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Legal and Policy Coherence in Nepal's Hydropower Sector: A Constitutional and Institutional Analysis

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Abstract

This qualitative study critically analyzes the coherence and effectiveness of Nepal's constitutional, legal, and policy frameworks governing hydropower development, emphasizing sustainability, social equity, and institutional accountability. Despite possessing an estimated 83,000 MW of theoretical hydropower potential, Nepal has utilized less than five percent due to fragmented governance, outdated legislation, and weak policy coordination. Employing a doctrinal legal research approach, the study examines constitutional mandates, statutory instruments, sectoral policies, and international environmental commitments to assess their alignment with national development objectives. The findings reveal a significant gap between constitutional principles of equitable resource distribution and the practical enforcement of environmental and social safeguards. Overlapping institutional mandates, insufficient coordination among agencies, limited public participation, and inadequate grievance mechanisms have undermined effective governance and justice for affected communities. Comparative insights from Bhutan and India demonstrate that coherent legal integration, transparent regulation, and participatory governance substantially enhance hydropower sustainability and social legitimacy. The study concludes that Nepal urgently requires comprehensive legal harmonization, particularly

through the formulation of an integrated Hydropower Act and the strengthening of environmental compliance and benefit sharing frameworks. Such reforms are essential to align economic growth with ecological integrity and social justice. Ultimately, the study aims to identify structural and institutional reforms necessary to transform hydropower into a cornerstone of Nepal's sustainable energy transition and inclusive national development.

Key words: hydropower governance, legal framework, environmental justice, policy coherence, sustainability.

Introduction

In the economic analysis of infrastructure projects, particularly large-scale hydropower, legal, policy, and regulatory frameworks play a pivotal role in shaping the distribution of costs and benefits across society and the state. A comprehensive evaluation of these frameworks is essential to ensure that feasibility studies, decision-making processes, and project implementation are equitable, transparent, and sustainable. In Nepal, such an evaluation must encompass constitutional mandates, sectoral policies, strategic development plans, statutory instruments, international commitments, and regulatory procedures that collectively influence hydropower planning, approval, implementation, and benefit-sharing.

Nepal, strategically located between India and China, possesses vast hydropower potential due to its steep altitudinal gradients and dense river networks. The theoretical hydropower capacity is estimated at 83,000 MW, of which about 43,000 MW is considered economically feasible (Shrestha, 1966). Despite this abundance, the country has developed less than 5% of its potential over more than a century of hydropower history (Panta, 2022). Nepal initiated electricity generation as early as 1911 with the Pharping Hydropower Plant preceding China and only shortly following India yet continues to rely heavily on electricity imports from

India, leaving it vulnerable to regional political and economic fluctuations (Adhikari, 2006).

The country's energy consumption profile further reflects this underutilization: traditional biomass and fossil fuels account for more than 90% of total energy use, while renewable sources, including hydropower, contribute barely 9% (Ministry of Finance [MoF], 2021). This dependency on non-renewable energy undermines environmental sustainability and national energy security, as starkly illustrated during the 2015 Indian blockade, which exposed Nepal's vulnerability to external disruptions (Shrestha et al., 2018). Consequently, hydropower development represents not merely an economic opportunity but a strategic necessity for achieving energy independence, fostering sustainable growth, and strengthening regional stability.

However, realizing this potential remains challenging. The sector faces multifaceted barriers including high capital costs, difficult terrain, policy fragmentation, weak institutional coordination, and inconsistent legal enforcement that collectively hinder project execution and equitable outcomes (Mishra & Aithal, 2022a, 2022b). These challenges point to a deeper governance problem rooted in incoherence between constitutional principles, outdated laws, and sector-specific policies. From a legal perspective, the central research issue is therefore: To what extent do Nepal's legal and policy frameworks for hydropower ensure coherent governance, effective implementation, and just outcomes for affected communities?

Accordingly, the objective of this study is to critically analyze Nepal's constitutional, legal, and policy frameworks governing hydropower development in order to assess their coherence, effectiveness, and implications for social and environmental justice. By examining institutional arrangements, regulatory consistency, and comparative regional experiences, the study seeks to identify structural reforms

necessary for transforming hydropower into a pillar of Nepal's sustainable and inclusive energy future.

