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Governing the Commons in Ladakh's Border Villages: Institutions, Engagement, and Sustainability

Limseer Ali P A, Dr, Naseer Ponnarath Kunnummal

*Research Scholar Department of Political Science University of Calicut,

Assistant Professor Department of Political Science Government College Madapally.

Abstract: *Managing common property resources (CPRs) in transboundary Himalayan borderlands involves complex political, institutional, and ecological challenges. This study examines CPR governance in five border villages of Ladakh located along the India–Pakistan Line of Control, focusing on interactions among traditional institutions (such as the Goba and Churpon), civil administration, and military authority. The analysis is based on a stratified household survey of 245 households and key informant interviews conducted during 2024–25. Composite indices were constructed to measure CPR Utilization, Politics of Engagement (PEI), Threat Perception (TPI), and Sustainability. Descriptive statistics and inferential methods including ANOVA, t-tests, chi-square tests, Pearson correlation, and multiple regression were used to assess how governance and political factors shape access to and use of shared resources. The results reveal substantial variation across villages and social groups. The mean Utilization Index ranges from 0.8004 in Mushkoo to 0.0286 in Darchik, with Balti and Shina communities displaying significantly higher dependence on CPRs than Dard and Purig groups. Governance structures also differ: the Union Territory administration is perceived as the dominant authority by 53.9 per cent of respondents, alongside the continued influence of village elders (40.4 per cent). The overall PEI is moderate (mean ≈ 0.41), but higher in villages such as Darchik and Mushkoo and among Balti and Dard households. Households in Drass tehsil exhibit significantly higher CPR utilization than those in Kargil. Regression analysis shows that higher threat perceptions significantly reduce CPR use ($\beta = -0.396$, $p < 0.001$), while effective rule enforcement and inclusive participation enhance utilization ($\beta = 0.347–0.422$, $p < 0.001$). Sustainability outcomes mirror these patterns. Interpreted through polycentric governance and political ecology perspectives, the findings highlight a pluralistic but uneven governance regime and highlight the need to strengthen community institutions to improve sustainable CPR management in militarized border regions.*

Keywords: *Common Property Resources; Borderland Governance; Politics of Engagement; Militarization; Polycentric Governance; Political Ecology; Sustainable Livelihoods; Ladakh*

Introduction

The governance of shared resources has been a persistent concern in academic studies. Early theorization, most notably Hardin's formulation of the "*tragedy of the commons*," suggested that shared resources inevitably

suffer from overuse in the absence of private ownership or strong state control. In contrast, subsequent work by Ostrom and others demonstrated that local communities are often capable of designing rules, monitoring mechanisms, and sanctions that enable the sustainable management of common property resources (CPRs). These points underpin contemporary emphasis on polycentric and community-based resource governance. However, much of this literature implicitly assumes relatively stable socio-political contexts in which communities exercise a degree of autonomy. In militarized borderlands, this assumption is difficult to sustain. Here, common lands are transformed into strategic spaces subject to surveillance, securitization, and military regulation. Political ecology studies increasingly recognizes border regions as socio-political spaces shaped by territorial control and security imperatives, processes that frequently marginalize local users and undermine customary institutions (Zimmerer & Bassett 2012; Peluso & Vandergeest 2011). Access to commons is be restricted through fencing or military claims, grazing routes reconfigured for security purposes, and community institutions displaced by bureaucratic or coercive authority.

The Union Territory of Ladakh in India exemplifies these dynamics. This high-altitude, arid region depends heavily on CPRs such as alpine pastures, glacial-fed irrigation channels, and community forests, which underpin agro-pastoral livelihoods and function as critical safety nets in an ecologically fragile environment (Dame & Nüsser 2011). At the same time, Ladakh's strategic location along contested borders with Pakistan and China has resulted in intense militarization, particularly in villages situated near the Line of Control (LoC). Consequently, CPR governance in Ladakh is shaped not only by ecological constraints but also by overlapping security regulations, territorial enclosures, and military land-use practices. Pastures is fall within restricted zones, irrigation systems may be altered to meet military requirements, and seasonal mobility often requires official permission. These processes fundamentally reconfigure access, control, and benefit-sharing, generating new forms of exclusion and inequality.

Climate change further compounds these pressures. Accelerated glacier retreat, erratic snowfall, and increasing drought in the trans-Himalayan region have intensified livelihood vulnerability, especially in border villages already constrained by limited market access and private landholdings (Nüsser et al. 2019; Wester et al. 2019). The Hindu Kush Himalaya assessment: mountains, climate change, sustainability and people (p. 627). Springer Nature. 2020). From a sustainable livelihoods perspective, vulnerability in Ladakh's borderlands is shaped by both ecological shocks and geopolitical disruptions, such as border closures and security alerts. CPR governance in this context is therefore doubly fraught, as shared resources are simultaneously environmentally stressed and politically contested.

