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Community-Based Resource Governance in Ladakh: Balancing Tradition, Ecology, and Emerging Policy Challenges*

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ABSTRACT

Ladakh, a high-altitude cold desert, thrives on a delicate balance sustained by Common Property Resources (CPRs), such as alpine pastures, glacial water sources, wild vegetation, and community-managed tree plantations, which form the lifeline of its agro-pastoral communities. The governance of these CPRs is deeply interwoven with Ladakh's socio-cultural ethos, economic sustenance, and environmental resilience. For centuries, these commons—pasturelands, water channels, wild foraging grounds, and community-managed forests—have supported survival in this harsh landscape, guided by customary laws, collective cooperation, and indigenous governance systems. Traditional practices, such as rotational grazing, regulated harvesting, and equitable water sharing, embody a sustainable ethos that has maintained ecological balance across generations. However, this time-tested governance framework is under unprecedented strain. Urban expansion, climate change, migration of youth from pastoral livelihoods, rampant growth in tourism, large-scale infrastructure projects, defence deployments, and administrative centralization are reshaping the socio-ecological landscape. Statutory laws often clash with traditional rights, eroding the autonomy of indigenous institutions and threatening the commons. This study examines the evolving dynamics of CPR governance in Ladakh, focusing on its critical role in maintaining ecological stability, biodiversity, and socio-economic resilience. It seeks to uncover pathways for integrating indigenous knowledge systems with modern policy frameworks, ensuring that Ladakh's commons endure not only as ecological assets but also as pillars of cultural heritage and collective identity.

Keywords: Common property resources, indigenous governance, agro-pastoral communities, ecological resilience, policy integration

JEL codes: O13, Q5, Q56, Q57, R58

I
INTRODUCTION

Common Property Resources (CPRs) are collectively managed and utilized by defined communities under shared rules that regulate access and use (Ostrom, 1990). Though they offer sustained communal benefits, their finite nature means individual use reduces their availability to others (Berkes, 1989). In fragile ecosystems such as Ladakh's cold-arid highlands, CPRs are not just economic assets; they are embedded in cultural, religious, and social systems (Jodha, 2001). Understanding CPR governance in such contexts requires an examination of both practical management strategies and the cultural and ethical values that shape collective decision-making. In Ladakh, CPRs mainly in the form of alpine pastures, glacial water sources, wild vegetation, and community-managed plantations, form the backbone of traditional

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agro-pastoral livelihoods (Nüsser & Gerlitz, 2011). These resources are deeply ingrained in Ladakh's socio-cultural fabric, where customary laws, collective norms, and indigenous institutions have historically regulated access, ensured equity, and maintained ecological balance. Private ownership is often unviable in this terrain; hence, communal stewardship is vital for survival. CPR governance here is far more than a mechanism for subsistence-it reflects enduring relationships between communities and their environment. Rooted in indigenous governance systems, Ladakh's CPR management practices, such as rotational grazing, regulated plant harvesting, and equitable water allocation, demonstrate a sophisticated ecological sensibility. These practices enable communities to navigate seasonal climatic extremes, labour mobility, and social transitions (Norberg-Hodge, 1991; Jina, 1995).

However, this traditional system now faces mounting stress. As younger generations shift away from nomadic lifestyles, many remote pastures are underutilized, while areas near settlements suffer from overgrazing. Climate change has reduced snowfall and disrupted glacial water cycles, impacting irrigation and water security. The expansion of tourism, defence facilities, and infrastructure development is intensifying land and resource pressures, while administrative centralisation and statutory laws increasingly conflict with customary rights and undermine indigenous institutions (Nüsser & Dame, 2014). In light of these challenges, this study seeks to critically examine the role, governance, and adaptive capacity of CPRs in sustaining Ladakh's cold-arid ecosystem. It investigates how CPRs underpin ecological stability, biodiversity conservation, and socio-economic resilience. The research also evaluates the durability of traditional management systems in the face of environmental and institutional change. Ultimately, the study aims to identify strategic pathways for integrating indigenous knowledge with contemporary policy, thereby safeguarding CPRs as both ecological assets and pillars of cultural heritage.

II

METHODOLOGY

This study employed a qualitative, interdisciplinary research design, integrating ethnographic fieldwork, institutional analysis, and participatory rural appraisal (PRA) methods to explore the governance, utilisation, and evolving dynamics of Common Property Resources (CPRs) in the cold-arid trans-Himalayan region of Ladakh. The methodology was specifically crafted to capture both the ecological realities and the deeply embedded socio-cultural dimensions of CPR management across diverse landscapes. The overarching objectives of the study were threefold: firstly, to identify the role of CPRs in sustaining traditional livelihoods and ecological balance in Ladakh. Secondly, to document indigenous governance systems and management practices associated with CPRs, and lastly, to assess emerging challenges and propose context-specific policy interventions for sustainable CPR governance.

