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Environmental Justice in the Era of Green Energy: A Critical Appraisal of Hydropower Expansion in Indigenous Territories of Nepal

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Abstract

The accelerating global transition toward renewable energy has cast hydropower as a cornerstone of green development. Yet, in nations like Nepal, the drive for hydropower expansion in ecologically and culturally sensitive areas inhabited by indigenous peoples poses ethical and environmental dilemmas. This paper critically evaluates the hydropower boom in Nepal through the lens of environmental justice, focusing on the Upper Tamakoshi Hydropower Project (UTKHP) in Dolakha District. Anchored in social science perspectives on distributive, procedural, and recognition justice, and informed by eco-justice and environmentalism-of-the-poor frameworks this study examines how hydropower development transforms landscapes, livelihoods, and local governance. The analysis reveals that hydropower, while symbolically green, often reproduces colonial and capitalist hierarchies that marginalize indigenous Tamang communities. Drawing upon the works of and complementary global literature, this paper argues that Nepal's green-energy transition must be reimagined through an eco-justice lens that prioritizes inclusivity, cultural integrity, and equitable participation.

Keywords

Environmental Justice, Hydropower Development, Indigenous Communities, Climate Change, Green Energy Transition, Eco-Justice, Displacement and Resettlement, Compensation and Livelihoods, Procedural Justice, Recognition Justice, Environmental Sociology, Sustainable Development, South Asia

1. Introduction

Hydropower development occupies a central place in Nepal's sustainable-energy narrative. With an estimated 83,000 MW potential, the government envisions hydropower as the engine for economic growth, regional cooperation, and climate resilience (Pandey, 2021). More than 90 percent of Nepal's electricity already comes from hydropower, and major projects such as Upper Tamakoshi, Arun III, and Budhi Gandaki have become symbols of national pride and modernity. However, behind these nationalistic and developmental discourses lies a deeper question of justice—who benefits and who bears the cost of green energy expansion?

Environmental-justice perspectives contend that sustainability must go beyond carbon accounting to include fair distribution of costs and benefits, meaningful participation, and cultural recognition (Schlosberg, 2007). In the Nepali context, hydropower construction often takes place in territories inhabited by marginalized ethnic groups such as Tamang, Sherpa, Rai, and Magar. These communities face displacement, loss of ancestral lands, and erosion of social networks with limited compensation or voice in decision-making processes (Sharma & Sharma, 2025a). The Upper Tamakoshi Hydropower Project (456 MW)—Nepal's largest domestically financed project—epitomizes these contradictions. Situated in Dolakha District, a region with a rich indigenous Tamang cultural heritage, UTKHP demonstrates how environmental governance, market logics, and national identity intersect to shape local experiences of justice and injustice.

Globally, scholars have noted that hydropower's green image masks its socio-ecological externalities. Ahlers et al. (2015) argue that the framing of hydropower as clean energy ignores the dispossession it causes in frontier regions of the Global South. Similarly, Horowitz (2019) emphasizes how dams restructure social relations of power by privileging state and corporate actors over local communities. In South Asia, Sharma & Sharma (2025c) trace how hydropower expansion aligns with a broader pattern of neoliberal environmentalism that commodifies rivers while marginalizing traditional custodians of water resources. These critiques reveal that energy transitions are not merely technical shifts, but deeply political processes rooted in historical inequalities.

Nepal's hydropower policy discourse has evolved from a state-centric model toward public-private partnerships and transboundary investments. Yet, despite participatory rhetoric, local engagement remains largely tokenistic. The document cases where consultation meetings were held only after land acquisition decisions had been finalized, undermining procedural justice. Moreover, compensation frameworks often privilege landowners while neglecting landless laborers, women, and marginalized castes—failing the distributive dimension of justice (Bennett et al., 2018). Recognition justice, as articulated by Fraser (2000), requires valuing cultural and epistemic diversity; however, indigenous cosmologies and relationships with rivers are rarely acknowledged in hydropower planning.

This paper situates the UTKHP within these overlapping debates. Building upon the analytical insights of (Sharma & Sharma, 2025b, 2025d), it adopts a

multi-scalar approach that connects local experiences of displacement and resistance to national policy frameworks and regional hydropower geopolitics. The study aims to 1) critically assess distributive, procedural, and recognition injustices in UTKHP; 2) explore how indigenous Tamang communities negotiate and resist these injustices; and 3) advance an eco-justice framework for inclusive renewable-energy governance in Nepal. In doing so, it contributes to broader environmental-justice scholarship that interrogates the social foundations of green transitions (Temper et al., 2020).

The following sections elaborate the theoretical foundations, review existing literature, analyze the UTKHP case, and propose pathways toward equitable hydropower governance.

2. Theoretical and Conceptual Framework

2.1. Environmental Justice and Its Dimensions

The concept of environmental justice (EJ) emerged from grassroots struggles in the United States in the 1980s, primarily led by African American communities against environmental racism (Bullard, 1990). Over time, the framework has expanded globally to address inequities in environmental burdens and benefits. Schlosberg (2007) conceptualizes EJ as encompassing three dimensions—distributive, procedural, and recognition justice. Distributive justice concerns the fair allocation of environmental goods and bads; procedural justice ensures participatory and transparent decision-making; and recognition justice involves respect for cultural identities, knowledges, and worldviews.