Institutional restructuring has added another layer of complexity. The 2019 reorganization of Ladakh as a Union Territory centralized governance and reshaped local–state relations. While this transition brought new development initiatives, it also raised concerns regarding the erosion of customary institutions, including village councils (goba) and traditional irrigation tribunals (churpon), alongside reduced local autonomy and weakened community participation. Stidies argue that such contexts demand attention to the politics of engagement not merely participation, but the power relations, representation, and negotiation that shape

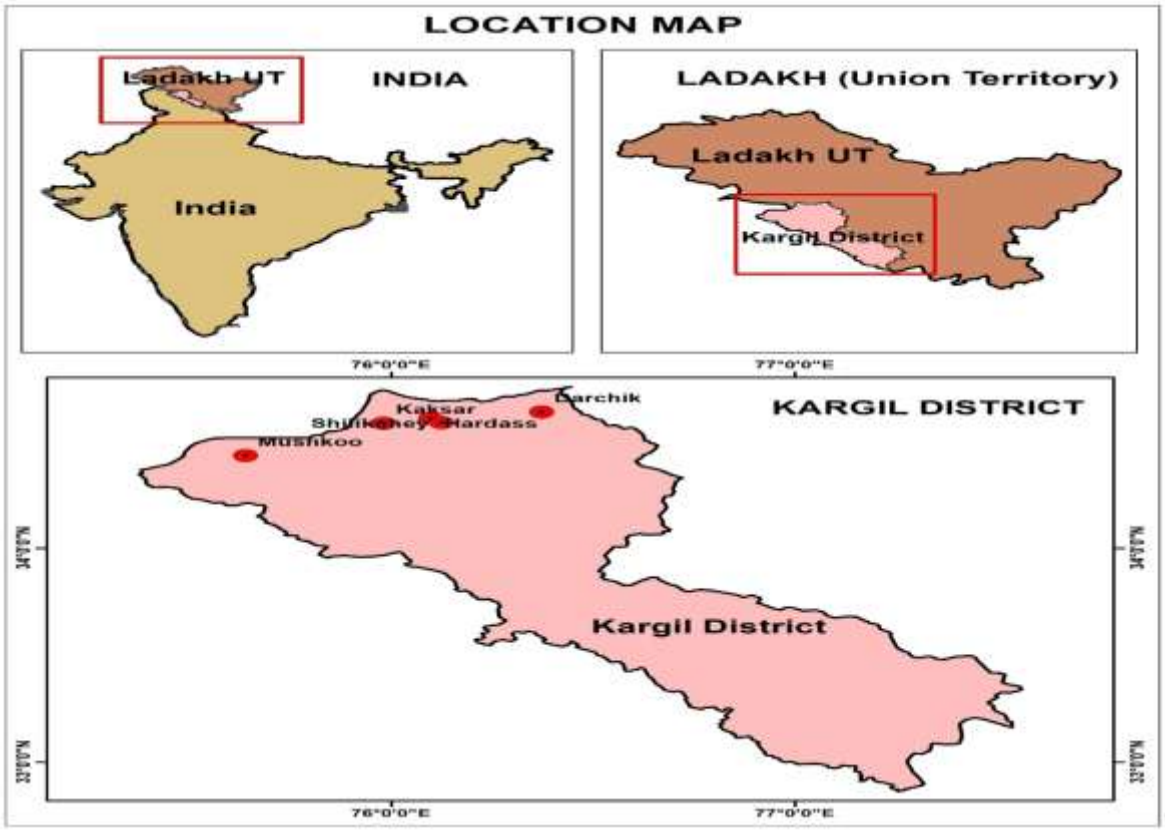
decision-making (Cornwall 2008; Gaventa 2006). In Ladakh's border villages, engagement is marked by pronounced asymmetries, as administrative and military actors often dominate, compelling communities to negotiate access to CPRs within constrained institutional spaces.

Despite the significance of these dynamics, systematic empirical research on CPR governance in militarized borderlands remains limited. Existing Himalayan studies tend to focus on ecological adaptation or traditional practices while underplaying the political dimensions of borders, security, and institutional pluralism. This study addresses this gap through an empirical examination of CPR governance in five frontier villages of Kargil district, Ladakh. Integrating institutional analysis, political ecology, and sustainable livelihoods perspectives, it asks how traditional institutions, state authorities, and local communities interact to govern CPRs, and how political engagement and perceived threats shape resource use and sustainability. The study hypothesize that household perceptions of threats, levels of political engagement, and governance quality significantly influence CPR utilization and sustainability, and that these relationships are mediated by institutional pluralism and military presence. Drawing on a stratified household survey, composite indices, and qualitative interviews, the study provides an integrated analytical understanding of commons governance in a conflict-prone borderland, with implications for more equitable and sustainable resource management in transboundary regions.

Methodology

The study was conducted in five villages located along the India–Pakistan border in Kargil district of the Union Territory of Ladakh (Figure 1). The selected villages Darchik, Hardas, Kaksar, Mushkoo, and Shilikchay fall within the Drass and Kargil blocks and were purposively chosen based on their proximity to the Line of Control, exposure to border-related conflict, presence of security installations, and the extent of military-imposed restrictions on access to pastures and forests. These criteria ensured meaningful variation across villages in terms of militarization, ecological conditions, and governance environments. According to the 2011 Census and updated local records, the five villages together comprised 667 households.

Figure 1. Location of the five surveyed border villages in Kargil district, Ladakh



Source: author elaboration

A stratified multi-stage sampling design was adopted. Using Cochran's formula for finite populations with a 95 per cent confidence level, a 5 per cent margin of error, and an assumed population proportion of 0.5, the required sample size was calculated as 245 households. The sample was distributed proportionately across villages according to their household populations (Hardas: 223 households, n = 86; Darchik: 85, n = 27; Shilikchay: 134, n = 49; Kaksar: 147, n = 54; Mushkoo: 78, n = 29). Within each village, households were selected using systematic random sampling based on updated lists obtained from Panchayat and revenue offices. The final sample represents 36.7 per cent of the total household population in the selected villages.