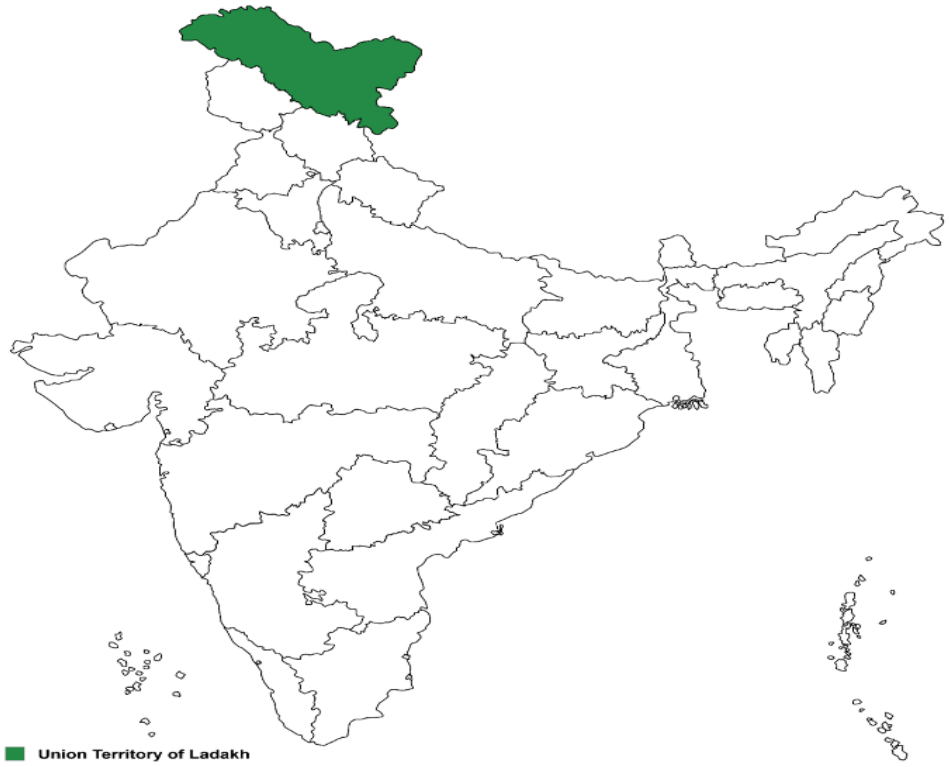

FIGURE 1. MAP INDICATING STUDY AREA

To achieve these objectives, the study employed a purposive sampling approach to ensure representation across Ladakh's diverse ecological zones and socio-cultural contexts. Villages were strategically selected based on their historical dependence on common grazing lands, community-managed water systems, and the use of wild resources, with an emphasis on traditional institutions that still play a role in local resource governance. A total of 27 Focus Group Discussions (FGDs) were conducted across high-altitude and mid-altitude villages in both Leh and Kargil districts, encompassing the major sub-regions of Ladakh. These FGDs were designed to elicit collective narratives and local knowledge on CPR access, use, degradation, and institutional change. Each group comprised 8 to 12 participants, selected for their lived experience and knowledge of CPR management. Participants included a diverse set of stakeholders: Village Heads (*Gobas*) and local elders, Water Masters (*Churpons*) managing traditional irrigation systems, Pastoralist communities, including *Changpa* nomads, Agro-pastoralists and smallholder farmers and Women's collectives and youth representatives

Additionally, the study conducted informal interviews with key local stakeholders, including community leaders, panchayat members, NGO representatives, and officials from relevant government departments, to gain deeper insights into institutional dynamics, policy interactions, and environmental shifts.

Data collected through FGDs and interviews were analysed using thematic content analysis, enabling the identification of recurring patterns, local strategies, institutional changes, and perceived threats to CPRs. Triangulation across data sources, i.e. field observations, stakeholder narratives, and policy documents, was employed to enhance credibility and validity. This multi-scalar and community-engaged methodology provided a holistic understanding of the CPR ecosystem in Ladakh, offering grounded insights into the challenges and opportunities for sustaining these vital socio-ecological assets in a rapidly changing environment.

III

RESULTS AND DISCUSSION

3.1 Land Use Classification of Ladakh

The Land Use Classification data for Ladakh (2022–23) reveals a total reported geographical area of approximately 295,000 hectares, offering critical insights into the region's unique ecological and socio-economic fabric (Table 1). Occupying an overwhelming 77.15% of Ladakh's reported geographical area, forest-like ecosystems dominate the region's land use; however, this classification is largely ecological rather than silvicultural. In Ladakh's cold, arid, and high-altitude terrain, "forest" refers not to dense, canopy-covered woodlands but to sparse vegetative zones comprising alpine pastures, cold desert shrublands, and high-altitude meadows. These ecosystems, though visually austere, play an indispensable role in maintaining ecological balance, acting as carbon sinks, supporting endemic biodiversity, regulating glacial hydrology, and sustaining transhumant livestock grazing systems that are foundational to Ladakh's traditional agro-pastoral economy. Although constituting only 2.68% of Ladakh's total reported area, land under non-agricultural use reflects a critical spatial dynamic, encompassing settlements, road networks, tourism facilities, defence infrastructure, and administrative establishments. While the percentage may appear modest, it signals a growing trajectory of urbanisation and land conversion, driven by the expansion of strategic infrastructure, rapid tourism development, and population clustering in urban hubs like Leh and Kargil. This evolving land use pattern underscores the tension between development imperatives and ecological sensitivity, raising urgent questions about sustainable planning, land zoning, and carrying capacity in a fragile high-altitude ecosystem.