In Nepal, these dimensions are deeply intertwined with caste, ethnicity, and geography. Hydropower projects, typically located in remote mountain regions, often displace communities that already face structural marginalization (Blaikie et al., 2019). The distributive outcomes of hydropower are skewed toward urban elites and corporate investors, while rural households experience livelihood disruption, resource loss, and uncertain compensation. Procedurally, project-affected people are rarely involved in feasibility assessments or environmental impact studies. Recognition justice, meanwhile, remains underdeveloped in policy discourse, as indigenous cosmologies—such as the Tamang belief in river spirits and ancestral guardianship of water—are excluded from modern environmental governance.

2.2. Eco-Justice and Environmentalism of the Poor

Eco-justice extends environmental justice by integrating ecological integrity with social equity. It emphasizes the intrinsic value of nature and critiques anthropocentric approaches to development. Eco-justice advocates for harmonious coexistence between humans and ecosystems, acknowledging that degradation of one inevitably harms the other. Within indigenous contexts, eco-justice resonates with holistic worldviews that see nature as kin rather than resource (Sharma & Sharma, 2025b). The indigenous struggles for eco-justice in Nepal are not merely about

compensation but about asserting relational ontologies—ways of being that resist commodification and dispossession.

Martinez-Alier (2002) coined the term "environmentalism of the poor" to describe resistance movements where marginalized communities defend their environments as a means of survival. This framework aptly describes indigenous mobilization against hydropower in Nepal. In Dolakha, Tamang groups have protested inadequate rehabilitation and demanded community benefit-sharing, embodying which is identified as eco-resistance—acts that blend cultural preservation with environmental defense. These actions challenge the hegemonic narratives of progress and modernity embedded in hydropower policy.

2.3. Methods and Research Design

This study adopts a qualitative case study design focusing on the Upper Tamakoshi Hydropower Project (UTKHP) in Dolakha District, Nepal. Data were collected through a triangulated approach including policy document analysis, semi-structured interviews with community members, and ethnographic observation in affected villages between 2023 and 2024. The analytical framework follows the three dimensions of environmental justice—distributive, procedural, and recognition justice—allowing systematic evaluation of local experiences of inequality and resistance. All data were coded thematically using iterative comparison to connect empirical findings with theoretical frameworks.

2.4. Decolonial Environmental Justice

Decolonial approaches to EJ emphasize historical continuities between colonial extraction and contemporary resource governance. Escobar (2015), Temper et al. (2020) argue that green energy projects often reproduce colonial logics by appropriating indigenous territories in the name of sustainability. In Nepal, hydropower's development discourse mirrors colonial modernization paradigms—portraying rural landscapes as empty spaces awaiting productive transformation (Bury et al., 2013). The UTKHP illustrates how state and corporate actors exercise epistemic dominance by privileging technocratic knowledge over indigenous experience.

The situate hydropower within South Asia's broader geopolitical contestations, where climate resilience and development rhetoric mask underlying asymmetries of power. Their analysis underscores the need for a decolonial energy justice that centers local epistemologies and autonomy. For indigenous Tamang communities, justice entails reclaiming both land and meaning—restoring cultural ties with rivers disrupted by the dam.

3. Literature Review

3.1. Hydropower Development and Environmental Justice in Nepal

Nepal's rapid hydropower expansion over the past three decades is widely portrayed as a pathway to energy sovereignty and climate resilience. Yet, beneath this

narrative lies a pattern of socio-ecological inequality that disproportionately affects rural and indigenous populations. Lord (2016) and Rigg et al. (2021) highlight how dam construction and associated infrastructure projects often displace subsistence-based communities, disrupting social cohesion and fragmenting landscapes. Hydropower projects, including the Upper Tamakoshi Hydropower Project (UTKHP), reflect the structural contradictions between national development goals and local well-being.

Sharma & Sharma (2025a) examine these contradictions through the lens of environmental justice, documenting how compensation mechanisms in Nepal privilege landowners and politically connected elites, leaving tenants and informal settlers uncompensated. The authors argue that the "green developmental state" model perpetuates distributive and procedural injustices under the guise of sustainable progress. Moreover, these injustices extend beyond economics—affecting cultural identity, ecological balance, and long-term social resilience.

Compensation frameworks for hydropower-affected communities in Nepal have been criticized for ignoring collective land tenure systems and the spiritual value of natural sites. Blaikie et al. (2019) refer to this as the "developmental dispossession paradox," wherein communities lose both tangible and intangible assets in exchange for minimal monetary restitution. Sharma & Sharma (2025b) build on this critique by introducing the concept of *eco-justice*—a holistic framework that situates justice within human-nature relationships. From this perspective, hydropower-induced displacement is not simply a loss of property but a disruption of ecological kinship and social meaning.

3.2. Governance, Participation, and Procedural Injustice

Nepal's Environmental Impact Assessment (EIA) processes are formally designed to incorporate public participation, yet, in practice, they often function as bureaucratic rituals (Khadka & Lamichhane, 2020; Paudel, 2019). Consultation meetings are frequently held post facto—after major decisions on project siting, design, and financing have been finalized. As a result, procedural justice is undermined, reducing community engagement to a symbolic exercise.

