Climate-Ecosystem-Society Nexus in the Hindu Kush Himalaya and South Asia

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Article

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Abstract

This paper examines the nexus of climate change, ecosystem services and socio-economic transformation in the ecologically sensitive and socio-economically vulnerable Hindu Kush Himalaya (HKH) and South Asia. It explores challenges like glacial retreat, biodiversity loss, pollution and deforestation and their impacts on agriculture, water security, displacement and inequalities. It underscores the limitations of development trajectories that neglect ecological sustainability and advocates for Forest and Ecosystem Restoration (FER) as a strategic solution. Exploring community-led initiatives and policy frameworks, the paper reviews and synthesizes a wide range of environmental trends, socio-economic impacts and potential solutions; highlighting the potential of integrated ecosystem management and regional cooperation to foster climate resilience, conserve biodiversity and enhance livelihoods. Ultimately, it proposes key policy recommendations centred on integrated approaches, trans-boundary governance, equitable restoration programs, capacity building and cross-sector policy alignment to achieve long-term environmental and socio-economic sustainability in the region.

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1. Introduction

The Hindu Kush Himalaya (HKH) region, stretching across eight countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan – represents one of the world's most ecologically diverse and environmentally sensitive mountain systems. As the source of ten major river systems that support the livelihoods of around 2 billion people downstream, the HKH plays a critical role in the socio-economic and environmental stability of South Asia (Singh et al., 2011; Wester et al., 2019). However, the region is facing unprecedented environmental challenges arising from climate change, biodiversity loss, deforestation and increasing pollution, which collectively threaten its ecological integrity and the well-being of its inhabitants.

Over the past century, the HKH region has experienced a higher rate of warming than the global average, leading to rapid glacial retreat, increased frequency of extreme weather events and altered hydrological cycles (Bolch et al., 2012; Krishnan et al., 2019). These environmental changes are occurring in parallel with accelerated development, urban expansion and infrastructural growth, often in ecologically unsustainable ways. The intersection of these forces has placed enormous strain on ecosystem services – such as biodiversity habitats, soil fertility, water regulation and carbon sequestration – which underpin both rural and urban livelihoods across the region (Xu et al., 2009).

The loss of ecosystem services in the HKH and broader South Asia has severe socio-economic implications, particularly for marginalized and indigenous communities who depend heavily on natural resources for their sustenance and cultural identity (Gentle & Maraseni, 2012). Moreover, development trajectories in the region have often failed to adequately integrate ecological resilience into planning frameworks, resulting in trade-offs that exacerbate inequality, vulnerability and environmental degradation. For instance, hydropower projects and road infrastructure may boost

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short-term economic outputs but lead to displacement of local communities, habitat fragmentation and forest loss.

In response to these converging crises, there is a growing consensus on the need for ecosystem-based approaches that promote climate resilience while supporting sustainable livelihoods. Forest and landscape restoration, in particular, has emerged as a strategic intervention with the potential to simultaneously address multiple challenges ranging from carbon sequestration and biodiversity conservation to poverty alleviation and disaster risk reduction (Chazdon et al., 2017; FAO & UNEP, 2020). Initiatives such as Bhutan's integrated conservation-development programs and community forestry in Nepal demonstrate the viability of participatory, bottom-up approaches that align ecological goals with human development (Ojha, 2006).

This paper examines the interlinked environmental and socio-economic dynamics of South Asia and the HKH, focusing on major ecological trends, their livelihood impacts, and the potential of Forest and Ecosystem Restoration (FER) as a strategic response. Due to the interdependencies between ecological systems and human well-being, this paper underscores urgent adoption of cross-sector and regionally coordinated responses that are inclusive, equitable and environmentally sustainable.