Covering nearly 9.39% of Ladakh's total land area, barren and unculturable land includes rock-strewn slopes, high-altitude deserts, glaciated zones, and wind-eroded terrains that are largely inhospitable for cultivation or habitation. While these

landscapes are often perceived as economically unproductive, they represent ecologically significant frontiers, serving as critical watersheds, biodiversity reservoirs, and natural buffers against desertification and climate extremes. Their harshness also preserves fragile alpine ecosystems, making them vital to climate regulation, conservation efforts, and the adaptive resilience of both flora and fauna. In policy terms, these lands pose both challenges for development and opportunities for environmental stewardship in Ladakh's evolving land-use strategy. Despite the deep-rooted dependence of Ladakh's indigenous pastoral communities, particularly the *Changpa* nomads, on livestock such as yaks, Pashmina goats, and sheep, only 0.05% of the Union Territory's land is officially classified as permanent pasture and grazing land. This glaring underrepresentation overlooks the extensive seasonal grazing corridors and high-altitude rangelands that form the backbone of Ladakh's transhumant livestock economy. These pasturelands are not only critical for sustaining pashmina wool production, a globally valued commodity, but also for maintaining socio-cultural continuity, food security, and ecological balance in this cold, arid region. Recognising and safeguarding these traditional grazing landscapes is crucial for the resilience of livelihoods, biodiversity preservation, and the sustainable coexistence of people, livestock, and nature in Ladakh.

Although accounting for just 0.67% of Ladakh's total land area, land under miscellaneous tree crops and groves holds outsized ecological and socio-economic significance. These pockets, often located near settlements, comprise plantations of poplars, willows, and fruit-bearing trees, which are integral to the region's resource security and microclimatic stability. In a landscape where vegetation is scarce, these groves serve multiple functions: they provide firewood, timber for construction, fodder, windbreaks, and even contribute to soil stabilisation and water retention. Moreover, such tree-based systems support local livelihoods, enhance aesthetic and cultural landscapes, and act as natural climate buffers, making them indispensable to Ladakh's pursuit of resilient and regenerative land-use practices.

Constituting 1.61% of Ladakh's total reported area, culturable wastelands represent a category of land that, while presently unused for agriculture, holds potential for reclamation and productive use through targeted interventions. These lands typically include degraded soils, marginal plots, and fallow areas, which are often constrained by factors such as limited irrigation access, rocky subsoils, or high salinity levels. However, with the application of appropriate soil and water conservation techniques, organic matter enrichment, and low-input climate-resilient farming models, these areas could be gradually transformed into productive agro-ecological zones. Unlocking the potential of culturable wastelands is especially significant in Ladakh's context, where arable land is scarce, and enhancing local food production, livelihood diversification, and land-use efficiency is essential for long-term sustainability in a fragile mountain environment.

Comprising only 7.38% of Ladakh's total reported land area, agricultural land is severely limited by the region's harsh climatic conditions, short growing season, fragile soils, and altitude-induced constraints. Cultivation is predominantly subsistence-based, relying heavily on glacial meltwater irrigation, with traditional crops like barley, wheat, and hardy vegetables forming the staple. The high diurnal temperature variation, low organic content in soils, and water scarcity further exacerbate challenges to crop productivity. Yet, Ladakh's farming communities have historically adapted through indigenous knowledge systems, community-managed irrigation channels (zings and khuls), and crop-livestock integration. In recent years, innovative interventions such as protected cultivation using greenhouses, horticultural diversification into apricots, seabuckthorn, and high-altitude floriculture, as well as the promotion of climate-resilient varieties, have helped overcome natural limitations. These adaptive practices not only enhance food and nutritional security but also pave the way for sustainable agri-entrepreneurship and value-chain integration in one of India's most ecologically sensitive and strategically significant regions.

TABLE 1. LAND USE CLASSIFICATION OF LADAKH

Particular	Area ('000 hectares)	Percentage
Total land area reported	295.00	100.00
Forests	227.00	77.15
Area under non-agricultural uses	8.00	2.68
Barren and un-culturable land	28.00	9.39
Permanent pastures and other grazing lands	0.14	0.05
Land under Misc. Tree Crops & Groves (Not Incl. in Net Area Sown)	2.00	0.67
Culturable wastelands	5.00	1.61
Fallow lands other than current fallow lands	1.00	0.41
Current fallows	2.00	0.66
Net area sown	22.00	7.38

Source: Land use statistics at a glance (2022-23), Ministry of Agriculture & Farmers Welfare, Department of Agriculture & Farmers Welfare, GoI

3.2 Scenario of CPRs in Ladakh

Common Property Resources (CPRs) in Ladakh constitute the collectively managed natural assets that underpin the region's agro-pastoral economy, sustain cultural practices, and maintain ecological balance in a high-altitude cold desert where individual resource ownership is rare and often impractical. These resources, including alpine pastures, glacial water systems, wild vegetation, fuelwood reserves, and community-managed tree plantations, form the backbone of traditional livelihood systems, particularly pastoralism and subsistence agriculture (Nüsser & Gerlitz, 2011). In an environment defined by climatic extremes, limited arable land, and fragile ecosystems, CPRs in Ladakh are not merely utilitarian; they embody the

communal ethic, indigenous governance structures, and adaptive ingenuity that have historically sustained regions with scattered yet resilient communities. Rooted in customary laws, oral traditions, and cooperative institutions, CPR governance has been characterised by rotational use systems, participatory decision-making, and ecological stewardship, ensuring both intergenerational equity and sustainability.