The socio-geographic profile of respondents (Table 1) indicates that most respondents were from Hardas (35.1 per cent), followed by Kaksar (22.0 per cent) and Shilikchay (20.0 per cent). A large majority (89 per cent) resided in Kargil tehsil. The sample included 49.0 per cent Balti and 33.9 per cent Shina households, along with smaller proportions of Dard (12.7 per cent) and Purig (4.5 per cent) groups. More than half of the households (55.5 per cent) were classified as Below Poverty Line, reflecting high levels of socio-economic vulnerability. This composition ensured adequate representation of the region's major ethnic, economic, and administrative categories.

Table 1 Socio-Economic Profile of Respondents in Border Villages of Ladakh

Variable	Category	Frequency	Percent
Gender Status of Household Head	Female	4	1.6
	Male	241	98.4
Occupation of Household Heads	Agriculture Labour	106	43.3
	Casual labour	7	2.9
	Cultivator	21	8.6
	Ex-servicemen	24	9.8
	Goda	3	1.2
	Govt employee	39	15.9
	Livestock, Hunting, Fishing	6	2.4
	Manufacturing & Processing other than Household Sector	11	4.5
	Not Employed	2	.8
	Private Sector Employee	1	.4
	Retire govt. Employe	6	2.4
	Self-Employed	3	1.2
	Trade & Commerce	15	6.1
	Transport, Storage	1	.4
Education Status	No formal	55	22.4
	Primary	101	41.2
	Secondary	78	31.8
	Higher	11	4.5
Seasonal migration for grazing or work	No	239	97.6
	Yes	6	2.4
Ration Card Status	Above Poverty Line (APL)	106	43.3
	Antyodaya Anna Yojana (AAY) – poorest of the poor	2	.8
	Below Poverty Line (BPL)	136	55.5
	Priority Household (PHH)	1	.4
Total		**245**	**100.0**

Descriptive Statistics

Variable	N	Min.	Max.	Mean	SD
Respondent's Age (In Years)	245	18.0	84.0	49.102	13.6006
Household size	245	1.0	45.0	7.151	3.6806
Total landholding (Canal)	245	.0	25.0	3.908	3.9701

Source: Primary Survey, 2025

Data were collected between winter and summer 2024–25 using a mixed-methods approach that combined a structured household questionnaire, key informant interviews, and field observations. The household questionnaire gathered information on demographic characteristics, livelihood assets, availability and use of CPRs, and perceptions of governance and institutional performance. Respondents were asked about the types of commons they accessed such as pastures, irrigation channels, and forests and the frequency of their use for activities including grazing, irrigation, fuelwood collection, and other livelihood purposes. The survey also captured perceptions of changes in CPR availability over the preceding decade. Governance-related questions

were measured using Likert scales and focused on trust in institutions, participation in decision-making, enforcement of CPR rules, and perceived changes following Ladakh's reorganization as a Union Territory.

Based on these responses, four composite indices were constructed to operationalize key analytical concepts. The Utilization Index (UI) measures the intensity of household dependence on CPRs. It was computed as the unweighted average of five standardized indicators: livestock holdings (converted into adult cattle units), size of private cultivable land (reverse-coded to reflect higher dependence among households with smaller holdings), contribution of CPR fodder to livestock feed, number of common ponds accessed, and quantity of CPR-based fuelwood collected. Each indicator was normalized using min–max scaling (0–1), and higher index values indicate greater dependence on CPRs. The UI serves as the principal outcome variable in the analysis of CPR use. The Politics of Engagement Index (PEI) captures household-level engagement and power relations in CPR governance. Drawing on a politics-of-engagement framework, the index integrates five dimensions: power and influence in decision-making, political involvement, community representation, the military–political interface, and cultural–geopolitical factors shaping access to resources. Each dimension was measured through two to four Likert-scale items, normalized, and averaged to generate sub-scores, which were then combined to produce an overall PEI ranging from 0 to 1. Higher values indicate stronger political engagement and greater capacity to negotiate CPR governance. The Threat Perception Index (TPI) reflects household assessments of external risks affecting CPRs. Respondents rated their level of concern regarding ecological and anthropogenic threats, including climate change, overgrazing, tourism pressure, and military activity. These items were normalized and averaged, with higher values indicating greater perceived vulnerability. The Sustainability Index (SI) provides an aggregate measure of the long-term resilience of CPRs. Guided by institutional and sustainability frameworks, the index combines indicators of current resource availability and trends, governance effectiveness (trust, enforcement, satisfaction with institutional change), and collective action (such as participation in conservation and monitoring). Threat perception was reverse-coded so that lower perceived threats contributed positively to sustainability. The final index ranges from 0 to 1, with higher values indicating stronger ecological and institutional resilience. All indices were tested for internal consistency using Cronbach's alpha, and diagnostic checks confirmed the absence of problematic multicollinearity among explanatory variables.

The quantitative analysis was conducted in multiple stages. First, descriptive statistics were used to profile the socio-economic characteristics of the sample and to document the availability and use of CPRs across villages. Frequencies and percentages summarized categorical variables, while means and standard deviations were used for continuous indices. Second, comparative statistical tests were applied to examine variations across villages, tehsils (Drass and Kargil), ethnic communities, and socio-economic groups. One-way analysis of variance (ANOVA) was used to test for differences in mean values of the Utilization and Sustainability Indices across villages and communities, while independent sample t-tests compared means between tehsils. Chi-square tests were employed to assess associations between categorical variables, such as perceived authority over CPR governance and village location. Third, Pearson correlation analysis was conducted to explore

relationships between CPR utilization and key household characteristics, as well as between utilization and governance-related perceptions. Finally, multiple linear regression models were estimated to identify the determinants of CPR utilization and sustainability. Explanatory variables included threat perception, political engagement, and governance sub-dimensions such as institutional authority, enforcement, participation, and perceived changes following Union Territory reorganization. Model diagnostics, including variance inflation factors and Durbin–Watson statistics, confirmed the robustness of the regression estimates. All quantitative analyses were carried out using SPSS and MS Excel, and qualitative findings from interviews and field observations were used to contextualize and interpret the statistical findings.