Methodology

This study adopts a qualitative and doctrinal legal research methodology to critically examine Nepal's hydropower development through the lens of its legal, policy, and institutional frameworks. The doctrinal approach involves a systematic review and interpretation of legal instruments, including constitutional provisions, national legislation, sector-specific Acts, regulations, and international treaties relevant to hydropower governance. Complementing this, a policy analysis framework was employed to assess the coherence, effectiveness, and justice implications of key policy documents such as national energy plans and hydropower development strategies. Sources include peer-reviewed journal articles, government reports, official websites (e.g., the Ministry of Energy, Water Resources and Irrigation, the Department of Electricity Development, and the Nepal Electricity Authority), and other credible publications. Through qualitative content analysis, the study identifies and evaluates major themes such as legal and institutional coherence, technical and administrative capacity, and challenges in implementation. The inclusion of constitutional interpretation provides a foundational perspective on the state's obligations and policy direction concerning energy infrastructure. This combined methodology ensures a comprehensive and grounded understanding of hydropower regulation and governance in Nepal.

Literature Review

Hydropower development in Nepal holds significant strategic importance but is hampered by institutional fragmentation and an outdated legal-regulatory framework. Although the 2015 Constitution designates natural resources, including hydropower, as national property with an emphasis on equitable benefit-sharing, translating these principles into effective sectoral laws remains a challenge. Foundational statutes like the Electricity Act (1992), Water Resources Act (1992), and Hydropower

Development Policy (2001) are considered outdated and poorly synchronized, limiting their effectiveness in modern energy governance (Dhungel, 2016; Baral & Heinen, 2007). Regulatory overlaps among agencies such as the Department of Electricity Development, Nepal Electricity Authority, and Investment Board Nepal create procedural ambiguities that delay project approvals and complicate environmental compliance (Shrestha & Pandey, 2021).

Policy incoherence extends to weak coordination between national energy policies, federal and local governance, and international environmental commitments under the Paris Agreement and SDGs. Public participation and environmental justice mechanisms are inadequately integrated, often marginalizing project-affected communities who face insufficient consultation and compensation (Rai et al., 2020; Ojha et al., 2016). The lack of a unified institutional framework for monitoring and inter-agency coordination further undermines transparency and timely decision-making.

International experiences from Norway and Canada underscore the importance of coherent legal frameworks and inclusive stakeholder engagement in balancing hydropower development with social equity and environmental protection (Keskitalo et al., 2014; Bakker, 2007). Conversely, South and Southeast Asian countries like India and Laos struggle with fragmented governance and weak safeguards, leading to social conflicts and ecological harm (Middleton et al., 2019; Kale, 2014). Global institutions such as the World Bank and IEA advocate for streamlined laws, enhanced transparency, and benefit-sharing to foster sustainable hydropower development (World Bank, 2021; IEA, 2022). These insights highlight Nepal's urgent need to reform its hydropower governance, aligning legal mandates with strategic and inclusive development goals.

Constitutional provision of hydropower development of Nepal, 2015

The Constitution of Nepal (2015) incorporates several provisions aimed at ensuring social justice, equity, and the protection of marginalized communities. Article 18(3) under Part 3 guarantees the right to equality, while allowing for affirmative action measures to safeguard the interests of historically disadvantaged groups such as women, Dalits, Adivasis, Tharus, Khas Arya, and Madhesis. Article 25 affirms the property right and sets out conditions under which private land may be acquired for public purposes, including the requirement of fair compensation through appropriate legislation. Further, Article 39(4) prohibits the employment of children in factories, mines, or any hazardous occupations, reinforcing child protection measures. Article 40 addresses the rights of Dalits, mandating the state to enact laws to allocate land to landless Dalit families (Clause 5) and ensure housing for homeless Dalits (Clause 6). These constitutional mandates collectively underscore Nepal's commitment to inclusive development, social equity, and lawful resource management.