3.2.1 Key Categories of CPRs in Ladakh

1. **Alpine Pasturelands: Keystone of Pastoral Economies:** Alpine grazing grounds represent one of the most critical CPRs in Ladakh, particularly for nomadic and semi-nomadic communities such as the *Changpa* pastoralists. These pastures support herds of yaks, sheep, and Changthangi goats, the latter renowned globally for producing luxurious pashmina wool. Governed traditionally by rotational grazing practices, collective herding, and customary access rights, these lands have ensured the sustainable productivity of fragile ecosystems. Leh district has nearly 7,554 sq. km (16.75%), and Kargil 2,599 sq. km (18.51%) under pasture, underscoring the economic and ecological centrality of rangelands in the region (Table 2).

TABLE 2. AREA UNDER PASTURES/GRAZING LANDS IN THE UT OF LADAKH

District	Geographical Area (in sq km)	Area under pastures/Grazing land (in sq km)	Percentage
Leh	45110	7554	16.75
Kargil	14036	2599	18.51

Source: Directorate of Environment and Remote Sensing. (2010). *Pasture/Grazing Land Study of Jammu and Kashmir Using Remote Sensing and GIS*. Government of Jammu & Kashmir.

2. **Water Resources: Community-Governed Lifelines -** In a landscape with minimal rainfall and erratic hydrology, glacial meltwater is the primary source of irrigation. Traditional water management systems, zings (small reservoirs), zongs (ponds), and khuls (canals), are governed through customary roles, particularly the *churpon* (water master), who ensures equitable water distribution. These decentralised systems demonstrate a high degree of social cohesion, hydrological wisdom, and adaptive governance, particularly crucial in the face of declining snowfall and glacial retreat.
3. **Wild Vegetation and Fuelwood:** The extreme scarcity of tree cover has led to strict community regulations on the harvesting of wild vegetation, including species such as juniper, seabuckthorn, and willow. These resources are essential for fuel, construction, fodder, and even ritual practices. Collection is often governed by village councils or religious authorities, ensuring controlled extraction, regeneration cycles, and ecological balance in otherwise treeless expanses.

4. **Community-Managed Tree Plantations:** In response to deforestation and land degradation, many villages have established tree plantations through collective labour, often supported by development agencies. These plantations help stabilise soils, mitigate erosion, and supply timber and firewood, providing multi-functional ecological services and enhancing community resilience in Ladakh's austere environment.

3.3 Role of CPRs

The table presents a compelling narrative of declining dependence on Common Property Resources (CPRs) across three temporal frames: the present, 15 years ago, and 30 years ago, while distinguishing between partial and complete reliance. The data reveal a systematic erosion in CPR dependence over time. Three decades ago, a substantial 94% of the population exhibited partial dependence, and an equally significant 90% were wholly reliant on CPRs for sustaining their livelihoods and basic needs (Table 3). Fifteen years later, this dependence had reduced to 88% and 85%, respectively. At present, only 72% report partial reliance, while complete dependence has declined to 66%. This steady downward trajectory reflects a broader transformation in Ladakh's socio-economic and ecological fabric. Key drivers include economic diversification, infrastructural expansion, shifts in livelihood portfolios, and growing access to privatised or state-supported alternatives. While this trend signals facets of modernisation, it also underscores a critical disconnection from community-managed resource systems—systems that once formed the backbone of Ladakh's ecological and cultural identity. The decline raises serious concerns about the erosion of collective stewardship, the dilution of traditional knowledge systems, and the heightened vulnerability of communities that are still heavily dependent on CPRs for survival.

TABLE 3. PERCENTAGE DEPENDENCE ON CPRS

	1993 (30 years back)	2008 (15 years back)	2023 (As of date)
Partially (%)	94	88	72
Wholly (%)	90	85	66

Source: Primary survey

Historically, Ladakhi communities have cultivated a deep ecological intelligence, evolving locally adapted systems of resource management that align with the region's harsh climate and fragile high-altitude ecosystems. At the core of these systems lies a reliance on CPRs—commonly referred to as shared natural assets — managed collectively to support not only economic survival but also social cohesion and cultural continuity. Among the most vital uses of CPRs in Ladakh is livestock grazing, rooted in the region's centuries-old pastoral traditions, particularly among semi-nomadic groups like the *Changpa* (Jina, 1995). Communal pastures serve not only as critical livelihood assets for producing meat, milk, wool, and the

globally prized pashmina, but also function as social commons, reinforcing kinship networks, reciprocal labour-sharing, and indigenous governance institutions. In a region where agricultural opportunities are severely limited by altitude, arid climate, and a short growing season, livestock and associated grazing lands are irreplaceable (Ostrom, 1990; ICAR-CAZRI, 2023). One of the clearest indicators of CPR dependence is the availability of seasonal fodder, which underpins livestock productivity throughout the year. Native alpine grasses dominate the summer diets, accounting for 82% of total feed intake (Table 4). However, this reliance declines sharply to 42% during the rainy season and plunges to less than 20% in winter, when communities must depend on stored fodder and supplementary feeds, such as the leaves and twigs of Salix (willow) and Populus (poplar) (Forest Department Ladakh, 2021). These stark fluctuations illustrate both the biophysical constraints and the adaptive strategies that shape pastoral livelihoods.

