways traditional governance systems struggle to regulate. Policy support for water-efficient agricultural technologies, alternative livelihoods reducing pressure on springs, and demand management mechanisms can reduce stress on water resources while respecting community economic aspirations.

Sixth, knowledge systems bridging indigenous and scientific understanding deserve investment. Collaborative research documenting indigenous ecological knowledge, community-based monitoring capturing spring conditions over time, and participatory processes developing locally appropriate management strategies can enrich both knowledge systems while supporting adaptive governance.

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Finally, addressing water governance in contexts of indigenous rights requires confronting colonial legacies and ongoing marginalisation. Indigenous peoples' exclusion from water governance, appropriation of their water resources, and dismissal of their knowledge systems constitute historical and ongoing injustices requiring remedy. Meaningful decolonisation of water governance demands redistributing authority, recognising indigenous sovereignty, and ensuring participation on indigenous communities' own terms rather than as token consultation.

7. CONCLUSION

Indigenous governance of water among the Mizo community in Jampui Hills demonstrates the viability and resilience of community-based commons management grounded in customary institutions, ecological knowledge, and cultural values. Through village councils, collective labour systems, and normative frameworks, Mizo communities have sustained spring-based water systems over generations despite minimal state support and significant contemporary pressures.

This governance system exhibits key characteristics of successful commons management identified in theoretical literature: clearly defined boundaries, participatory decision-making, monitoring and enforcement mechanisms, conflict resolution processes, and adaptive capacity responding to changing conditions. It operates according to indigenous principles treating water as sacred, emphasising reciprocal human-water relationships, integrating water management within broader social-ecological systems, and centering community participation.

However, indigenous water governance in Jampui Hills now faces unprecedented challenges from climate change, livelihood transitions, demographic pressures, and development interventions. Springs dry or decline in discharge due to altered rainfall patterns and degraded catchment areas. Intensified water demand from commercial agriculture and population growth exceeds traditional supply patterns. External development initiatives introduce new authorities and approaches that sometimes conflict with customary governance.

Communities demonstrate remarkable adaptive capacity, modifying allocation rules, adopting new technologies, forming specialised institutions, and engaging strategically with external actors while maintaining core governance principles. Yet adaptation has limits when biophysical changes exceed community-level control or when political-economic forces overwhelm indigenous authority.

Sustainable and equitable water governance in Jampui Hills and similar contexts requires neither abandoning indigenous systems in favour of state management nor romanticising indigenous governance as sufficient alone. Rather, it demands genuinely polycentric approaches that formally recognise indigenous water rights and governance authority, provide resources supporting community capacity, coordinate across scales for challenges exceeding local control, and respect indigenous knowledge and participation on communities' own terms.

The case of Mizo water governance contributes to broader scholarly and policy discussions on commons management, indigenous rights, and water governance transformation. It demonstrates that effective natural resource governance need not follow western state-centric or market-based models but can emerge from indigenous institutional traditions adapted to specific social-ecological contexts. It highlights the importance of recognising and strengthening community-based governance as essential components of sustainable water systems.

As climate change accelerates, as rural livelihoods transform, and as development pressures intensify across hill regions of South Asia and globally, the fate of indigenous water governance systems like those in Jampui Hills holds significance extending far beyond local communities. These systems embody centuries of accumulated wisdom about sustainable human-environment relationships. Their erosion represents not merely local resource management challenges but profound losses of alternative governance models desperately needed as humanity confronts converging ecological and social crises.

The Mizo community's continued commitment to collective spring governance, despite minimal recognition and mounting pressures, demonstrates both the resilience of indigenous institutions and the justice imperative of supporting rather than undermining them. Water governance policies recognising indigenous authority, respecting

indigenous knowledge, and providing collaborative support can enable these time-tested systems to continue sustaining both human communities and ecological integrity into uncertain futures.

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