Note on Methodology

This paper is prepared as a conceptual review and synthesis rather than an empirical investigation. The arguments developed here are informed by an extensive survey of peer-reviewed literature, regional assessments and policy reports published between 2006 and 2023. Sources were identified through major academic databases (Scopus, Web of Science and Google Scholar) as well as institutional repositories such as ICIMOD, FAO, UNEP and national policy documents. Selection was guided by relevance to three thematic domains: climate and cryosphere change, ecosystem services and forest restoration, and socio-economic vulnerabilities and governance responses in South Asia and the HKH. By triangulating scientific studies, development reports and regional policy frameworks, the paper seeks to provide a balanced synthesis that connects ecological evidence with socio-economic realities. The emphasis is on drawing out linkages across disciplinary silos and offering an integrated perspective rather than conducting a systematic or quantitative review.

2. Environmental Trends and Challenges

The Hindu Kush Himalaya (HKH) region is undergoing rapid environmental transformation due to synergistic pressures from climate change, biodiversity loss, pollution and land-use change. These changes, though global in scope, are particularly acute in the HKH because of its ecological fragility, altitudinal gradients and high dependence of local communities on natural resources. The following section outlines the interrelated environmental challenges that shape the ecological and developmental landscape of South Asia and the HKH.

2.1. Climate Change and Cryosphere Instability

Climate change is the most pervasive environmental challenge in the HKH. The region has experienced warming at a rate higher than the global average, with observed temperature increases between 0.1–0.6°C per decade in the 20th century. This warming has significantly impacted the region's cryosphere, particularly glaciers, snow cover and permafrost. Glacial retreat has been well-documented across the Himalayas, with an average reduction in glacier mass of 0.3 to 1 meter water equivalent per year since the early 2000s (Bolch et al., 2012; Maurer et al., 2019). This threatens downstream water security and increases the risk of glacial lake outburst floods (GLOFs), endangering lives and infrastructure.

Changes in the monsoon system, a key climate driver in South Asia, are also becoming more pronounced, with increasing variability in rainfall patterns, shortened monsoon durations and more

 doi:10.20944/preprints202509.0747.v1

frequent extreme precipitation events (Roxy et al., 2014). These shifts disrupt agriculture cycles, reduce crop yields and elevate disaster risks such as floods and landslides.

2.2. Biodiversity Loss and Ecosystem Degradation

The HKH is a global biodiversity hotspot, home to over 10,000 species of plants, 300 mammals and 977 birds (Xu et al., 2009). Yet the region is experiencing accelerated biodiversity loss due to habitat fragmentation, land-use change, poaching and climate-induced shifts in species distributions. Forests, wetlands and alpine meadows get encroached upon by agricultural expansion and infrastructure development, often without comprehensive environmental impact assessments.

Particularly notable is the decline in endemic and keystone species, such as the red panda and snow leopard, whose habitats are becoming increasingly fragmented. Biodiversity loss undermines the resilience of ecosystems to absorb shocks and leads to cascading impacts on ecosystem services such as pollination, nutrient cycling and water purification.

2.3. Pollution: A Trans-boundary and Escalating Threat

Pollution in the HKH and surrounding South Asian region is both a local and trans-boundary issue. Air pollution, driven by urban emissions, biomass burning and industrial activity, has formed a persistent Atmospheric Brown Cloud (ABC) over the Indo-Gangetic Plain, which also affects upland areas in Nepal, Bhutan and northern India (Ramanathan et al., 2008). This contributes not only to public health crises but also alters regional climate patterns by changing solar radiation absorption and accelerating snow and ice melt.

Water pollution is similarly widespread. In many river systems, including the Ganges and Yamuna, water quality has been severely degraded due to untreated sewage, industrial effluents and agricultural runoff. This pollution affects both human health and aquatic ecosystems and reduces the availability of clean water for agriculture and domestic use.

2.4. Deforestation and Land Degradation

Despite national afforestation efforts in several South Asian countries, deforestation continues to be a significant challenge, particularly in regions where population pressure, illegal logging and weak governance coincide. Between 2001 and 2020, South Asia lost over 3.5 million hectares of forest cover, with hotspots in north-eastern India, central Nepal and northern Pakistan (Global Forest Watch, 2023). Deforestation exacerbates soil erosion, reduces carbon sequestration capacity and increases the risk of landslides – especially on unstable mountain slopes.