TABLE 4. CONTRIBUTION OF GRAZING TO THE TOTAL FEED REQUIREMENT

Season	Contribution (%)
Rainy	42.0
Summer	82.0
Winter	<20.0

Source: Primary survey

Furthermore, herding arrangements vary significantly across Ladakh's three major sub-regions, Kargil-Zanskar, Leh-Khardungla, and Nubra-Chushul, reflecting differences in altitude, ecological conditions, and customary norms (Table 5). In many cases, herding is a shared community responsibility, with families rotating duties or engaging specialist herders, thereby reinforcing the collective ethic embedded in CPR-based resource management. Water, another cornerstone of CPRs in Ladakh, is communally accessed and meticulously managed. With precipitation extremely scarce, Ladakhi villages have developed sophisticated traditional systems, zings (reservoirs), zongs (ponds), and khuls (canals), to collect and distribute water for drinking, irrigation, and livestock. The *churpon*, a traditional water manager, plays a pivotal role in ensuring equity, efficiency, and conflict resolution, particularly during periods of scarcity (Norberg-Hodge, 1991; ICAR-CAZRI, 2023). These polycentric governance systems, rooted in customary laws, social trust, and a deep understanding of hydrological processes, represent exemplary models of climate-resilient water management, offering lessons that extend far beyond the region.

The value of CPRs in Ladakh extends well beyond agriculture and livestock. In remote, high-altitude villages, where market access is limited, especially during the long winters, CPRs provide fuelwood, timber, wild edibles, and medicinal plants essential for household needs. Besides, several grass species are found in the region (Table 6). Species like juniper, seabuckthorn, and wild rhubarb meet practical needs

TABLE 5. CURRENT SCENARIO OF GRAZING AND HERDING PRACTICES IN LADAKH

Region	Altitude (in feet)	Scenario
Kargil-Zanskar	12000 to 14000	• Grazing and herding are delegated to a few people in a village • Grazing is performed in the village outskirts, mountain areas • Livestock stay in the grazing areas for the summer season • Owners collect milk themselves from the livestock
Leh-Khardungla	15000 to 18000	• Grazing and herding are delegated to each household of the village on a turn basis • Each family gets its turn once a month • Households with a large herd size perform their turn twice or thrice in a month
Nubra-Chushul	14000 to 16000	• Grazing and herding are performed by the household itself, subject to the herd size • Families with a small herd size mostly prefer the village vicinity for grazing

Source: Primary survey

while also holding ritual and spiritual importance. Increasingly, these biological resources are being linked to alternative livelihoods, such as ecotourism, herbal medicine, and organic value chains, which enhance income while reinforcing conservation (Kunzes et al., 2015; Singh et al., 2022). In this context, CPRs represent multi-functional ecosystem services, capable of bridging the gap between subsistence and sustainability, tradition and innovation. The strategic importance of CPRs in

TABLE 6. KEY GRASS SPECIES FOUND IN LADAKH

Changthang	Nubra	Leh and the central region	Zanskar	Kargil (Drass and Suru)
Kobresia pygmaea	Poa spp.	Stipa orientalis	Kobresia royleana	Poa pratensis
Stipa orientalis	Stipa orientalis	Poa spp.	Carex spp.	Stipa spp.
Carex spp.	Elymus spp.	Artemisia spp.	Stipa orientalis	Agropyron spp.
Poa attenuata	Carex spp.	Festuca spp.	Poa spp.	Festuca spp.
Artemisia spp.	Artemisia spp.	Carex spp.	Elymus spp.	Bromus spp.
Astragalus spp.	Agropyron spp.	Elymus spp.	Festuca ovina	Artemisia spp.
Elymus nutans	Festuca spp.	Bromus spp.	Astragalus spp.	Hordeum spp.
Festuca ovina	Bromus spp.		Artemisia spp	Elymus spp.
Agropyron cristatum				
Saussurea spp.				

Source: Primary survey

Ladakh is profound and multifaceted. They serve as ecological buffers, economic safety nets, and cultural repositories. Whether it's the alpine pastures that support globally renowned pashmina production, or the traditional water-sharing systems that embody resilient community governance, CPRs are woven into the adaptive DNA of the region. As climate change, demographic shifts, and developmental pressures intensify, the urgency to recognise, protect, and revitalise CPRs becomes paramount. For policymakers and development actors, CPRs must not be viewed merely as residual resource pools, but as living institutions that reflect Ladakh's resilience, heritage, and ecological stewardship. Any sustainable future for Ladakh must be rooted in the commons through their revived governance, restored productivity, and reimagined value in a rapidly transforming socio-ecological landscape.