As detail several instances in the UTKHP case where affected Tamang households were consulted only during the compensation phase, with little input on ecological impacts or resettlement planning. Procedural justice requires that communities participate meaningfully throughout the project lifecycle—from feasibility studies to monitoring—but hydropower governance in Nepal remains dominated by centralized bureaucracies and private contractors.

This procedural gap reflects a broader structural issue. As Schlosberg (2007) notes, procedural justice is not simply about participation but about *influence*. Without legal or institutional mechanisms ensuring that local voices shape outcomes, participation risks becoming performative. In Nepal's hydropower sector, the technical framing of energy development as an engineering challenge sidelines socio-cultural expertise and indigenous knowledge systems.

3.3. Indigenous Rights, Recognition Justice, and Eco-Cultural Relations

Recognition justice is a central but often neglected dimension of environmental governance in Nepal. Following Fraser (2000) framework, recognition involves acknowledging and respecting diverse cultural identities and epistemologies. For indigenous Tamang, Sherpa, and Rai communities, rivers are not inert natural resources, but sacred entities embedded in cosmological and ritual practices. Dam construction, therefore, represents not just ecological disturbance but spiritual desecration.

Despite Nepal's ratification of ILO Convention 169 and constitutional provisions safeguarding indigenous rights, implementation has been weak. Upreti (2018) and Bhattachan (2019) document how the state's development apparatus continues to privilege technocratic expertise and economic valuation over indigenous governance systems. Sharma & Sharma (2025c) extend this critique through their notion of *environmentalism of the poor*, which captures the moral and ecological foundations of indigenous resistance movements.

In Dolakha District, Tamang communities affected by UTKHP have articulated their grievances through collective action—demanding fair compensation, employment quotas, and cultural recognition. These struggles echo those observed in other Himalayan regions, where dam-induced resettlements fracture social fabrics and weaken traditional authority structures. Recognition justice thus involves restoring both cultural dignity and agency within hydropower governance frameworks.

3.4. Climate Narratives and Green Developmentalism in Nepal

The global climate crisis has reframed hydropower as a form of renewable energy essential for carbon neutrality. However, this "green developmentalism" (Ahlers et al., 2015; Horowitz, 2019) often obscures the social and ecological costs of dam construction. In South Asia, climate adaptation rhetoric is frequently deployed to justify projects that replicate historical inequalities of resource control. In Nepal, climate-friendly discourse has legitimized large-scale interventions in mountain ecosystems while marginalizing the very communities most vulnerable to climate impacts.

Newell and Mulvaney (2013) describe this process as the neo liberalization of climate governance, where market mechanisms and private investment dominate environmental policy. Within Nepal's hydropower sector, this translates into public-private partnerships that prioritize financial efficiency over social accountability. The UTKHP, while celebrated as a "national pride project," demonstrates how developmental nationalism and climate narratives intersect to reinforce state-corporate power at the expense of local autonomy.

3.5. Regional Parallels: South Asian Comparative Perspectives

The patterns observed in Nepal's hydropower expansion resonate with broader

South Asian experiences, where large dams have historically been symbols of modernization and national integration. Across India, Bhutan, and Pakistan, similar justice dilemmas unfold—linking environmental transformation to questions of equity, sovereignty, and identity.

In India, the Narmada Valley and Tehri Dam movements exemplify the enduring conflicts between state-led development and local livelihoods. Baviskar (1995) and Dwivedi (2006) document how displaced Adivasi and farming communities framed their struggles as fights for both ecological survival and cultural recognition. Like the Tamang in Nepal, these communities highlight the disconnect between centralized energy planning and local needs. Sharma & Sharma (2025c) connect these cases to a regional narrative of *environmentalism of the poor*, emphasizing that South Asia's marginalized populations resist not merely for compensation but for justice and dignity.

Bhutan offers a contrasting yet instructive case. While often portrayed as a model of environmentally responsible governance, Bhutan's hydropower expansion—driven by export-oriented projects such as Punatsangchhu I and II—has generated socio-environmental tensions. Wangchuk (2020) notes that although hydropower revenues support national welfare, downstream communities experience ecological disruptions, including increased landslide risk and altered river flows. These patterns mirror the distributive injustice seen in Nepal's UTKHP, where benefits flow upward to state elites and urban consumers, while rural communities bear localized costs.

In Pakistan, the colonial legacy of river control persists in the Indus Basin. Abdul Hadi's (2018) study, *Dams and Destruction*: *The Impacts of Dams on Deltaic Communities in Sindh*, demonstrates how large-scale irrigation and hydropower projects—such as Tarbela and Kotri Barrage—have devastated deltaic livelihoods, salinized agricultural lands, and displaced fishing communities. Hadi frames these outcomes as forms of "hydraulic injustice," linking ecological degradation to political marginalization. Sharma & Sharma (2025d) incorporate this argument in their regional synthesis, suggesting that hydropower expansion across South Asia functions as a new phase of resource colonialism—extracting value from peripheral landscapes to sustain urban-industrial centers.

