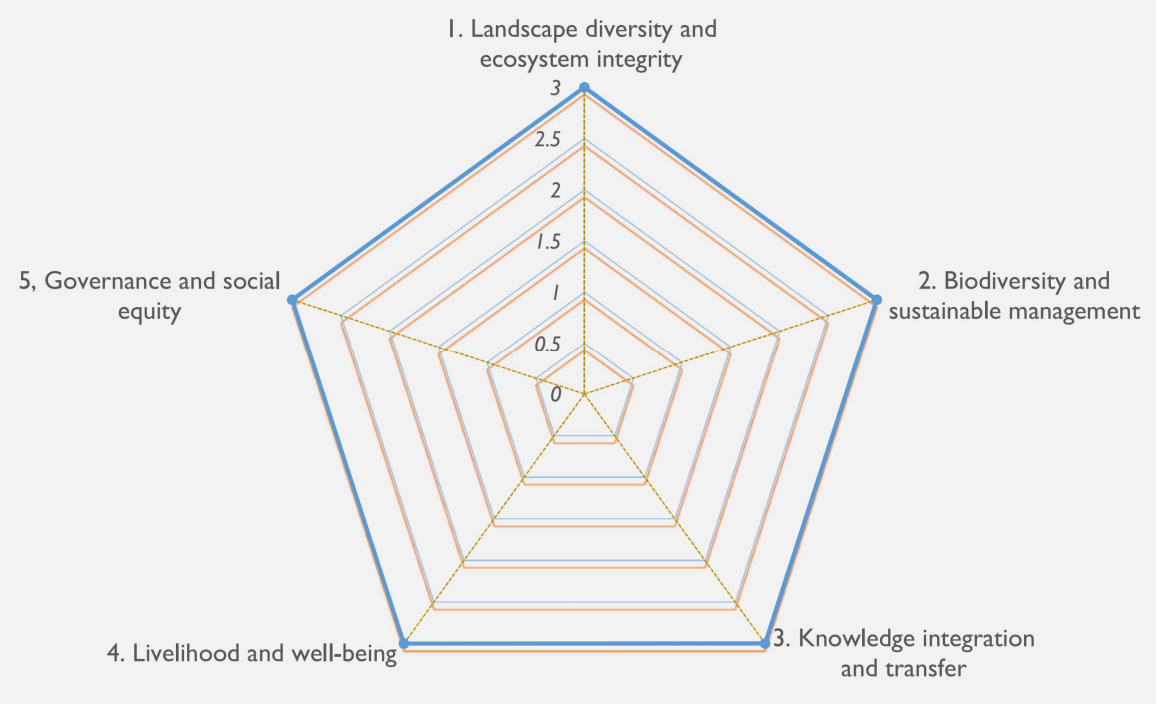
Community Development and Knowledge Management for Satoyama Initiatives (COMDEKS)- Phase 4

Baseline SEPLS Satoyama Initiatives Indicator Performance in Detail for the Lower Tamor Landscape, Nepal



Baseline Survey: SEPLs Indicator Performance

The baseline survey for COMDEKS Phase IV in the Lower Tamor landscape aims to establish a comprehensive benchmark of the current socio-ecological status. This baseline data is crucial for monitoring and evaluating the program's impact, informing adaptive management strategies, and ensuring that interventions are tailored to the specific needs and contexts of the communities and ecosystems within the landscape. The survey adopted a participatory and inclusive approach, ensuring the active involvement of all relevant stakeholders, recognizing the importance of local knowledge and perspectives in understanding the complexities of the SEPLS and in designing effective, community-led solutions.

Data collection for the baseline survey was structured around five indicators proposed by the Satoyama Initiative, reflecting the core components of socio-ecological production landscapes:

- Indicator 1 (I1): Landscape Diversity and Ecosystem Integrity – Measures the variety of ecosystems and habitats within the landscape and their overall health and resilience.
- Indicator 2 (I2): Biodiversity and Sustainable Management – Assesses the richness of biological life and the extent to which natural resources are managed sustainably.
- Indicator 3 (I3): Knowledge Integration and Transfer – Evaluates the extent to which traditional and modern knowledge are combined and shared for sustainable land management.
- Indicator 4 (I4): Livelihood and Well-being – Reflects the economic and social welfare of the communities, including access to resources and quality of life.
- Indicator 5 (I5): Governance and Social Equity – Examines the effectiveness of local institutions, community participation, and fairness in decision-making processes.