3.4 Governance of Common Property Resources in Ladakh: A Model of Cultural Ecology and Collective Wisdom

The governance of Common Property Resources (CPRs) in Ladakh extends beyond mere resource distribution; it embodies a profound expression of cultural ethos, ecological literacy, and communal stewardship. Guided by village assemblies (yulpas) and customary leaders, Ladakhi communities enforce traditional norms, resolve disputes, and cultivate inter-village cooperation. These indigenous institutions reflect an adaptive intelligence finely attuned to the region's environmental fragility and climatic volatility. Decision-making in CPR management is consensus-driven, often involving elders, monks, and local leaders whose moral authority and indigenous knowledge shape fair and sustainable frameworks for resource sharing. This fosters a culture of environmental ethics, where nature is revered not as a commodity but as a shared inheritance that commands care, restraint, and reciprocity. Yet, despite their adaptive strength, Ladakh's CPR systems now face unprecedented stress from climate change, demographic transitions, and developmental incursions, posing critical questions for their continuity and resilience.

1. **Pastureland Management - Commons Rooted in Custom and Conservation**: In Ladakh's high-altitude geography, pasturelands, especially in Changthang, Nubra, and Zanskar, are the most vital CPRs. Though not privately owned, these landscapes are communally governed through centuries-old practices that blend ecological pragmatism with socio-cultural values. Key among these are rotational grazing, transhumance, and livestock-based resource allocation.
    a) **Rotational Grazing:** This time-honoured system protects fragile alpine ecosystems by shifting grazing zones seasonally. By resting overused pastures, rotational grazing curbs overgrazing, regenerates vegetation, and maintains ecological balance. Livestock herding is undertaken cooperatively: each household takes turns managing the village herd, while in some cases, hired herders (paid ₹800–₹900 per day) fulfil this role, reflecting the integration of traditional labour with evolving rural economies.

b) **Transhumance:** Practised extensively by the *Changpa* nomads, transhumance involves the cyclical movement of livestock ascending to high-altitude meadows in summer and retreating to lower valleys in winter. This practice equalises grazing pressure and enhances fodder availability. The *Changpa* pastoral system is supported by a sophisticated administrative framework led by the *goba* (village head), who maintains pasture registers, enforces usufruct rights, and oversees herd-based land allocation.

c) **Livestock-based resource allocation**: Pasturelands are classified for monastic and community herds, with grazing entitlements determined through triennial livestock censuses. This system discourages overstocking, balances land use, and ensures equitable distribution of resources. Village boundaries, mapped against natural landmarks, are respected, and local disputes are resolved through customary arbitration, preserving both ecological justice and social harmony.

2. **Water Governance - Indigenous Infrastructure in a Water-Stressed Land*:*** In one of India's driest regions, water is not just a necessity—it is a social asset governed through collective care. Communities manage glacial meltwater, springs, and streams using traditional systems such as zings (reservoirs) and kuls (irrigation channels), which are repaired and maintained cooperatively. Water allocation is governed by communal timetables and monitored by the *goba*, ensuring fairness across households. Inter-village water-sharing agreements prevent monopolisation and foster mutual dependency. This decentralised, community-led governance reflects a nuanced understanding of seasonal hydrology and underpins Ladakh's agricultural resilience.
3. **Tsogs of Nubra - Regenerating Commons through Local Regulation:** The tsogs, or shrub and scrubland grazing commons, in Nubra serve as multifunctional landscapes, providing fodder, fuelwood, and ecological buffers. Notably, they support gyate trees, whose hardwood is prized for crafting farm tools. Historically open-access, tsogs suffered degradation, prompting self-imposed regulations to safeguard remaining resources. Today, tsogs are categorised into three ownership types: individual households, schhu-cho (sub-household), and entire village collectives. Boundaries, often demarcated by sea buckthorn bio-fences, signal growing institutionalisation of access. While communal grazing continues, outside access is restricted, and enforcement mechanisms reflect a community-led approach to conserving natural resources.
4. **Ecosystem Service Valuation (ESV) - Making the Invisible Visible:** Ladakh's CPRs, ranging from highland meadows and glacial waters to communal forests and wild flora, offer ecosystem services of immense but often unrecognised value. These include:
    a) Carbon sequestration
    b) Soil fertility and erosion control

c) Biodiversity habitat preservation
d) Microclimate regulation
e) Cultural, medicinal, and spiritual services

Despite their exclusion from formal markets, these services underpin food security, livestock rearing, and community resilience. Integrating ESV into regional planning not only legitimises conservation but also enables the inclusion of CPRs in broader frameworks for climate adaptation, sustainable livelihoods, and biodiversity policy. Table 7 gives the existing ecosystem service valuation in the cold arid region of Ladakh.

TABLE 7. EXISTING ECOSYSTEM SERVICE VALUATION IN LADAKH

Service Category	Examples from Ladakh CPRs	Economic Relevance
Provisioning Services	Fodder, pashmina wool, medicinal plants, firewood, wild vegetables and fruits, water for irrigation and livestock	Income, subsistence, health support
Regulating Services	Soil erosion control (via alpine grasses), microclimate regulation, groundwater recharge (via pasturelands and zings)	Avoided damage costs, water security
Supporting Services	Biodiversity conservation, nutrient cycling, pollination (wild flora)	Long-term resilience and productivity
Cultural Services	Sacred groves, pastoral landscapes, eco-tourism, and traditional knowledge systems	Non-market values, tourism economy, social capital

Source: Primary survey

3.5 Valuing the Commons: Economic and Ecological Wealth of Ladakh's CPRs:

The Common Property Resources (CPRs) of Ladakh are foundational to the region's ecological sustainability, cultural continuity, and economic vitality. This detailed mapping of ecosystem services and their indicative values based on the primary survey reveals the hidden yet critical role these shared resources play in everyday life and long-term resilience (Table 8).