Shifting cultivation practices, unregulated grazing and poorly planned road construction also contribute to land degradation, reducing the productivity of agricultural systems and threatening food security. In some high-altitude regions, permafrost thaw and overgrazing are compounding these impacts, leading to permanent loss of arable land.

3. Socio-Economic Impacts and Development Dilemmas

The environmental challenges unfolding in the HKH and wider South Asia are not solely ecological – they are deeply intertwined with socio-economic systems. The degradation of ecosystems and intensifying climate impacts disproportionately affect the region's poorest and most marginalized populations. While development strategies have accelerated economic growth in several countries of the region, they have often failed to integrate principles of environmental justice, sustainability and resilience. Let us examine the critical socio-economic dimensions in this section.

3.1. Agriculture, Water Security and Livelihoods

Agriculture remains the backbone of the economy in much of South Asia and the HKH, engaging nearly 60% of the workforce in countries like Nepal, India and Bangladesh (FAO, 2021). And it is highly vulnerable to environmental change. Altered precipitation patterns, glacial retreat and

 doi:10.20944/preprints202509.0747.v1

increased evapotranspiration are reducing water availability, particularly in mid-hill and lowland areas dependent on spring-fed irrigation (Immerzeel et al., 2010). Seasonal droughts and erratic rainfall decrease crop yields, especially of water-intensive crops like rice and wheat.

Climate stressors also exacerbate existing structural weaknesses in mountain farming systems, including fragmented landholdings, limited access to markets and lack of insurance coverage. These stressors lead to declining agricultural productivity and increased reliance on remittances and non-farm income sources (Gentle & Maraseni, 2012). As a result, rural livelihoods are becoming increasingly precarious, particularly for subsistence farmers and pastoralists.

3.2. Displacement, Migration and Demographic Shifts

Environmental degradation and climatic hazards are driving both temporary and permanent displacement across the region. The Internal Displacement Monitoring Centre reported over 3 million new displacements due to weather-related disasters in South Asia in 2022 alone, many of them in flood-prone areas of Pakistan, India and Bangladesh (IDMC, 2023). In the HKH, communities are being forced to relocate due to repeated landslides, water scarcity and GLOFs.

Mountain outmigration is accelerating, with entire villages in Nepal and Uttarakhand (India) becoming "ghost villages" as younger generations seek employment in cities or abroad (Adhikari & Hobley, 2015). While remittances contribute to rural economies, the social cost of migration – including agriculture feminization, traditional knowledge erosion and loss of labour – weaken community resilience.

3.3. Social Vulnerability and Inequities

The socio-economic impacts of environmental change are not evenly distributed. Gender, caste, ethnicity and class intersect to shape differential vulnerabilities. Women – who are often responsible for managing household water, fuel and food resources – are disproportionately affected by environmental degradation but are frequently excluded from decision-making processes (Agarwal, 2010). Indigenous and marginalized communities in high-altitude areas face compounded risks due to geographic isolation, lack of political representation and erosion of customary land rights.

The shift toward market-oriented development in many parts of the HKH has also led to the commoditization of natural resources, reducing communal access to forests, water and grazing lands. This increases inequality and reduces the adaptive capacity of low-income households, many of whom rely on ecosystem goods and services for daily survival.

3.4. The Development-Conservation Trade-Off

South Asian countries have invested heavily in infrastructure development – roads, hydropower, mining and tourism – viewed as catalysts for economic growth and regional integration. However, many of these projects have been implemented without sufficient socio-environmental safeguards, leading to habitat loss, local communities' displacement and deforestation. For instance, hydropower dams in India and Bhutan have led to flooding of forested areas and increased downstream sedimentation, impacting ecosystems and human settlements (Ojha et al., 2007).

There is a growing critique of "green grabbing" – the appropriation of land and resources for conservation or carbon offsetting projects without adequate community consultation. While well-intentioned, such projects can undermine local livelihoods if not carefully designed with inclusive benefit-sharing mechanisms (Fairhead et al., 2012). This highlights the need for rights-based participatory approaches that treat conservation and development as complementary goals.