Results

The survey findings indicate that dependence on common property resources (CPRs) is widespread and multifaceted across the study villages. A large majority of households rely on CPRs for key livelihood activities: 81.2 per cent use commons for livestock grazing, 78.8 per cent for irrigation, 77.1 per cent for crop cultivation, and 74.3 per cent for fuelwood collection. In addition, a substantial proportion of households depend on CPRs for collecting medicinal plants (45.7 per cent), fishing (38.8 per cent), and small-scale tourism-related activities (21.2 per cent). These patterns highlight the central role of CPRs in sustaining everyday livelihoods, with grazing and irrigation emerging as near-universal uses and highlighting the critical importance of pastures and irrigation channels in border communities.

Marked inter-village variation, however, reveals the uneven availability and accessibility of commons. Nearly all households in Kaksar and Mushkoo reported using CPRs for grazing (100 per cent in both villages), whereas no households in Darchik reported such use, reflecting village-specific land arrangements or access restrictions. Similarly, irrigation is entirely dependent on CPRs in Darchik and Kaksar (100 per cent of households), while a substantial majority of households in Hardas and Mushkoo (approximately 73–75 per cent) also rely on communal irrigation systems. These contrasts illustrate that while grazing and irrigation dominate CPR use across the study area, the specific configuration of commons varies considerably by village.

To assess the intensity of CPR dependence more systematically, study examine the Utilization Index (UI), which aggregates normalized indicators of livestock ownership and CPR use. As shown in Table 2, mean UI values differ sharply across villages. Mushkoo exhibits the highest level of CPR dependence (mean UI = 0.8004, SD = 0.1027), followed by Kaksar (mean = 0.7485, SD = 0.0432) and Hardas (mean = 0.6797, SD = 0.1649). In stark contrast, Darchik records an exceptionally low mean UI (0.0286, SD = 0.0117), indicating minimal reliance on CPRs. A one-way ANOVA confirms that these inter-village differences are statistically significant ($F(4,240) = 160.466$, $p < 0.001$), highlighting pronounced spatial disparities in access to and dependence on common property resources.

Table 2 Average Utilization Index of Common Property Resources by Revenue Village

Revenue Village	N	Mean Utilization Index of CPRs	Std. Deviation	Std. Error
Darchik	27	.0286	.0117	.0023
Hardas	86	.6797	.1649	.0178
Kaksar	54	.7485	.0219	.0030
Mushkoo	29	.8004	.0797	.0148
Shilikchay	49	.5549	.1982	.0283
Total	245	.6124	.2575	.0165
	ANOVA		F (4,240) =160.466, p=0.000	

Note: Value Closer to 1 means High Utilization, Closer Zero Mean Lower Utilization; Source: Primary Survey, 2025

These disparities reflect both institutional context and resource endowments. Mushkoo and Kaksar (Drass block) are closer to key grazing areas and have stronger access rules, whereas Darchik appears to be largely excluded (perhaps due to recent military fencing or land allocations). The dominance of Mushkoo in CPR use suggests high dependence where permissible, consistent with its lively pastoral economy. Community identity also matters. Table 3 summarizes UI by linguistic/ethnic group. Balti (mean 0.6700) and Shina (0.7670) communities exhibited relatively high CPR use, whereas Purig households had moderate use (0.4646) and the small Dard group had almost none (0.0291). A one-way ANOVA yields $F(3,241)=353.458$, $p<0.001$, indicating these differences are highly significant.

Table 3 Average Utilization Index of Common Property Resources by Community Group

Community Group	N	Mean Utilization Index of CPRs	Std. Deviation	Std. Error
Balti,	120	.670	.139	.013
Dard	31	.029	.013	.002
Purig	11	.465	.212	.064
Shina	83	.767	.056	.006
Total	245	.612	.258	.016
	ANOVA		F (3,241) =353.226, p=0.000	

Note: Value Closer to 1 means High Utilization, Closer Zero Mean Lower Utilization; Source: Primary Survey, 2025

The negligible UI of Dard households suggests that this minority group is effectively excluded from common lands (perhaps due to localized inter-community politics), whereas Balti and Shina communities manage and use CPRs more intensively. These results align with the idea that traditional norms and ethnic networks influence resource access.

It also examined basic household predictors of CPR use. Larger landholdings correlated positively with utilization ($r = 0.320$, $p<0.01$), likely because wealthier farmers integrate more CPR fodder into cultivation. By contrast, respondent age and household size had negligible correlations ($r\approx0.02$) with UI. Gender of household head made no significant difference in UI (male-headed mean 0.614 vs female-headed 0.524; $t(243)=-0.688$, $p=0.492$). However, location did: households in Drass tehsil had much higher utilization (mean

0.797) than those in Kargil tehsil (0.590), $t(243)=4.070$, $p<0.001$. This regional gap likely reflects Drass's greater remoteness and dependence on commons, and possibly different state enforcement regimes. These descriptive results document that CPR availability and use are highly uneven across the study area. Grazing and irrigation are universally important, but the intensity of use depends on ethnicity, village, and administrative context. These patterns set the stage for analyzing the institutional factors that accompany them.