1. **Provisioning Services - The Livelihood Backbone:** The provisioning services derived from Ladakh's CPRs are not peripheral; they are central to survival and rural income. Alpine pastures, especially in regions such as Changthang and Zanskar, provide fodder worth ₹20,000–₹30,000 annually per household. The famed pashmina economy, reliant on communal highland grazing, generates over ₹20 crore annually, positioning CPRs as key drivers of high-altitude rural economies. Similarly, fuelwood and timber from community groves offer energy

security worth up to ₹30,000 per household annually, especially in off-grid settlements. Wild edibles, herbs, and access to irrigation from community-managed water bodies, such as zings and khuls, further strengthen subsistence livelihoods and climate resilience.

TABLE 8. ECONOMIC AND ECOLOGICAL WEALTH OF LADAKH'S CPRS

Service Category	Ecosystem Service	CPR Source in Ladakh	Indicative Economic Value
Provisioning	Fodder and Grazing Biomass	Alpine pastures (e.g., Changthang, Zanskar, etc.)	₹20,000–₹30,000 per HH/year
	Pashmina Wool Production	Communal highland pastures (Changthangi goats)	₹20 crore/year (UT-wide)
	Fuelwood & Timber	Community-managed groves (willow, poplar)	₹28,000- ₹30,000 per HH/year
	Wild Fruits, Vegetables & Herbs	Riverine CPRs, tsogs, wastelands	₹10,000–₹15,000 per HH/year
	Drinking & Irrigation Water	Zings, zongs, khuls (community-managed)	₹5,000–₹15,000 per HH/year
Regulating	Soil Erosion Control	Pastures, tree plantations, riparian zones	Not directly monetised; proxies via crop/fodder yield
	Groundwater Recharge	Alpine grasslands, riverbeds	Linked to sustained spring flows
Supporting	Habitat Provision & Biodiversity	High-altitude rangelands, wetlands	High ecological significance (e.g., migratory birds)
	Nutrient Cycling & Seed Dispersal	Pastures, wetlands	Ecological backbone of agro-pastoralism
Cultural	Spiritual, Heritage & Religious Values	Sacred groves, tsogs, gompa-owned pastures	High non-use value; community-reported importance
	Eco-tourism & Recreational Value	Markha, Changthang, Nubra valley CPRs	₹8–12 crore/year (direct + indirect)
	Traditional Knowledge Systems	CPR governance (*goba*, *churpon*, grazing rotations)	Essential for adaptive governance

Source: Primary survey

2. **Regulating Services - Nature's Unseen Infrastructure:** While not always monetised, the regulating services of Ladakh's CPRs are vital ecological safeguards. Soil erosion control through vegetative cover, groundwater recharge by alpine grasslands, and micro-climate regulation via tree groves prevent land degradation, preserve water tables, and stabilise fragile ecosystems. Although more challenging to price, these services protect communities from severe economic losses due to flash floods, droughts, and desertification, serving as natural risk mitigation systems.
3. **Supporting Services- Ecological Resilience in Action:** CPRs in Ladakh form the ecological backbone of the high-altitude agro-pastoral system. Rangelands and wetlands sustain biodiversity, provide habitats for rare and migratory species, and ensure seed dispersal and nutrient cycling, which are essential for crop and pasture productivity. These "invisible services" are the lifeblood of Ladakh's ecological health and long-term agricultural viability, providing a foundation for both economic and environmental sustainability.
4. **Cultural Services -Where Ecology Meets Identity:** Cultural and spiritual services embedded in Ladakh's CPRs elevate their value far beyond economics. Sacred groves, gompa-owned lands, and tsogs represent living cultural landscapes that reinforce community bonds, religious practices, and traditional ecological knowledge. Eco-tourism landscapes, such as Markha, Changthang, and Nubra, generate ₹8–12 crore annually, blending nature with economic benefits. Moreover, indigenous institutions like *Goba* and *Churpon* embody deeply rooted knowledge systems that ensure adaptive governance, equitable access, and ecological stewardship, which are critical in a region facing climate and developmental transitions.

3.6 Policy Challenges in the Governance of Common Property Resources (CPRs) in Ladakh

The management of Common Property Resources (CPRs) in Ladakh operates at the intersection of traditional knowledge and contemporary administrative systems. While customary norms, rooted in community wisdom, have historically guided CPR governance, these systems today face unprecedented stress due to mounting socio-economic and environmental pressures. The converging forces of climate change, militarisation, rapid urbanisation, and unregulated tourism are straining Ladakh's fragile ecological equilibrium, exposing deep policy voids and institutional limitations. If left unaddressed, these gaps threaten not only the sustainability of the region's unique ecosystems but also the socio-economic stability of its indigenous communities.

1. **Ambiguity in Tenure and Legal Ownership of Pasturelands:** A primary policy deficiency lies in the ambiguous legal status of pasturelands, which remain the lifeline of nomadic groups such as the *Changpa* and Zanskari communities.