A deeper political economy lens also reveals how development choices get mediated by power relations and priorities. Large-scale infrastructure projects, for instance, are frequently justified on grounds of regional integration or national energy security, yet the costs are borne disproportionately by marginalized mountain communities who lack political representation. Similarly, the dominance

 doi:10.20944/preprints202509.0747.v1

of short-term growth metrics in planning frameworks may obscure ecological risks and intergenerational equity. This asymmetry underscores the importance of embedding environmental governance within wider debates on social justice, federal arrangements and decentralization. Unless governance systems consciously align ecological sustainability with distributive equity, developments will reproduce vulnerabilities even when accompanied by conservation rhetoric.

4. Forest and Ecosystem Restoration as a Strategic Response

In response to the mounting environmental degradation and socio-economic vulnerabilities in South Asia and HKH, FER has emerged as a multidimensional strategy offering climate mitigation, biodiversity recovery and livelihood resilience. Globally recognized through initiatives such as the UN Decade on Ecosystem Restoration (2021–2030), restoration interventions are now embedded within many national development strategies in South Asia. In this section, we will explore the ecological rationale for FER, key restoration approaches in the region, enabling policy frameworks and the challenges associated with scaling up restoration sustainably.

4.1. Ecological Rationale and Climate Resilience

Restoration of degraded ecosystems – forests, watersheds, grasslands and agro-ecological landscapes – serves as a nature-based solution (NbS) to many of the environmental threats. Forests play a critical role in carbon sequestration, hydrological regulation, soil stabilization and microclimate modulation (Chazdon et al., 2017). Empirical studies suggest that restoring just 350 million hectares of degraded forestland globally could sequester up to 1.7 gigatonnes of CO_2 per year (Bastin et al., 2019).

In the HKH, where deforestation and land degradation have disrupted ecosystem services essential for mountain agriculture and water provisioning, restoration can enhance slope stability, replenish springs and reduce disaster risks. Catchment-level reforestation and vegetation rehabilitation have improved water flow in mid-hill villages in Nepal, boosting both irrigation and drinking water availability (Wester et al., 2019). Afforestation of landslide-prone zones in the Indian Himalayan Region has proven effective in stabilizing slopes and reducing erosion.

4.2. Community Forestry and Participatory Models

South Asia has a long tradition of community-based forest management, with countries like Nepal, Bhutan and India implementing large-scale participatory forestry programs. Nepal's Community Forestry Program (CFP), involving over 22,000 user groups and managing approximately 2.9 million hectares of forest, became a global model for decentralized forest governance (Ojha, 2006). Studies show that community forests in Nepal have improved forest conditions while delivering socio-economic benefits such as income generation from non-timber forest products (NTFPs), ecotourism and carbon credits under REDD+ pilots (Kanel& Acharya, 2008; Maraseni et al., 2014).

Bhutan's forest conservation is similarly embedded in its Gross National Happiness (GNH) framework, emphasizing ecological sustainability, cultural preservation and inclusive governance. The country has maintained over 70% forest cover and protected more than half of its land area through integrated conservation-development programs.

These models underscore the importance of local stewardship, customary knowledge and equitable benefit sharing in achieving successful restoration outcomes. Importantly, they also challenge top-down technocratic approaches that marginalize local actors and disregard traditional land-use systems.

4.3. Policy and Institutional Frameworks

South Asian governments have made explicit commitments to forest and landscape restoration (FLR) through various international and national platforms. India pledged to restore 21 million

 doi:10.20944/preprints202509.0747.v1

hectares of degraded land under the Bonn Challenge, while Pakistan launched the "Ten Billion Tree Tsunami Programme" (TBTTP), aiming to plant ten billion trees by 2023. Nepal's REDD+ Strategy (2018) and Forest Policy (2019) include restoration objectives aligned with climate and biodiversity goals.

At the regional level, ICIMOD's Trans-boundary Landscape Program to foster cross-border collaboration in conservation and restoration across the Kailash Sacred Landscape and the Eastern Himalayas served to create enabling conditions for investment in restoration. However, implementation sometimes may suffer from funding gaps, weak institutional coordination and inadequate monitoring systems.