Given the pluralistic governance environment in the study area, study first examine the distribution of authority over common property resources (CPRs) and then assess household perceptions of governance and political engagement. Survey responses indicate a clear concentration of decision-making authority in formal state institutions. A majority of respondents (53.9 per cent) identified the Union Territory (UT) administration as the most influential actor in CPR decision-making, reflecting its enhanced authority following Ladakh's reorganization in 2019. At the same time, village elders and other traditional institutions continue to play a substantial role, with 40.4 per cent of households identifying them as key decision-makers. Other actors including the revenue department, the Ladakh Autonomous Hill Development Council (LAHDC), the military, and religious institutions were each cited by fewer than 4 per cent of respondents, indicating their limited direct influence in everyday CPR governance.

This configuration points to a dual governance arrangement in which formal state authority predominates while customary leadership retains significance in regulating access and ensuring compliance with informal rules. Although 53.9 per cent of respondents overall expressed trust in the UT administration as the primary decision-maker, this pattern varies markedly across villages. In Darchik and Kaksar, more than 96 per cent of households identified UT officials as the dominant authority, whereas in Hardas and Mushkoo traditional elders retained greater influence (73.3 per cent and 51.7 per cent, respectively). A chi-square test confirms that the distribution of authority across governance actors differs significantly by village ($\chi^2 = 184.12$, $p < 0.001$). Qualitative interviews reinforce this interpretation, with respondents describing layered and negotiated governance arrangements in which formal approvals from district or LAHDC officials are often complemented by informal agreements mediated by the goba and other community leaders.

Then examine the Politics of Engagement Index (PEI), which captures the extent to which households perceive themselves as able to influence CPR governance. Overall, the PEI score is moderate (mean ≈ 0.410, SD $\approx$ 0.106), suggesting limited but non-negligible political engagement. The relatively narrow dispersion indicates that while few households enjoy high levels of influence, most occupy broadly similar positions within the governance hierarchy. However, engagement levels vary significantly across villages (ANOVA, $p < 0.001$). Households in Darchik and Mushkoo report comparatively higher engagement (PEI ≈ 0.45), whereas those in Kaksar exhibit substantially lower levels (PEI ≈ 0.32). This spatial variation likely reflects differences in institutional flexibility: despite relatively high CPR availability in Kaksar, more rigid administrative controls appear to constrain local participation, while Mushkoo and Darchik retain more active village-level institutions. All PEI sub-dimensions also show statistically significant inter-village variation ($p < 0.05$).

Patterns of political engagement further diverge across community groups. As shown in Table 4, the Dard community reports the highest overall PEI (0.451), driven primarily by an exceptionally high score on the military–political interface dimension (0.949). This reflects the intense visibility and influence of military institutions in Darchik, where proximity to forward posts makes security considerations central to resource access. Balti households exhibit the next highest level of engagement (PEI = 0.429), accompanied by moderate military influence (0.448). In contrast, Purig and Shina communities report lower overall engagement (0.392 and 0.368, respectively). These differences are statistically significant (ANOVA, $p < 0.001$) and underscore the community-specific nature of political engagement in CPR governance. Groups characterized by stronger internal cohesion or greater exposure to security pressures tend to be more engaged, while smaller or less militarized communities remain relatively marginalized. Together, these findings highlight how power relations, representation, and institutional context shape uneven patterns of engagement within Ladakh's plural CPR governance regime.

Table 4 Politics of Engagement Index (PEI) and Its Dimensions Across Communities

Parameters	Community	N	Mean	Std. Deviation	Std. Error	ANOVA
Power and influence in CPR governance	Balti,	120	.394	.175	.016	F (3,241) = 6.517, p=0.000
	Dard	31	.339	.084	.015	
	Purig	11	.477	.151	.046	
	Shina	83	.460	.131	.014	
	Total	245	.413	.156	.010	
Political involvement and policy impact	Balti,	120	.268	.274	.025	F (3,241) = 0.473, p=0.702
	Dard	31	.280	.125	.022	
	Purig	11	.303	.267	.080	
	Shina	83	.241	.141	.015	
	Total	245	.262	.220	.014	
Community representation and participation	Balti,	120	.419	.132	.012	F (3,241) = 35.663, p=0.000
	Dard	31	.165	.118	.021	
	Purig	11	.313	.217	.065	
	Shina	83	.170	.254	.028	
	Total	245	.298	.221	.014	
Military–political interface	Balti,	120	.448	.262	.024	F (3,241) = 58.405, p=0.000
	Dard	31	.949	.130	.023	
	Purig	11	.356	.274	.083	
	Shina	83	.390	.124	.014	
	Total	245	.487	.275	.018	
Cultural and geopolitical	Balti,	120	.619	.251	.023	F (3,241) = 2.307, p=0.077
	Dard	31	.524	.099	.018	
	Purig	11	.511	.308	.093	
	Shina	83	.577	.164	.018	
	Total	245	.588	.215	.014	
Politics of Engagement Index (PEI)	Balti,	120	.429	.120	.011	F (3,241) = 8.066, p=0.000
	Dard	31	.451	.055	.010	
	Purig	11	.392	.125	.038	
	Shina	83	.368	.082	.009	
	Total	245	.410	.106	.007	

Source: Primary Survey, 2025

With regards to the determinants of CPR utilization is provided by the correlation and regression analyses linking governance-related factors to household resource use. Table 5 presents a multiple linear regression model in which the Utilization Index (UI) serves as the dependent variable, with threat perception, political engagement, and governance dimensions included as predictors. Together, these variables explain a substantial proportion of the variation in CPR use ($R^2 = 0.381$; adjusted $R^2 = 0.366$), indicating strong explanatory power.