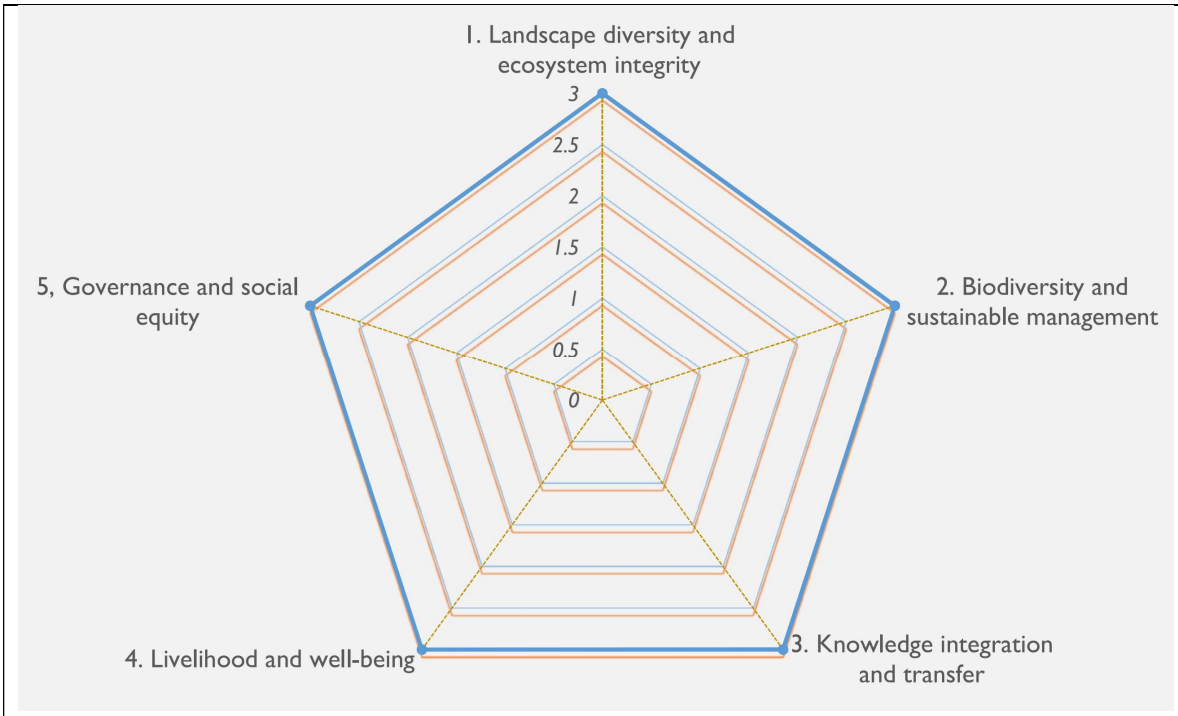


Figure 1: Indicators proposed by the Satoyama Initiative, reflecting the core components of socio-ecological production landscapes

3.1 Overall SEPLS Indicator Performance

An aggregate analysis of the interview data from the Lower Tamor Landscape provides a foundational understanding of the overall health of its socio-ecological production landscapes. Across 301 respondents, the average scores for the five SEPLS indicators fall within a moderate range, suggesting that while there are no critically low scores, there is also significant room for improvement across all dimensions. The relatively lower scores for ecological indicators (I1 and I2) compared to human-centric indicators (I3, I4, I5) suggests that the underlying ecological health of their landscape might be experiencing degradation or is already compromised. If the natural resource base continues to decline, it could eventually undermine the very livelihoods and well-being that communities currently perceive as moderate. This highlights the urgent need for interventions that explicitly link human prosperity to the regeneration and health of the ecosystem, promoting practices that build natural capital rather than deplete it.

Table 1: Average indicator scores

Indicator Thematic Area	Average Score (1-3)	Standard Deviation	Qualitative Assessment
I1: Landscape Diversity and Ecosystem Integrity	1.75	0.29	Moderate
I2: Biodiversity and Sustainable Management	1.88	0.23	Moderate
I3: Knowledge Integration and Transfer	1.88	0.18	Moderate
I4: Livelihood and Well-being	1.87	0.27	Moderate
I5: Governance and Social Equity	1.95	0.45	Moderate

Source: Field survey 2025
Note: Scores are based on a 1-3 scale, where 1 indicates lower perceived resilience and 3 indicates higher perceived resilience.

The indicator for Landscape Diversity and Ecosystem Integrity (I1) recorded the lowest average score at 1.75 with a standard deviation of 0.29, suggesting that the ecological foundation of the SEPLS faces considerable challenges. Moderate variability indicates location-specific pressures. Biodiversity and Sustainable Management (I2) averaged 1.88, indicating moderate efforts in conserving biodiversity and managing resources sustainably, but still below optimal levels. Knowledge Integration and Transfer (I3) achieved an average of 1.88, suggesting a fair degree of traditional and modern knowledge exchange, yet implying that mechanisms for effective knowledge application could be strengthened. Low standard deviation (0.18) indicates stable knowledge transfer systems. Livelihood and Well-being (I4) scored 1.87, pointing to moderate economic and social welfare among residents, with moderate variability (0.27 standard deviation) reflecting uneven livelihood opportunities. The highest average score was observed for Governance and Social Equity (I5) at 1.95, indicating relatively better perceived performance in local institutional effectiveness and equitable decision-making, though high standard deviation suggests significant disparities across communities.