These lands, traditionally governed under communal tenure systems, lack formal legal recognition, leaving them vulnerable to encroachment, unsustainable use, and developmental appropriation. Despite generations of effective traditional stewardship through rotational access, the absence of codified rights obstructs equitable resource allocation and long-term planning. A National Grazing Policy is urgently required to establish clear ownership and usage norms, enshrine community rights, and lay the foundation for sustainable rangeland governance in high-altitude ecosystems.

2. **Overgrazing and Pastureland Degradation:** Ladakh's pastures are under siege from rising livestock pressures and the erosion of traditional grazing controls. Rotational grazing practices, once strictly enforced through community norms, are now weakened by population growth, livestock intensification, and policy neglect. This has accelerated pasture degradation and reduced forage productivity. It is imperative to introduce science-based carrying capacity norms, revive community-led rotational systems, and consider livestock caps per household as part of local bylaws. Sustainable grazing must be integrated into district-level land-use plans to restore ecological integrity and extend pasture longevity.
3. **Restricted Access to CPRs due to Border Valley Externalities:** The expansion of defence infrastructure in border-adjacent regions, especially Changthang, Turtuk, and Nyoma, has resulted in the involuntary displacement of pastoralists and the curtailment of traditional migratory routes. While national security remains a valid concern, blanket access restrictions to critical grazing lands and water sources have severely compromised the rights and livelihoods of local communities. Policy must balance defence imperatives with livelihood protection, ensuring context-sensitive frameworks that enable controlled community access without compromising security protocols. A co-governance model between defence agencies and local institutions can be explored to safeguard both national and human security.
4. **Climate Change and Ecological Vulnerability:** Ladakh's CPRs are at the frontline of climate disruption. The retreat of glaciers, erratic precipitation, and rising temperatures have led to shrinking water reserves, altered vegetation patterns, and degraded alpine pastures. This has direct consequences on livestock productivity, crop viability, and water security. Policy interventions must prioritise climate-resilient land and water management strategies, including glacier and spring revival, rainwater harvesting, soil moisture conservation, and the rehabilitation of ancient irrigation systems such as zings and khuls. Furthermore, ecosystem monitoring frameworks need to be institutionalised at the community level to ensure adaptive planning.
5. **Urbanisation and Tourism-Driven Resource Strain:** Unplanned urban expansion and the tourism boom have led to the diversion of CPRs for infrastructure development, resulting in the commodification and depletion of

communal lands. Prime agricultural and grazing areas are being converted into hotel complexes, roads, and tourist facilities, thereby marginalising local users. The influx of tourists also exerts enormous pressure on water and sanitation systems, intensifying waste management challenges. Policymakers must implement land-use zoning regulations, promote low-impact ecotourism, and mandate Environmental Impact Assessments (EIAs) that explicitly account for the use and dependency on CPRs. Integrating CPR conservation into tourism master plans is essential for sustainable development.

6. **Fragmented Legislative and Institutional Architecture:** Ladakh suffers from a patchwork of disconnected laws governing its CPRs. Legislation such as the Forest Conservation Act (1980) and Forest Rights Act (2006) offer partial protections, but fail to accommodate the region's unique pastoral and agro-ecological dynamics. Moreover, enforcement remains inconsistent due to institutional inertia and jurisdictional ambiguities. A comprehensive legal framework is needed, one that consolidates CPR governance under a unified system, bridges customary and statutory laws, and recognises community-based governance bodies. This framework should cover pasturelands, forested commons, wetlands, and water sources, with legal backing for local management committees.
7. **Weak Institutional Capacity and Multi-Level Disconnects:** Although Ladakh has a rich legacy of community-led resource governance through institutions like *goba*, *churpon*, and yulpa councils, these bodies remain under-resourced, poorly supported, and increasingly marginalised in decision-making processes. Simultaneously, there is a disconnect between national, UT-level, and grassroots policy regimes, with top-down frameworks often blind to local socio-ecological realities. Strengthening institutional capacity through training, technical assistance, funding, and participatory governance reforms is critical. A decentralised, polycentric approach that bridges vertical and horizontal governance gaps can enhance the effectiveness and legitimacy of CPR management in Ladakh.

IV

CONCLUSION

Ladakh's common property resources are not merely ecological assets—they are the lifelines of cultural identity, economic survival, and climate resilience in this cold desert region. The enduring traditional systems that once balanced conservation and livelihood imperatives are rapidly being overwhelmed by the compounding pressures of modernity. As these challenges mount, the absence of coherent legal, institutional, and policy frameworks poses a direct threat to both ecological and social sustainability. To ensure the resilience of Ladakh's CPRs, an integrated policy vision is essential, one that synergises traditional ecological knowledge with modern governance mechanisms. Key policy imperatives include enacting a National Grazing Policy (NGP) tailored to trans-Himalayan ecosystems, clarifying ownership and user

rights through legislative reforms, promoting climate-resilient and ecologically sound resource management practices, reconciling national security priorities with community rights, regulating tourism and urbanisation through sustainable land use and environmental planning and strengthening local institutions and multi-tier coordination mechanisms. Only through such a holistic and inclusive policy architecture can Ladakh's commons be safeguarded, not just as relics of the past, but as pillars of a sustainable, dignified, and community-led future.

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