Among the predictors, the Threat Perception Index exerts a pronounced negative effect on CPR utilization ($\beta = -0.396$, $p < 0.001$). This suggests that households perceiving higher levels of ecological or geopolitical risk arising from factors such as climate change, environmental degradation, or military intrusion are significantly less likely to rely on common resources. The Politics of Engagement Index shows a weak negative association with utilization ($\beta = -0.109$), although this effect is not statistically significant ($p = 0.080$), indicating that higher political engagement does not necessarily translate into increased CPR use.

In contrast, governance-related variables display strong and positive effects. Perceived enforcement and institutional trust are significantly associated with higher levels of CPR utilization ($\beta = 0.347$, $p < 0.001$), as is participation and inclusiveness in decision-making processes ($\beta = 0.422$, $p < 0.001$). These findings indicate that when households perceive CPR governance as fair, participatory, and effectively enforced, they are more likely to engage actively in the use of shared resources. Conversely, perceived governance changes following Ladakh's transition to Union Territory status have a modest but significant negative effect on utilization ($\beta = -0.216$, $p = 0.047$), suggesting that recent top-down institutional restructuring may have temporarily disrupted established patterns of resource use. Notably, the variable capturing the formal role and authority of institutions has no discernible effect ($\beta \approx 0$, $p \approx 0.99$), underscoring that formal authority alone absent trust and enforcement does not shape household behavior.

Correlation analysis further supports these results. Household CPR utilization is positively and significantly associated with all five governance perception dimensions, with Pearson correlation coefficients ranging from 0.277 to 0.406 ($p < 0.01$). The strongest association is observed with perceptions of change over time ($r = 0.406$), followed by participation and inclusiveness ($r = 0.389$) and governance changes since Union Territory reorganization ($r = 0.361$). These moderate-to-strong relationships indicate that households holding more favorable views of governance particularly those perceiving institutional change as positive and inclusive tend to rely more heavily on CPRs. These results emphasise the central role of institutional trust, participatory governance, and perceived legitimacy in sustaining the use of common property resources.

Table 5 Regression of Utilization Index on Key Factors

Predictor	Std. β	p-value
Threat Perception Index (TPI)	–0.396 **	<0.001
Politics of Engagement (PEI)	–0.109	0.080
Governance Change (UT status)	–0.216 *	0.047
Enforcement & Trust (Institutional)	0.347 **	<0.001
Participation & Inclusiveness	0.422 **	<0.001
Model: R^2=0.381, F(6,238)=24.46 **		

Source: Primary Survey, 2025

Finally, study examine how the observed governance and threat-related factors translate into the composite Sustainability Index (SI) of common property resources at both the village and social-group levels. The SI captures long-term CPR viability by integrating ecological conditions with socio-institutional resilience. As shown in Table 6, sustainability outcomes vary significantly across villages (ANOVA, $F(4,240) = 115.21$, $p < 0.001$). Among the study villages, Kaksar records the highest mean SI (0.7684, SD = 0.0394), followed by Mushkoo (0.6046, SD = 0.1027) and Hardas (0.5605, SD = 0.0709). In contrast, Shilikchay exhibits the lowest sustainability score (0.4442, SD = 0.1147), indicating comparatively weaker ecological and institutional resilience. Pairwise comparisons reveal no statistically significant difference in sustainability between Drass tehsil (mean SI = 0.602) and Kargil tehsil (mean SI = 0.585; $t = 0.607$, $p = 0.545$), suggesting that broader administrative location exerts less influence on CPR sustainability than village-level governance arrangements. In contrast, differences across ethnic communities are pronounced. Shina households display the highest mean sustainability (0.711, SD = 0.104), while Purig households report the lowest (0.371), with the overall variation across communities being statistically significant (ANOVA, $F(3,241) = 82.071$, $p < 0.001$). Socio-economic status, measured through ration card classification, shows only modest effects: households above the poverty line report slightly higher sustainability scores than those below the poverty line (0.612 versus 0.567), though this difference is not statistically significant ($p = 0.076$).

Table 6 Sustainability Index of Common Property Resources across Villages, Communities, and Social Groups

Variable	Category	N	Mean Sustainability Index	Std. Deviation	Std. Error	ANOVA/ t-test
Revenue Village	Darchik	27	.5467	.0512	.0099	F (4, 240)= 115.211, p=0.000
	Hardas	86	.5605	.0709	.0076	
	Kaksar	54	.7684	.0394	.0054	
	Mushkoo	29	.6046	.1027	.0191	
	Shilikchay	49	.4442	.1147	.0164	
	Total	245	.5868	.1342	.0086	
Tehsil	Drass	27	.602	.105	.020	t (243)=0.607, p=0.545
	Kargil	218	.585	.137	.009	
	Total	245	.587	.134	.009	
Community	Balti,	120	.531	.099	.009	F (3, 241)=82.071, p=0.000
	Dard	31	.545	.050	.009	
	Purig	11	.371	.074	.022	
	Shina	83	.711	.104	.011	
	Total	245	.587	.134	.009	
Ration Card	APL	106	.612	.128	.012	F (3, 241)=2.323, p=0.076
	AAY	2	.597	.092	.065	
	BPL	136	.567	.137	.012	
	PHH	1	.629			
	Total	245	.587	.134	.009	