Policy and Legislative Provisions for Hydropower Projects

Nepal's abundant water resources and mountainous terrain offer significant hydropower potential, with approximately 42,000 MW considered technically and financially feasible out of a theoretical 83,000 MW capacity (GoN, 1992). Recognizing this potential, the Government of Nepal introduced the *Hydropower Development Policy, 1992*, to promote transparent, investment-friendly frameworks for both domestic use and export-oriented hydropower development. The policy emphasizes liberalization, private sector participation, and integrated water resource management to support national industrialization, rural electrification, and economic growth.

Despite the availability of resources, electricity generation remains low, with a large portion of the population lacking reliable energy access. The slow progress is attributed to weak infrastructure, limited investment, and

an underutilized private sector. The policy highlights the need for multipurpose water projects, equitable benefit-sharing, clarity in public-private partnerships, and alignment with international environmental and investment standards. It also advocates for strategic cooperation at the regional level to maximize benefits such as flood control, job creation, and environmental protection.

The 1992 policy, while groundbreaking at the time, has required periodic updates to incorporate emerging global energy trends, technologies, and sustainability commitments. These revisions aim to improve transparency, attract foreign investment, and transform hydropower into a key pillar of Nepal's long-term development strategy (Hydropower Development Policy, 1992).

National Policy, Legal and Administrative Framework

Nepal's hydropower and infrastructure development are governed not only by broad environmental laws, such as the *Environmental Protection Act (EPA)*, *Environmental Protection Regulations (EPR)*, and the *Nepal Environmental Policy and Action Plan (1993)*, but also by sector-specific legal frameworks. A key instrument is the *Policy on Land Acquisition, Resettlement, and Rehabilitation for Infrastructure Development Projects, 2015*, which outlines critical safeguards for project-affected persons (PAPs). The policy mandates that the livelihood of displaced households must be restored to at least pre-project conditions and requires meaningful consultations with vulnerable groups, including women, Dalits, Janajatis, the landless, and others.

It emphasizes land acquisition through negotiation, transparent compensation based on scientific valuation, and relocation near original residences unless the PAPs opt otherwise. In cases of total displacement, land-based compensation and access to project benefits, such as share allocations and subsidized services, are required. Additional assistance is mandated for housing, transportation, livelihood restoration, and

employment, especially for vulnerable groups. The policy also calls for an effective grievance redress mechanism and institutional oversight to ensure just implementation of compensation, resettlement, and rehabilitation measures (GoN, 2015).

In Nepal, several sectoral policies and strategic frameworks have been formulated to integrate environmental sustainability and biodiversity conservation into infrastructure and hydropower development. The Nepal Biodiversity Strategy and Action Plan 2014 emphasizes landscape-level planning (Section 5.1.1), conservation of habitats and species (5.1.4), and cross-sectoral coordination for biodiversity protection (5.1.8). It further mandates environmental assessments (IEE/EIA) to mitigate significant project-induced impacts on biodiversity (5.1.13), and highlights integrated coordination for protected area management (5.2.1.2) (GoN, 2014).

Similarly, the National Water Strategy 2002 stresses environmental sustainability, watershed management, and cost-effective hydropower production (Sections 4-5). The Hydropower Development Policy 2001 outlines responsibilities for environmental protection (5.7), impact mitigation (5.8), local employment (5.20), environmental flow maintenance, land acquisition, and rehabilitation of displaced communities (6.1), and hydropower project handover to the state (6.5) (GoN, 2001).

The Nepal Water Plan 2005 incorporates environmental management, including impact identification, mitigation, monitoring, and institutional mechanisms (Section D, Clause 6). The Forest Sector Policy 2015 supports land use planning and biodiversity preservation (Sections 7.1-7.2), while the Nepal Environmental Policy and Action Plan 1993 promotes natural resource stewardship, sustainable development, and institutional integration.

Foundational strategies such as the National Conservation Strategy (1988) emphasize the sustainable use of renewable resources and the protection

of biodiversity and ecosystem services. Complementing this, the Nature Conservation National Strategic Framework for Sustainable Development (2015–2030) and the National Wetlands Policy stress community participation in wetland identification, knowledge mobilization, and conservation planning (GoN, 1988; 1993; 2005; 2015).