3.6. Cross-Border Environmental Governance and Climate-Induced Displacement

Hydropower development in the Himalayas is increasingly intertwined with transboundary water politics and climate adaptation policies. Rivers such as the Koshi, Gandaki, and Brahmaputra traverse multiple national boundaries, creating interdependence between Nepal, India, China, and Bhutan. In this context, regional energy cooperation is often promoted as a win-win strategy; however, cross-border projects raise new justice challenges related to sovereignty, risk-sharing, and accountability (Pomeranz, 2021).

Climate-induced displacement is another emerging dimension. As glacier-fed river regimes fluctuate due to warming temperatures, dam safety and water avail-

ability become uncertain. Communities relocated for hydropower may face compounded vulnerability from climate hazards in resettlement zones. As Sharma & Sharma (2025b) argue stress that eco-justice frameworks must integrate climate resilience and cultural continuity—ensuring that adaptation strategies do not reproduce displacement cycles.

3.7. Toward a Regional Eco-Justice Framework

The comparative literature underscores that South Asia's hydropower expansion is shaped by intertwined crises of inequality, governance, and climate change. Across cases—from Nepal's Upper Tamakoshi to India's Narmada, Bhutan's Punatsangchhu, and Pakistan's Indus Delta—the same structural dynamics recur centralized control, weak local participation, inadequate compensation, and the erasure of indigenous knowledge.

Building on eco-justice paradigm, an integrated regional framework for environmental justice should address four interlinked dimensions:

1) Distributive justice—ensuring fair allocation of hydropower benefits and burdens.

2) Procedural justice—guaranteeing meaningful participation and legal recourse for affected populations.

3) Recognition justice—acknowledging cultural diversity and indigenous ecological worldviews.

4) Ecological justice—maintaining the integrity of ecosystems as a precondition for human justice.

Such a framework demands decolonial rethinking of development, moving away from extractive modernization toward participatory sustainability. It aligns with Temper et al. (2020), who argue that environmental justice must extend beyond redistribution to include epistemic and relational dimensions of equity. In South Asia, where rivers sustain both livelihoods and cultural identities, hydropower governance must be rooted in respect for ecological limits and plural ways of knowing.

3.8. Synthesis and Implications for the Upper Tamakoshi Case

The reviewed scholarship reveals that the injustices surrounding Nepal's hydropower sector are not isolated incidents but part of a regional pattern of uneven development. The Upper Tamakoshi Hydropower Project, while framed as a domestic triumph, reproduces many of the contradictions observed in South Asian dam politics—elite capture of benefits, exclusionary decision-making, and disregard for indigenous cosmologies.

By integrating lessons from neighboring countries, this study situates UTKHP within a broader regional struggle for environmental justice. As achieving truly sustainable energy transitions in South Asia requires more than technological advancement—it necessitates moral, institutional, and epistemic transformation. The eco-justice approach, therefore, offers a promising pathway toward reconcil-

ing hydropower development with social equity and ecological care.

4. Case Study—The Upper Tamakoshi Hydropower Project (Dolakha District, Nepal)

4.1. Overview of the Project and Its Socio-Environmental Context

The Upper Tamakoshi Hydropower Project (UTKHP), situated in Dolakha District of central Nepal, represents the country's largest domestically financed energy infrastructure, with an installed capacity of 456 MW. Constructed along the Tamakoshi River, a tributary of the Koshi Basin, the project is often hailed as a symbol of national pride and energy self-reliance (Nepal Electricity Authority [NEA], 2022). However, beneath its developmental triumph lies a complex web of socio-environmental transformations that expose tensions between national growth narratives and localized justice concerns.

The project area lies within the ancestral territories of the Tamang and Thami indigenous communities, whose livelihoods traditionally depend on mixed agro-pastoralism, forest resources, and spiritual relationships with riverine ecosystems. The hydropower construction in this region reshaped both ecological landscapes and social relations—triggering displacement, loss of ancestral land, and disruption of sacred geographies.

While UTKHP was designed as a "people's project" with broad domestic ownership, its development trajectory reflects the uneven power dynamics embedded in Nepal's energy sector. The planning and financing structure favored Kathmandu-based elites and institutional investors, while local households bore the brunt of environmental degradation and livelihood insecurity (Lord, 2016; Rigg, Shrestha, & Turner, 2021).

4.2. Distributive Justice: Unequal Burdens and Benefits

Distributive justice in hydropower contexts refers to the equitable allocation of both costs and benefits arising from development interventions (Schlosberg, 2007). In the case of UTKHP, the distributional pattern reveals clear asymmetries. Although the project's electricity generation is expected to contribute significantly to national revenue, local communities in Lamabagar, Gongar, and Suri—who lost agricultural land, forest access, and grazing areas—received disproportionately low compensation relative to their losses.

Compensation mechanisms were based primarily on land ownership certificates, a system that systematically excluded marginalized groups such as landless laborers, tenants, and sharecroppers (Paudel, 2019). Moreover, monetary compensation failed to capture the non-economic values attached to land—such as spiritual identity, ecological interdependence, and ancestral continuity—central to Tamang worldviews (Bhattachan, 2019).