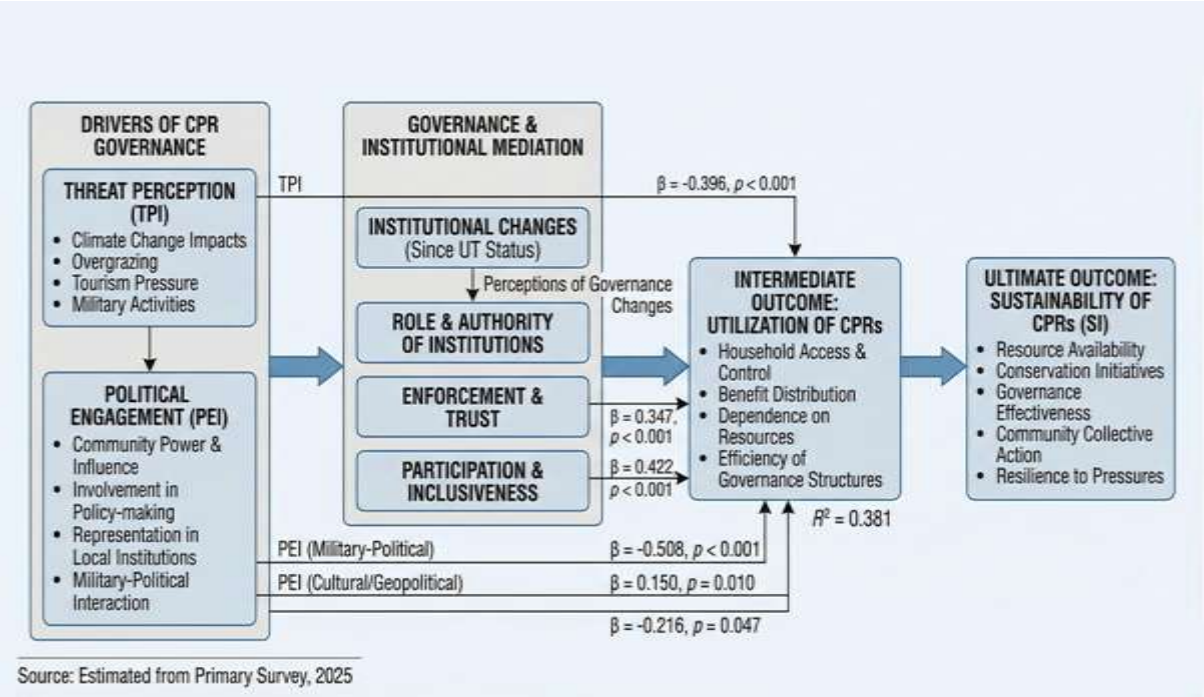
Source: Primary Survey, 2025

These findings indicate that villages and social groups characterized by stronger governance mechanisms and lower perceived threats tend to exhibit higher levels of CPR sustainability. Kaksar's high sustainability score, coincides with relatively abundant pasture resources and cohesive collective action, despite its comparatively

lower Politics of Engagement Index. Conversely, Shilikchay's low sustainability reflects weaker governance performance and heightened environmental pressures. These patterns reinforce the conclusion that long-term CPR viability is shaped not only by ecological endowments but, crucially, by institutional effectiveness, social cohesion, and governance quality.

This study also proposes a conceptual model to explain CPR governance in Ladakh's border villages by linking threat perception, political engagement, governance, utilization, and sustainability. Perceived threats such as climate change, overgrazing, tourism, and military pressure, measured through the Threat Perception Index, directly influence how communities use CPRs. Political engagement shapes governance through power relations, representation, and military–civil interactions. Governance factors especially enforcement, trust, and inclusive participation mediate these influences and determine access and use of CPRs. Utilization acts as an intermediate outcome, reflecting dependence and management efficiency. Ultimately, sustainability emerges from effective governance, lower threats, and active community participation. Regression results strongly support this model, showing that high threat perception reduces CPR use, while inclusive governance and trust significantly enhance utilization and long-term sustainability.

Figure 2 Conceptual Model for Governing Common Property Recourses in Ladakh



Discussion

This study shows comprehensive account of how institutions, political engagement, and perceived threats interact to shape common property resource (CPR) outcomes in Ladakh's militarized border villages. Several interrelated findings emerge from the analysis. First, the findings reaffirm the central importance of governance quality and community engagement in shaping CPR utilization. Households that perceive CPR governance as fair, participatory, and institutionally responsive tend to rely more heavily on common resources. This pattern is consistent with Ostrom's foundational argument that effective local institutions characterized by monitoring, rule enforcement, and inclusion enable sustainable commons management. In

the present context, enforcement and trust, along with participation and inclusiveness, emerge as the strongest predictors of CPR use ($\beta \approx 0.35–0.42$). Where villagers believe that rules are enforced equitably and that their voices matter, they engage more actively with shared resources. By contrast, heightened threat perceptions linked to climatic stress, environmental degradation, or military restrictions significantly suppress CPR use ($\beta = -0.396$), suggesting that insecurity prompts withdrawal or defensive conservation. From an institutional perspective, governance quality mediates external stressors: trusted institutions can buffer communities against risk, whereas weak or opaque institutions amplify vulnerability.

Second, the study highlights the distinctly pluralistic yet asymmetric governance setting of Ladakh's commons. Authority over CPRs is formally concentrated in the Union Territory administration, which a majority of respondents identify as the dominant decision-making actor. This reflects the centralization of power following Ladakh's reorganization in 2019. At the same time, traditional institutions village councils, elders, and customary leaders retain substantial informal influence. This coexistence of formal centralization and informal local authority points to a polycentric but uneven governance arrangement. While statutory decentralization has been curtailed, informal decentralization persists, with communities continuing to negotiate access and compliance through customary channels. These dynamics align closely with institutional bricolage literature, which emphasizes how old and new institutional forms coexist and are continually renegotiated in periods of political transition.