National Land Use Policy

The National Land Use Policy, 2012 aims to optimize the use of available land resources based on their sustainable socio-economic and environmental potential. It sets forth key objectives including controlling unplanned urbanization and land fragmentation, classifying land according to its optimal use capacity, and ensuring a balanced integration of development with environmental protection. The policy also emphasizes the preservation of culturally, geographically, and historically significant areas, including religious and touristic sites (GoN, 2012).

In support of large infrastructure projects like hydropower, Nepal has established several legislative instruments. The Land Acquisition Act, 1977 provides the legal foundation for acquiring private land for public purposes, detailing procedures for compensation, public notice, grievance mechanisms, and appeal processes (Articles 4-25). The Guthi Corporation Act, 1967, as amended in 2010, governs Guthi lands, defining authority and responsibilities for management, use, tenancy rights, revenue collection, and compensation in the case of government acquisition (Articles 16-42).

The Environment Protection Rules, 1997, amended to align with modern environmental standards, lay out procedures for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA), including public hearings, approval processes, and provisions for affected parties' compensation (Rules 3-11, 45-47). The Forest Act, 1993, and Forest Rules, 1995, permit the use of forest areas for national priority projects, contingent upon full compensation and environmental compliance (Article 68; Rule 65).

Additional legal provisions include the Water Resources Regulation, 1993 (Rules 32-35) for land acquisition in water-related projects, the Ancient Monument Protection Act, 1956 to safeguard archaeological heritage (Articles 2, 3, 13, 17), and the Local Self-Governance Act, 1999, which authorizes local bodies to coordinate development activities and resolve compensation disputes (Articles 33, 47, 101, 115).

Labor Act 1991 (2048 BS)

Nepal's labor law prohibits child labor (Article 5) and imposes restrictions on minors and women. It outlines provisions on retrenchment (Article 12), working hours and pay (Articles 16-26), occupational safety (Article 27), worker welfare (Articles 37-44), construction site arrangements (Article 46), and labor dispute resolution (Articles 72-82). Nepal is also bound by international treaties it has ratified, including the Convention on the Rights of the Child (1990), CEDAW (1991), ILO Convention No. 169 (2007), and the Convention on the Rights of Persons with Disabilities (2010) (GoN, Labor Act; UN, 1966-2010).

Strategies of Hydropower Policy

The Hydropower Development Policy of Nepal emphasizes sustainable, inclusive, and investment-friendly hydropower growth. Its core objectives include expanding electricity access in rural areas, maximizing national water resource benefits, and promoting both domestic consumption and export. The policy encourages a joint approach public, private, and community-based to develop small to large-scale hydropower projects using transparent and competitive procedures. Development strategies focus on bilateral/regional cooperation, risk-sharing mechanisms, and river basin-based planning to ensure equitable and efficient resource use. The policy outlines specific implementation measures such as promoting Build-Own-Operate-Transfer (BOOT) models, ensuring environmental protection, resettlement of displaced people, encouraging internal capital mobilization, and reducing electricity leakage through technical and legal reforms. Emphasis is placed on rural electrification via small/micro-hydro

projects, creating local benefits, and offering reasonable tariffs to protect consumers. Institutional restructuring aims to promote competition and ensure quality, affordable electricity nationwide (Hydropower Development Policy, 2001).

Aligned with this, Nepal's 15th Plan (2019-2024) focuses on sustainable, reliable energy to enhance national prosperity. Key strategies include increasing generation through domestic and foreign investments, risk-sharing mechanisms, hedging against currency fluctuations, and boosting cross-border transmission. Power system reliability would be enhanced via infrastructure upgrades and disaster-resilient planning (NPC, 2019-2024).

The plan also aims to expand distribution networks, promote community electrification, implement smart metering, and support electric mobility with appropriate tariffs and charging infrastructure. Clean energy adoption, like electric stoves and rooftop solar, will replace fossil fuel reliance, supported by efficiency standards and net metering. To ensure energy security, a balanced energy mix will be pursued reservoir, semi-reservoir, and alternative sources, alongside regional power trade. Institutional reforms include unbundling NEA's operations, decentralizing distribution to provinces, and introducing policies on land acquisition, environmental compliance, and benefit-sharing (NPC, 2019-2024).