Restoration also intersects with other sectors such as agriculture, energy and infrastructure. Hence, mainstreaming FER into broader land-use planning is essential to avoid policy fragmentation. Integration of FLR into Nationally Determined Contributions (NDCs) under the Paris Agreement is a step in this direction, but coherent action at sub national levels remains limited.

4.4. Challenges and Risks of Restoration at Scale

Despite its promise, scaling up restoration efforts has own challenges. One major risk is the imposition of monoculture plantations or exotic species, which may undermine biodiversity goals and provide limited ecosystem services (Holl & Brancalion, 2020). Such practices are prevalent in fast-track afforestation projects aimed at meeting short-term carbon targets. Land tenure insecurity and lack of clarity over usufruct rights can hinder local participation and benefit sharing, especially in indigenous territories. Restoration projects that ignore these rights can trigger conflict or result in "green grabbing" – the appropriation of land in the name of environmental protection (Fairhead et al., 2012). Additionally, restoration success is contingent on long-term funding, institutional support and capacity building – factors often neglected in donor-driven or politically motivated programs.

Another challenge lies in monitoring and evaluating restoration outcomes. Current metrics are often limited to tree survival rates or area covered, overlooking qualitative aspects like ecosystem functionality, biodiversity value and social equity. Adoption of holistic tools like the Restoration Opportunities Assessment Methodology (ROAM) remains limited across South Asia.

5. Integrated Approaches and Regional Cooperation

Addressing the complex environmental and socio-economic challenges requires strategies that go beyond local or national boundaries. The interconnectivity of ecosystems, hydrological systems and socio-economic processes across national borders calls for integrated approaches that recognize the shared vulnerabilities and interdependencies between countries. Regional cooperation is essential for achieving sustainable development, climate resilience and biodiversity conservation.

5.1. The Case for Integrated Ecosystem Management

The challenges in the HKH region are deeply interconnected. The interlinked issues of climate change, land degradation, biodiversity loss and socio-economic disparities do not respect national borders and require integrated solutions that address the complex dynamics between ecosystems, communities and economies. Integrated ecosystem management (IEM) considers ecological, economic and social dimensions together; offering a holistic approach to managing natural resources.

IEM encourages cross-sector policies that coordinate the management of forests, watersheds, agriculture and biodiversity. It acknowledges the multiple functions of ecosystems, such as water provision, carbon sequestration and soil stabilization and integrates these functions into development planning. For instance, watershed management that includes reforestation and sustainable agriculture can improve water quality, reduce soil erosion and enhance local livelihoods. This type of integrated approach is particularly relevant in the HKH, where communities depend on fragile ecosystems for their livelihoods.

 doi:10.20944/preprints202509.0747.v1

IEM facilitates the design of policies that simultaneously address climate change adaptation and mitigation. The restoration of degraded ecosystems – such as reforestation, agro forestry and sustainable land-use practices – can enhance ecosystem services, increase carbon sequestration and improve resilience to climate impacts such as flooding, drought and landslides. The need for integrated frameworks in addressing climate change challenges is further emphasized by the synergies between mitigation and adaptation strategies.

5.2. Trans-boundary Cooperation in the HKH

Given the vast transnational nature of the challenges facing the HKH, regional cooperation is critical. The region is home to several trans-boundary river basins, such as the Ganges, Brahmaputra and Indus, which provide water to hundreds of millions of people. The management of these water resources requires cooperation among the nations to avoid water allocation conflicts, ensure equitable access and address cross-border pollution issues. Similarly, trans-boundary conservation efforts, such as the preservation of biodiversity corridors and ecosystems, require collective approach.

Institutions like the International Centre for Integrated Mountain Development (ICIMOD) have played a pivotal role in fostering regional collaboration on sustainable development and conservation in the HKH. ICIMOD's work on the Hindu Kush Himalaya Assessment emphasized the need for collective action on climate change, water security and biodiversity conservation. It facilitated dialogues between the governments of Bhutan, China, India, Nepal and Pakistan, promoting the idea of the HKH as a shared ecosystem that requires cooperative governance.