This mirrors broader regional patterns. In India's Tehri and Narmada projects, compensation frameworks similarly privileged property rights over cultural and ecological entitlements (Baviskar, 1995). In Bhutan, displaced households from

the Punatsangchhu project faced comparable inequities, with state-centric development models prioritizing national energy export revenue over community well-being (Ahlers et al., 2015). As Sharma & Sharma (2025b) interpret these injustices through an eco-justice lens, emphasizing that distributive fairness must encompass both material equity and ecological reciprocity.

Furthermore, downstream ecological disruptions—such as altered sedimentation, reduced fisheries, and increased landslide risks—have compounded distributive injustices. These effects are rarely quantified or compensated, reflecting a systemic undervaluation of ecosystem services in hydropower accounting (Temper, Del Bene, & Martinez-Alier, 2020). An illustrative example emerged during consultation meetings in 2019, when local women's representatives from Lamabagar were excluded from the minutes despite raising objections about compensation inequity. This exclusion demonstrates how formal participation can mask procedural injustice.

4.3. Procedural Justice: Participation, Voice, and Transparency

Procedural justice concerns the fairness of decision-making processes and the degree to which affected groups can meaningfully participate. Although Nepal's environmental regulations mandate public hearings and Environmental Impact Assessments (EIAs), multiple studies have revealed that consultations in UTKHP were largely perfunctory and conducted after key project decisions were already made (Khadka & Lamichhane, 2020).

Community leaders from Lamabagar reported that meetings were organized primarily to fulfill bureaucratic formalities, not to integrate local input into project design or mitigation planning. The project's EIA was dominated by technocratic assessments focusing on hydrological and engineering feasibility, with minimal attention to social and cultural dimensions (Paudel, 2019).

The lack of transparency regarding compensation allocation, benefit-sharing schemes, and environmental monitoring eroded trust between local residents and project authorities. In some instances, grievances escalated into protests, particularly when promised employment opportunities and infrastructure improvements failed to materialize (Rigg et al., 2021).

From a comparative standpoint, these procedural shortcomings resonate with regional hydropower experiences. In Pakistan's Tarbela and Diamer-Bhasha projects, local communities have similarly faced procedural exclusion, with consultation processes reduced to token participation (Hadi, 2018). In India, displaced communities around the Sardar Sarovar Dam mobilized through the *Narmada Bachao Andolan* to demand genuine participatory rights and post-resettlement accountability (Baviskar, 1995).

The procedural injustices in hydropower governance stem from the dominance of "expert-driven rationalities," where local epistemologies are marginalized in favor of technocratic modernism. Correcting this imbalance requires institutionalizing participatory environmental governance, where indigenous and community

voices are embedded in all stages—from feasibility studies to monitoring and post-project evaluation.

For instance, one of the Tamang ritual sites, the Gumba cremation ground along the Tamakoshi River, was submerged during dam impoundment, disrupting ancestral worship and seasonal rites tied to the river's spiritual identity. This tangible loss illustrates how recognition injustice extends beyond policy omission to cultural erasure.

4.4. Recognition Justice: Identity, Culture, and Ontological Pluralism

Recognition justice emphasizes respect for diverse cultural values, knowledge systems, and ways of relating to nature. For the Tamang and Thami communities of Dolakha, the Tamakoshi River is not merely a resource, but a living entity imbued with spiritual significance. Ritual sites along the riverbanks—used for ancestral offerings and seasonal festivals—embody collective memory and identity.

Hydropower construction, by submerging or restricting access to these sites, represents not only environmental degradation but also symbolic, such erasures are rarely acknowledged within state-led development discourse, which frames hydropower as a purely technical and economic domain.

Recognition deficits are widespread across South Asia. In Bhutan, the Drukpa identity has been privileged in state hydropower narratives, marginalizing local and transborder communities (Ahlers et al., 2015). In Pakistan's Sindh province, downstream deltaic communities perceive dam-induced water scarcity as an existential threat to their cultural survival (Hadi, 2018). Sharma & Sharma (2025c) link these struggles to the broader notion of environmentalism of the poor—where indigenous resistance arises from intertwined ecological, cultural, and moral imperatives.

Fraser (2000) and Schlosberg (2007) underscore that recognition justice is inseparable from distributive and procedural dimensions. In the UTKHP case, failure to recognize the Tamang's cultural relationship with the river led to policies that treated land and water merely as commodities, eroding social cohesion and intergenerational knowledge transmission.

4.5. Post-Resettlement Transformations and Livelihood Adaptation

Post-settlement dynamics in Dolakha illustrate the enduring social impacts of displacement. Many affected households were relocated to fragmented and less fertile areas, forcing shifts from subsistence agriculture to wage labor or small-scale trade. While project authorities promised improved infrastructure—roads, schools, and clinics—delivery has been inconsistent.

Women have faced heightened vulnerability due to disrupted kinship networks and increased dependency on male wage income (Bennett et al., 2018). The erosion of communal resource management institutions, such as *guthi* and *aama samuha* (mothers' groups), has further weakened traditional safety nets.