The Politics of Engagement Index (PEI) further illuminates these patterns. The moderate overall PEI score (≈ 0.41) suggests limited but non-negligible political empowerment across communities. Formal political participation such as representation in statutory bodies remains weak, while influence exercised through local hierarchies is more pronounced. Importantly, engagement varies sharply across villages and communities. Higher PEI scores in Darchik and Mushkoo, and among Dard and Balti groups, reflect differential exposure to power and security structures. The exceptionally high military–political engagement score among Dard households underscores the salience of military presence in shaping everyday resource negotiations. In contrast, Shina and Purig communities appear relatively marginalized, likely due to smaller population size or weaker connections to dominant political networks. These patterns reveal that access to CPR governance in Ladakh is structured by both place and identity, producing uneven political participation. These findings carry important normative implications for representation and equity. As Cornwall and Gaventa argue, participation without attention to power asymmetries risks reproducing exclusion. In Ladakh, informal authority exercised by elders continues to mediate some inequalities, yet the dominance of state institutions constrains broader community voice. Notably, villages with greater bureaucratic presence do not necessarily exhibit higher political engagement, underscoring that authority without accountability does not generate participation. This is consistent with classic political science insights on delegation and legitimacy, and is reinforced by our regression results, which show that formal institutional authority alone has no effect on CPR use in the absence of trust and enforcement.

From a political ecology perspective, the results also resonate strongly with debates on the securitization of nature in borderlands. Elevated threat perceptions particularly in heavily militarized villages illustrate how security imperatives intrude into everyday livelihood practices. The observed association between threat perception and reduced CPR use suggests that militarization may, in some contexts, lead to resource withdrawal rather than overexploitation. While this may temporarily ease ecological pressure, it represents a fragile and livelihood-eroding form of "*conservation*." Sustainable outcomes depend on whether governance institutions can convert fear and insecurity into collective adaptation, such as negotiated access arrangements or alternative resource strategies. Our findings indicate that where institutional trust and participation are stronger, communities are more willing to continue using CPRs despite perceived risks.

Finally, the Sustainability Index integrates these dynamics into a longer-term perspective. High sustainability scores in villages such as Kaksar and among Shina communities point to relatively favorable governance–ecology configurations. Kaksar's strong sustainability performance reflects effective local institutions and lower perceived threats, even in the presence of modest political engagement. Conversely, Shilikchay's low sustainability underscores how weak governance capacity combined with environmental pressure undermines CPR resilience. These contrasts support a central conclusion of the study: neither ecological endowments nor institutions alone determine sustainability; rather, it is their interaction mediated through power, trust, and participation that shapes long-term outcomes.

Conclusion

This study reveals that in Ladakh's militarized borderlands, the sustainability of common property resources (CPRs) depends on a continual negotiation among state authority, traditional institutions, and local communities. Quantitative analysis shows that where governance is perceived as inclusive and rules are enforced fairly, CPRs are used more intensively and managed more sustainably. Conversely, heightened perceptions of external threats and exclusion linked to environmental stress and securitization are associated with withdrawal from commons. The coexistence of Union Territory authorities and village elders illustrates an institutionally plural system that is neither fully centralized nor wholly community-based; in practice, governance remains asymmetrically polycentric, with formal state actors holding ultimate authority while customary institutions mediate everyday access.

These findings have important policy implications. Strengthening grassroots governance through greater transparency, revitalization of customary councils, and recognition of community-based monitoring can enhance trust and participation. Security measures in border regions should also be designed to minimize disruption to local livelihood systems and resource access. Theoretically, the study contributes to debates on decentralization and political ecology by showing that partial devolution without meaningful participation yields limited outcomes, while local agency remains crucial even in highly securitized contexts. More broadly, the Ladakh case highlights that sustainability in border regions is as much an institutional and political achievement as an ecological one, requiring governance arrangements that balance security concerns with community stewardship.

References

Cornwall, A. (2008). Unpacking 'Participation': models, meanings and practices. *Community development journal*, *43*(3), 269-283.

Dame, J., & Nüsser, M. (2011). Food security in high mountain regions: Agricultural production and the impact of food subsidies in Ladakh, Northern India. *Food Security*, *3*(2), 179-194.

Gaventa, J. (2006). Finding the spaces for change: a power analysis. *IDS bulletin*, *37*(6), 23-33.

Hardin, G. (1968). The tragedy of the commons: the population problem has no technical solution; it requires a fundamental extension in morality. *science*, *162*(3859), 1243-1248.

Nüsser, M., Dame, J., Kraus, B., Baghel, R., & Schmidt, S. (2019). Socio-hydrology of "artificial glaciers" in Ladakh, India: assessing adaptive strategies in a changing cryosphere. *Regional Environmental Change*, *19*(5), 1327-1337.

O'donell, G. A. (1994). Delegative democracy. *Journal of democracy*, *5*(1), 55-69.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.

Peluso, N. L., & Vandergeest, P. (2011). Political ecologies of war and forests: Counterinsurgencies and the making of national natures. *Annals of the Association of American Geographers*, *101*(3), 587-608.

Wester, P., Mishra, A., Mukherji, A., & Shrestha, A. B. (2019). *The Hindu Kush Himalaya assessment: mountains, climate change, sustainability and people* (p. 627). Springer Nature.

Zimmerer, K. S., & Bassett, T. J. (Eds.). (2012). *Political ecology: an integrative approach to geography and environment-development studies*. Guilford Press.