An example of trans-boundary cooperation is the Kailash Sacred Landscape Conservation Initiative (KSLPI), which involves China, India and Nepal in a joint effort to conserve the biodiversity and cultural significance of the Kailash Sacred Landscape, a critical water source for millions in the region. The initiative has helped strengthen cross-border partnerships and align conservation priorities, including the restoration of degraded lands and forests.

However, regional cooperation cannot be divorced from broader political economy dynamics. Divergent national development priorities, competition over water and energy resources, and asymmetries in state capacity often shape the scope of collaboration. For example, hydropower trade agreements between upstream and downstream countries are frequently influenced by geopolitical considerations as much as by ecological concerns. Acknowledging these realities does not negate the potential for cooperation, but highlights the need for governance frameworks that build trust, reduce power imbalances and create mechanisms for fair benefit-sharing. Without such provisions, trans-boundary initiatives risk being reduced to symbolic exercises that fail to alter the trajectory of resource extraction and uneven development.

Despite above-noted successes, challenges of coordinating trans-boundary efforts remain. Political issues, divergent national interests and weak institutional capacities often impede cooperation. However, strengthening regional frameworks, improving information sharing and enhancing diplomatic engagement remain essential for addressing the trans-boundary challenges of climate change, water scarcity and biodiversity loss.

5.3. Shared Knowledge and Capacity Building

Another crucial element of regional cooperation is the exchange of knowledge and capacity building. The diversity of landscapes, cultures and ecosystems in the HKH means that solutions to environmental and socio-economic challenges need to be context-specific, relying heavily on local knowledge systems. There is growing recognition of the value of the traditional indigenous knowledge that has long been used to sustainably manage resources in mountain environments. However, the region also requires modern scientific research and technological innovations to complement traditional knowledge.

Shared knowledge platforms, such as the South Asian Network for Development and Environmental Economics (SANDEE) provide a forum for researchers, policymakers and

 doi:10.20944/preprints202509.0747.v1

practitioners to exchange ideas, share lessons learned and disseminate best practices for sustainable development and environmental management. Programs like ICIMOD's Regional Resource Centres also provide training and capacity-building opportunities for local communities and government agencies to enhance their ability to manage natural resources sustainably.

5.4. Policy Integration and Cross-Sector Cooperation

To achieve successful integrated management, policies need to be harmonized across sectors. Environmental policies cannot be developed in isolation from economic, social, or agricultural policies. For example, policies promoting sustainable agriculture should integrate principles of ecosystem restoration, such as the use of agro forestry practices that protect watersheds while enhancing soil fertility. Similarly, hydropower development must be aligned with environmental safeguards to minimize its impact on ecosystems and local communities.

A model of policy integration can be seen in Bhutan's approach to environmental conservation, which is embedded within the country's broader development strategy of **Gross National Happiness (GNH)**. The GNH framework integrates social, economic and environmental indicators, ensuring that development policies prioritize ecological sustainability alongside economic growth and social well-being (Ura et al., 2012). This integrated approach has contributed to Bhutan's reputation as a pioneer in promoting both development and conservation.

5.5. The Role of Regional Institutions

Regional institutions have a critical role to play in fostering cooperation and supporting integrated approaches. The South Asian Association for Regional Cooperation (SAARC) remains an important platform for dialogue on regional environmental issues. Strengthening the environmental pillar of SAARC, alongside other regional initiatives like the Himalayan Consensus and the Bangladesh, Bhutan, India, Nepal (BBIN) Initiative, could enhance cooperation on climate change adaptation, water resource management and ecosystem conservation.

6. Conclusions and Policy Recommendations

6.1. Conclusions

The HKH and broader South Asia face intertwined ecological and socio-economic challenges that threaten the region's sustainability. Climate change, biodiversity loss, land degradation and pollution converge with social inequalities and fragile mountain livelihoods produce a complex and uneven landscape of vulnerability. These pressures are compounded by development trajectories that prioritize rapid growth and infrastructure expansion, at the cost of ecological stability and community well-being.