In response, some communities have sought to reassert agency through cultural revitalization movements and local environmental monitoring initiatives. (harma & Sharma (2025b) highlight these as expressions of eco-justice praxis, where local actors transform ecological loss into collective resilience and moral regeneration.

Comparatively, similar adaptive strategies have emerged across South Asia. In India's northeast, indigenous groups displaced by the Subansiri project established community-based watershed restoration programs. In Pakistan's Sindh Delta, fisherfolk unions have mobilized for ecological compensation and delta restoration (Hadi, 2018). These examples suggest that environmental justice extends beyond grievance—it embodies the creative reconstitution of social and ecological life in the aftermath of disruption.

4.6. Synthesis: Justice, Resilience, and the Green Energy Paradox

The Upper Tamakoshi case encapsulates the paradox of Nepal's "green energy transition." While the project contributes to national climate goals and economic modernization, it simultaneously reproduces old hierarchies of exclusion and marginalization. The justice triad distributive, procedural, and recognition offer a critical lens to expose these contradictions and guide transformative reform.

The rhetoric of renewable energy must be reconciled with principles of environmental justice and social inclusion. Otherwise, hydropower risks becoming a new frontier of ecological imperialism—green in appearance but socially extractive in substance. Achieving genuine sustainability in Nepal's hydropower sector requires pluralizing governance, embedding indigenous rights, and valuing ecosystems as living commons, not merely as instruments of state revenue.

As Abdul Hadi (2018) demonstrates in the Indus Delta context, justice in hydropower and water governance is inseparable from broader questions of democracy, equity, and intergenerational responsibility. The lessons from Dolakha thus resonate across the Himalayas: true green development must be both ecologically sustainable and socially emancipatory.

5. Discussion

5.1. Revisiting Environmental Justice in Nepal's Hydropower Trajectory

The discourse of environmental justice in Nepal's hydropower development has evolved from a technocratic debate about energy sufficiency to a socio-political dialogue about fairness, recognition, and participation. As this research reveals, the expansion of hydropower—exemplified by the Upper Tamakoshi Hydropower Project (UTKHEP)—embodies the tensions between green growth imperatives and the rights of local, largely Indigenous, communities. While national policy discourses frame hydropower as a "clean" path toward energy independence and climate mitigation (Ministry of Energy, Water Resources and Irrigation [MoEWRI], 2023), lived experiences among Tamang, Thami, and Sherpa populations in Dolakha demonstrate uneven burdens and benefits.

Hydropower in Nepal is not merely an energy agenda but a socio-ecological experiment that reconfigures land-water relations, identity, and belonging. The Upper Tamakoshi case shows that even when projects are domestically financed and labeled "national pride," distributive inequities persist—manifesting through compensation disparities, loss of common property resources, and exclusion from employment opportunities. These findings echo global critiques of green energy transitions as "green grabs" (Fairhead et al., 2012) in which environmental goals legitimize new forms of dispossession.

5.2. Distributive Justice: Equity and Compensation in Practice

Distributive justice concerns who gain and who loses from environmental decision-making (Schlosberg, 2007). In the UTKHEP, inequities arise at multiple scales. A majority of affected Tamang households received monetary compensation for land but little consideration for non-market losses—sacred landscapes, communal forests, and grazing rights. Field informants consistently reported that compensation rates favored titled landowners, leaving tenants and women with limited entitlements, consistent with the patterns as "monetization of cultural landscapes."

Beyond direct payments, distributive justice also involves access to project-related benefits—electricity, employment, and infrastructure. Despite being in Dolakha, only a fraction of the local population enjoys subsidized electricity or secure jobs within the project. Similar findings are reported across South Asia: in Bhutan's Punatsangchhu projects and India's Teesta Valley, nearby Indigenous and hill communities bear ecological costs while urban centers reap benefits (Lord, 2016; Ahlers et al., 2015). Such patterns reinforce regional "hydropower frontiers" where peripheries provide ecological space for national ambitions.

5.3. Procedural Justice: Participation, Transparency, and Power

Procedural justice addresses the fairness of decision-making processes—who participates, whose voices are heard, and whose knowledge counts (Fraser, 2000). In Nepal, the Environmental Impact Assessment (EIA) process is legally mandated to include public consultations, yet these are often tokenistic. Interviews in Lamabagar and Suri villages revealed that consultation meetings were conducted post-factum, with documents inaccessible in local languages. procedural gaps reproduce epistemic injustice, marginalizing Indigenous cosmologies and traditional ecological knowledge.

Furthermore, hydropower governance is highly centralized: the Nepal Electricity Authority and MoEWRI dominate planning, while local governments have limited influence. This structural imbalance echoes critiques from Hadi (2018) in Pakistan's Indus Delta, where upstream dam decisions excluded deltaic communities. Procedural inequity thus extends beyond project boundaries to inter-basin governance—how river systems are imagined and controlled by technocratic elites.

Nevertheless, some incremental progress is visible. The UTKHEP incorporated

social safeguard frameworks from the Asian Development Bank even though it is domestically funded, introducing grievance redress mechanisms and resettlement audits. However, field observations show that such mechanisms often lack enforcement capacity. Without accessible, culturally sensitive participation channels, procedural justice remains aspirational.