Environmental Safeguards and Compliance Mechanisms

Environmental safeguards in Nepal are primarily governed by the Environment Protection Rules (1997, revised 2019), which mandate Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for development projects to identify and mitigate potential environmental risks (GoN, 2019). While these mechanisms provide a legal framework for environmental compliance, enforcement faces challenges including limited sanctioning power, bureaucratic delays, and loopholes that reduce effectiveness (Shrestha & Dhakal, 2020).

Additionally, Nepal increasingly integrates climate change adaptation into environmental safeguards, recognizing vulnerabilities in hydropower and natural resources, and promoting resilient project design and ecosystem-based approaches to mitigate climate impacts (MoFE, 2021). Strengthening compliance and adaptive management remains essential for sustainable development.

Results and Discussion

Legal and policy coherence in Nepal's hydropower development is shaped by a dynamic interaction between constitutional mandates, sector-specific policies, and evolving regulatory frameworks. The Constitution of Nepal (2015) guarantees equitable access to natural resources and mandates environmental protection, forming the legal foundation for sectoral instruments such as the Hydropower Development Policy (2001) and the Land Acquisition Act (1977) (GoN, 2015; GoN, 2001; GoN, 1977). Despite this progressive constitutional vision, a significant disconnect persists between statutory frameworks and policy aspirations. Outdated acts, weak enforcement, and fragmented institutional mandates have resulted in inconsistent implementation and project delays, particularly in social and environmental safeguard mechanisms (NPC, 2019-2024). The absence of an integrated hydropower governance law has allowed overlapping mandates among agencies such as the Department of Electricity Development, Nepal Electricity Authority, and Investment Board Nepal to proliferate, creating procedural ambiguity and undermining accountability. This fragmentation has also constrained the coordination required among federal, provincial, and local governments under the post-2015 federal structure, weakening participatory decision-making and environmental compliance at the local level.

From a governance perspective, this institutional incoherence has far-reaching implications for equity, efficiency, and environmental sustainability. The constitutional intent of ensuring inclusive development and equitable benefit-sharing has often not translated into practice, with project-affected communities reporting inadequate compensation, limited

consultation, and weak grievance mechanisms (Rai et al., 2020; Ojha et al., 2016). The lack of strong regulatory monitoring further allows procedural discretion, which in turn opens space for political interference and elite capture in project approvals. Moreover, the environmental safeguard processes embedded in the Environment Protection Act and Rules, although robust on paper, are undermined by limited institutional capacity, insufficient technical expertise, and inadequate inter-agency coordination. This gap between de jure commitments and de facto practices reflects a broader challenge of governance reform how to transform normative frameworks into enforceable, transparent, and inclusive systems in practice.

Comparatively, other South Asian countries face similar coordination dilemmas, though the institutional outcomes vary. India's federal system, governed by the Electricity Act (2003), provides a relatively clear structure for private participation, environmental oversight, and grievance redressal (Government of India, 2003). However, the dual jurisdiction of state and central governments leads to regulatory fragmentation, especially in land acquisition and environmental clearance processes (Upadhyay & Srivastava, 2015). Bhutan, conversely, demonstrates the value of a unified and centralized model. Its Hydropower Policy (2008) and Renewable Natural Resources Policy integrate social equity, environmental safeguards, and economic objectives under a single institutional umbrella the Department of Hydropower and Power Systems (MoEA, 2008). This has enabled coherent planning, streamlined approval procedures, and consistent benefit-sharing mechanisms that align with its national philosophy of Gross National Happiness (Brooks & Dukpa, 2019). Pakistan's experience, led by WAPDA, highlights the consequences of weak federal-provincial coordination, where environmental protection remains secondary to project execution, leading to local resistance and project-level inefficiencies (ADB, 2020). Bangladesh, though possessing limited hydropower potential, demonstrates progress in integrating social and resettlement guidelines

into its broader energy governance structure, showing that procedural consistency can compensate for limited resources (Hasan et al., 2020).