Meeting these challenges requires more than technical solutions. The evidence reviewed in this paper highlights the urgency of approaches that combine ecological science with community participation and governance accountability. If designed inclusively and equitably, FER can deliver ecological recovery with enhanced livelihoods and climate resilience. Yet restoration must be conceived as more than tree planting. It requires recognition of local rights and knowledge, sustained institutional support and mechanisms that prevent new inequalities in the name of "green growth."

From a governance perspective, sustainability in the HKH cannot be separated from the political economy of development. Decisions on land use, energy, and infrastructure are inherently political, shaped by negotiations over resources, power and representation. Without embedding ecological goals into these wider political and economic processes, well-intentioned interventions may reproduce the very vulnerabilities they seek to address. A more durable pathway lies in policies that prioritize equity, accountability and regional cooperation, treating ecological resilience as a foundation for rather than an obstacle to development.

 doi:10.20944/preprints202509.0747.v1

6.2. Policy Recommendations

The following recommendations are proposed to advance resilience and sustainability in the HKH and South Asia. They build on ecological priorities while also addressing the governance and political economy dimensions of development.

6.2.1. Strengthen Integrated Ecosystem Management (IEM) Approaches

Governments should embed ecosystem management in national planning, not as an add-on but as a structuring principle. This means aligning forest, water, agriculture and urban policies within a common framework.

- **Cross-sector planning:** Foster coordination across ministries and sectors so that ecological costs are not overlooked in pursuit of short-term growth.
- **Landscape-scale restoration:** Shift from isolated projects to ecosystem or watershed-scale interventions that balance ecological integrity with livelihood security.
- **Climate-resilient agriculture:** Promote practices such as crop diversification, agro-ecology and water-efficient irrigation, while addressing deeper structural constraints like market access and land tenure.

6.2.2. Enhance Regional Cooperation and Governance

Trans-boundary challenges demand more than technical coordination; they require governance frameworks that build trust and address power asymmetries.

- **Joint governance frameworks:** Strengthen institutions such as ICIMOD and SAARC to move beyond dialogue and enable fair benefit-sharing in water, energy and biodiversity management.
- **Shared water management:** Develop transparent agreements that recognize upstream-downstream interdependence and include conflict-resolution mechanisms.
- **Cross-border biodiversity corridors:** Establish corridors with active participation of local communities, ensuring conservation does not displace or marginalize them.

6.2.3. Implement Equitable FER Programs

Restoration must deliver both ecological and social outcomes.

- **Community-led restoration:** Expand participatory forest management while safeguarding against elite capture and ensuring recognition of customary rights.
- **Gender inclusion:** Support women's leadership and participation in restoration governance through targeted training, resources and representation.
- **Local knowledge integration:** Place traditional ecological knowledge alongside scientific expertise to design culturally rooted and socially legitimate restoration strategies.

6.2.4. Invest in Capacity Building, Research and Education

Long-term success requires stronger institutions and knowledge systems.

- **Training and support:** Build local and institutional capacity in technical restoration as well as in participatory planning and conflict resolution.
- **Research and innovation:** Support regional universities and think tanks to generate locally grounded knowledge and innovations, with greater attention to the political economy of development.

6.2.5. Promote Policy Integration, Accountability and Alignment

Policies must ensure that sustainability commitments translate into action on the ground.

- **Integrate sustainability into development planning:** Make environmental safeguards mandatory within national growth strategies, with explicit evaluation of ecological trade-offs.

 doi:10.20944/preprints202509.0747.v1

- **Private sector responsibility:** Hold private actors in infrastructure, mining and hydropower accountable through enforceable standards, transparency and community consultation.
- **Accountability mechanisms:** Establish independent monitoring, civil society oversight and accessible grievance redress systems to prevent the misuse of "green development" rhetoric.

6.3. Closing Note

The HKH and South Asia stand at a crossroads. By embedding ecological resilience into governance and development pathways, the region has an opportunity to move beyond crisis management and towards a more equitable and sustainable future. Restoration and cooperation, when rooted in justice and accountability, can regenerate ecosystems, strengthen communities and chart a collective path through an era of accelerating environmental change.

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