5.4. Recognition Justice: Culture, Identity, and Belonging

Recognition justice entails acknowledging diverse cultural values, identities, and worldviews (Schlosberg, 2007). In Dolakha, hydropower construction disrupted not only livelihoods but also sacred geographies central to Tamang cosmology. Mountain deities and ancestral waters are integral to communal identity, yet project design rarely integrates these dimensions. The erasure of such relational ontologies exemplifies what the term "spiritual displacement of the Indigenous."

Recognition failures are not unique to Nepal. Across South Asia, marginalized groups—from India's Lepcha in Sikkim to Pakistan's Sindhi fisherfolk—face symbolic invisibility in development planning (Hadi, 2018). The Upper Tamakoshi narrative mirrors these struggles: despite nominal inclusion, Indigenous voices are reframed within technocratic language. Recognition justice thus requires epistemic pluralism—valuing Indigenous environmental ethics alongside scientific hydrology.

5.5. Eco-Justice and Post-Settlement Transformations

Post-settlement realities in Lamabagar and Gongar highlight the long-term social ecology of hydropower. Resettled families encounter fragmented kin networks, commodified water resources, and altered gender roles. As observed, resettlement often leads to "slow violence"—a gradual erosion of community cohesion and ecological identity. Yet, new forms of agency also emerge women's cooperatives engage in forest restoration; youth associations demand community-based royalties.

These post-project transformations resonate with the concept of *eco-justice*—a framework integrating ecological sustainability with social equity (Temper et al., 2020). The Upper Tamakoshi experience shows that justice is not a one-time compensation event but an evolving process of renegotiating rights, access, and recognition within a changing landscape. Eco-justice therefore reframes compensation from a financial transaction to a restorative dialogue between humans and rivers.

5.6. Comparative Insights: Hydropower Frontiers in South Asia

Situating Nepal within South Asia reveals shared structural dynamics. In India's Northeast, the Subansiri and Siang projects face Indigenous resistance due to cultural desecration and inadequate consultation (Ahlers et al., 2015). In Bhutan, despite state ownership, hydropower revenues bypass local reinvestment, echoing Nepal's distributive asymmetries (Lord, 2016). Pakistan's Sindh Delta exemplifies downstream ecological injustice as upstream dams diminish flows vital for fisheries and mangroves (Hadi, 2018).

Across these cases, the language of "green energy" obscures political asymmetries. Regional integration initiatives such as the South Asia Subregional Economic Cooperation (SASEC) Energy Strategy promote trans-boundary power trade but rarely address cross-border justice (World Bank, 2023). Consequently, hydropower becomes both a climate adaptation strategy and a vector of new marginalizations. Nepal's Upper Tamakoshi thus serves as a microcosm of these broader patterns—a local struggle within a global green transition.

Unlike Fraser's triadic justice model—which centers redistribution, recognition, and representation—and decolonial environmentalism, which critiques historical power asymmetries, the eco-justice framework introduces a fourth dimension: restoration. This addition emphasizes repairing ecological and cultural damage caused by hydropower development, giving it unique analytical leverage.

5.7. Theoretical Implications for Environmental Justice in the Global South

The Upper Tamakoshi case contributes to theoretical debates by demonstrating that environmental justice in the Global South cannot be fully captured through Western distributive frameworks. Instead, it requires attention to *relational ontologies*, *multi-scalar governance*, and *historical inequalities*. Fraser's (2000) three-dimensional justice model—redistribution, recognition, and representation—offers a useful lens, but Nepal's context suggests a fourth dimension: *restoration*.

Sharma & Sharma (2025d) propose "eco-justice" as a Southern epistemology grounded in reciprocity between humans and ecosystems. This aligns with decolonial environmentalism (Temper et al., 2020) and post-development critiques (Escobar, 2015), which argue for reimagining development beyond growth metrics. In practice, integrating eco-justice means embedding Indigenous worldviews into hydropower governance—from basin-level planning to benefit-sharing mechanisms.

Moreover, climate change amplifies justice concerns. As glacial melt and monsoon variability reshape hydrology, hydropower risks become intertwined with adaptation imperatives. The challenge for Nepal and the broader Himalaya is to design energy transitions that are both low-carbon and socially inclusive. This calls for plural governance, where hydrologists, Indigenous elders, and local governments co-produce knowledge and policy.

Each principle directly responds to injustices identified in the UTKHP case—for example, Redistributive Equity addresses compensation shortfalls; Participatory Governance targets exclusion in consultation processes; Cultural Recognition remedies spiritual displacement; Restorative Ecology counters ecological degradation from dam construction; and Adaptive Learning ensures post-resettlement monitoring.

5.8. Toward a Transformative Justice Framework

Synthesizing the preceding analysis, a transformative justice framework for hydropower in Indigenous territories should integrate the following principles:

1) Redistributive Equity: Ensure transparent, livelihood-based compensation valuing both tangible and intangible losses.

2) Participatory Governance: Institutionalize free, prior, and informed consent (FPIC) and local veto rights in hydropower licensing.

3) Cultural Recognition: Safeguard sacred sites and customary institutions within environmental assessments.