These regional contrasts underscore that effective hydropower governance requires both institutional clarity and procedural inclusivity. Nepal's framework is normatively rich but procedurally weak, suggesting a need for structural reforms rather than entirely new policies. Establishing a comprehensive Hydropower Act that consolidates constitutional mandates, environmental provisions, and investment facilitation measures could serve as a unifying legal anchor. This Act should clarify institutional roles, define coordination mechanisms among federal, provincial, and local levels, and ensure enforceable rights for project-affected communities. Similarly, strengthening the Environmental Impact Assessment (EIA) regime by ensuring independent review panels, transparent disclosure, and post-project monitoring can bridge the gap between compliance and enforcement. Integrating climate resilience and adaptive management into project design, as emphasized under Nepal's commitments to the Paris Agreement and SDG 7 (Affordable and Clean Energy), is essential to future-proof the sector against increasing hydrological variability.

Furthermore, lessons from international experiences particularly Norway and Canada demonstrate that hydropower sustainability depends not only on legal clarity but also on institutional culture that values transparency, accountability, and stakeholder inclusion (Keskitalo et al., 2014; Bakker, 2007). For Nepal, fostering such a culture would require long-term capacity building, digitalization of licensing and monitoring systems, and performance-based evaluation of agencies. Emphasizing river basin level planning rather than project-level approvals would also ensure ecological balance and integrated water resource management. Importantly, benefit-sharing mechanisms should move beyond one-time compensation toward ongoing revenue-sharing, community equity participation, and livelihood programs that ensure long-term local ownership.

In overall terms, Nepal's hydropower sector stands at a critical juncture endowed with vast natural potential yet constrained by legal fragmentation and institutional inertia. Aligning policy frameworks with constitutional and global sustainability commitments demands a shift from procedural compliance to substantive governance reform. By harmonizing legislation, empowering local institutions, and embedding transparency and accountability throughout all stages of project development, Nepal can transform hydropower from a contested resource into a catalyst for inclusive, equitable, and sustainable national growth.

Conclusion

Nepal's hydropower development is underpinned by constitutional guarantees of equitable access to natural resources and environmental conservation. However, the effective realization of these commitments is hindered by several legal and policy shortcomings. Chief among these are the persistence of outdated legislative frameworks, such as the Land Acquisition Act and Forest Act, which have not kept pace with evolving policy directions. Inadequate enforcement of environmental and social safeguards, the absence of clearly defined benefit-sharing mechanisms, and the fragmentation of institutional roles further compound these challenges. Collectively, these factors contribute to regulatory inconsistencies, implementation delays, and insufficient protection for affected communities and ecological systems.

To address these gaps, Nepal must undertake comprehensive legal reforms. First, harmonization of existing laws with constitutional provisions and international standards is essential, particularly aligning the Land Acquisition Act with the Land Acquisition, Resettlement and Rehabilitation Policy (2015). Second, codifying benefit-sharing mechanisms in law would ensure equitable distribution of hydropower revenues to affected local communities. Third, the establishment of an independent environmental tribunal could enhance compliance monitoring, resolve disputes, and strengthen accountability in project

execution. Additionally, the consolidation of sectoral mandates under a unified regulatory framework would reduce institutional fragmentation and improve coordination.

Future research should explore the effectiveness of benefit-sharing models in similar federal or mountainous contexts (e.g., India, Bhutan), evaluate the institutional capacity of enforcement agencies, and assess how constitutional environmental rights are operationalized in hydropower governance. Comparative legal studies across South Asia could offer valuable insights into best practices for integrating environmental justice, participatory decision-making, and sustainable development principles into Nepal's hydropower policy and legal landscape.

Implication

The findings of this study underscore the critical need for Nepal to modernize and harmonize its legal and policy frameworks governing hydropower development. Despite Nepal's vast hydropower potential and supportive constitutional mandates, outdated legislation, institutional fragmentation, and weak enforcement mechanisms continue to hinder effective implementation. The lack of coherence between constitutional rights, environmental safeguards, and sectoral policies compromises equitable benefit-sharing and undermines public trust. Strengthening legal clarity, integrating environmental and social justice principles, and ensuring institutional accountability are essential for advancing sustainable hydropower development. Comparative insights from countries like Bhutan and India reveal that streamlined governance structures, robust regulatory mechanisms, and inclusive planning processes can significantly enhance policy effectiveness. For Nepal, aligning its legal instruments with international best practices and its own constitutional vision will not only improve project efficiency and investment climate but also promote energy security, environmental sustainability, and social equity.

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