4) Restorative Ecology: Promote ecological rehabilitation and community-led benefit-sharing.

5) Adaptive Learning: Monitor social-ecological changes post-settlement through participatory observatories.

6. Conclusion

6.1. Synthesis of Key Findings

This study has critically examined environmental justice in the context of hydropower expansion in Nepal, with the Upper Tamakoshi Hydropower Project (UTKHP) serving as a primary case study. Through the lenses of distributive, procedural, and recognition justice, the research demonstrates that large-scale hydropower development, while contributing to national energy security and low-carbon ambitions, simultaneously produces socio-environmental inequalities for Indigenous communities.

Distributivity, affected Tamang and Thami households experience disproportionate costs relative to benefits. While national grids and urban centers enjoy electricity and revenue, local communities face land loss, disrupted livelihoods, and ecological degradation. Procedurally, engagement mechanisms such as EIAs and public consultations are largely technocratic and exclusionary, providing minimal meaningful participation for those most impacted (Khadka & Lamichhane, 2020). Recognition justice is similarly deficient, as Indigenous cosmologies, sacred geographies, and traditional ecological knowledge are undervalued or ignored in project planning (Schlosberg, 2007).

These findings underscore a broader paradox: the transition to "green energy" in Nepal reproduces historical inequities while attempting to mitigate environmental harms. Similar patterns are evident in South Asia, including India's Subansiri and Teesta projects, Bhutan's Punatsangchhu hydropower, and Pakistan's Sindh Delta (Lord, 2016; Hadi, 2018; Ahlers et al., 2015). Thus, Nepal is not an isolated case but part of a regional "hydropower frontier," where energy ambitions intersect with social marginalization.

Post-settlement transformations reveal nuanced dynamics. Although resettled communities face fragmentation, emerging forms of agency—community forest restoration, women's cooperatives, and youth-led advocacy—illustrate pathways toward eco-justice praxis as (Temper et al., 2020). This highlights the ongoing, relational nature of justice: it is not fully achieved through compensation or legal frameworks alone but through sustained engagement, ecological stewardship, and cultural recognition.

6.2. Policy and Research Implications

6.2.1. Policy Implications

1) Equitable Compensation Frameworks: Monetary compensation alone is insufficient. Policies must account for intangible losses—cultural, spiritual, and ecological—and include gender-sensitive approaches to ensure women and marginalized groups receive fair restitution.

2) Participatory Governance: Free, prior, and informed consent (FPIC) should be institutionalized across all stages of hydropower development, including basin-level planning, EIAs, and post-construction monitoring. Local governments and Indigenous councils should have co-decision authority to prevent tokenistic consultations (Fraser, 2000).

3) Cultural Recognition and Sacred Site Protection: Environmental assessments must integrate Indigenous knowledge systems, respecting sacred landscapes and ritual practices. This can reduce conflicts and strengthen project legitimacy while honoring cultural heritage, as Schlosberg (2007) argues.

4) Restorative and Adaptive Measures: Post-resettlement programs should include ecosystem restoration, livelihood diversification, and climate-adaptive infrastructure. Participatory monitoring committees can track long-term ecological and social impacts, as Temper et al. (2020) argue.

5) Integration into Regional and Climate Policy: Nepal's hydropower planning should align with transboundary energy cooperation and climate adaptation strategies while explicitly addressing justice dimensions. Cross-border projects must include mechanisms for downstream communities' voices (Hadi, 2018; World Bank, 2023).

6.2.2. Research Implications

1) Longitudinal Social-Ecological Studies: There is a need for long-term monitoring of both environmental and social outcomes in hydropower zones to inform adaptive governance and evidence-based policy.

2) Comparative South Asian Analyses: Future research should explore how distributive, procedural, and recognition justice manifest across diverse hydropower contexts in South Asia, contributing to theory-building for "green energy justice" in the Global South.

3) Indigenous Knowledge Integration: Research should investigate methods for co-producing knowledge with Indigenous communities, embedding relational and spiritual understandings of rivers and landscapes into hydropower science and policy.

4) Eco-Justice Metrics: Scholars should develop frameworks for evaluating eco-justice outcomes—combining environmental integrity, social equity, and cultural recognition—to guide project assessment beyond economic and technical metrics.

6.3. Concluding Reflections

The Upper Tamakoshi Hydropower Project exemplifies the complex interplay between green energy imperatives and justice concerns in Indigenous territories.

While hydropower contributes to national climate goals and energy security, it simultaneously reproduces patterns of socio-environmental marginalization if justice dimensions are neglected.

This research affirms that environmental justice in the Global South requires a plural, relational, and context-specific approach. Distributive fairness must go beyond land and monetary compensation, procedural justice must ensure authentic participation, and recognition must value Indigenous ontologies and ecological ethics. Moreover, eco-justice provides a transformative lens for integrating sustainability with social emancipation.

Ultimately, the transition to green energy cannot be deemed successful if it undermines the rights, identities, and livelihoods of those who live alongside the rivers that power it. Nepal's hydropower frontier offers both cautionary lessons and inspiration: just energy transitions are possible, but only when governance, policy, and community action converge to produce inclusive, equitable, and culturally attuned development.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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