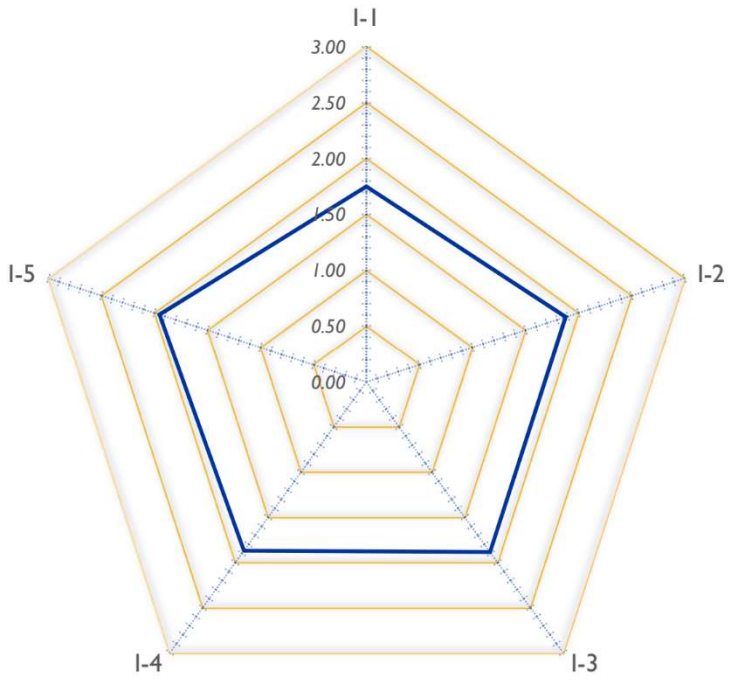


Figure 1: Spider chart illustrating indicator scores in the Lower Tamor Landscape

Municipality-Level Analysis

A detailed examination of indicator performance across the seven municipalities within the Lower Tamor Landscape reveals significant variations, underscoring the localized nature of SEPLS challenges and opportunities. Each municipality exhibits a unique profile of strengths and weaknesses, suggesting that a one-size-fits-all approach to SEPLS development would be ineffective. The disparities observed at the municipal level, where an indicator like Governance and Social Equity (I5) is strong in Barahachetra but weak in LaliGurans, point to highly localized factors influencing SEPLS performance. These differences are not random and suggest unique socio-economic, political, or environmental conditions specific to each municipality. For instance, a strong governance score might reflect effective local leadership or vibrant community-based organizations, while a weak score could indicate issues of corruption, limited citizen participation, or power imbalances. Understanding these localized drivers is essential for designing effective and context-sensitive programs.

Table 2: Indicator scores by municipality

Municipality	I1	I2	I3	I4	I5
Barahachetra	1.82	1.74	2.34	2.09	2.30
Chathar	1.36	1.74	1.97	2.08	2.11
Chathar Jorpati	1.73	2.05	1.67	1.81	1.99
Dhankuta	1.75	1.88	1.81	2.12	2.07
LaliGurans	1.88	1.92	1.82	1.62	1.70
Sahidbhumi	2.00	2.03	2.04	2.03	2.11
Sangurigadhi	2.29	1.56	1.94	1.72	1.96

Source: Field survey 2025

- Barahachetra (Sunsari): Shows strength in Knowledge Integration and Transfer (I3, 2.34) and Governance and Social Equity (I5, 2.30), indicating effective knowledge sharing and robust local governance. However, Biodiversity and Sustainable Management (I2, 1.74) and Landscape Diversity and Ecosystem Integrity (I1, 1.82) are relatively weaker, indicating potential areas for ecological improvement.
- Chathar (Tehrathum): Records the lowest score for Landscape Diversity and Ecosystem Integrity (I1, 1.36), highlighting a significant ecological challenge. Biodiversity and Sustainable Management (I2, 1.74) is also weak. Conversely, Livelihood and Well-being (I4, 2.08) and Governance and Social Equity (I5, 2.11) are perceived as stronger, suggesting that despite ecological pressures, communities perceive their socio-economic conditions and governance as relatively stable.
- Chathar Jorpati (Dhankuta): Demonstrates strength in Biodiversity and Sustainable Management (I2, 2.05) but struggles with Knowledge Integration and Transfer (I3, 1.67), its weakest indicator.
- Dhankuta (Dhankuta): Shows strength in Livelihood and Well-being (I4, 2.12) and Governance and Social Equity (I5, 2.05). Its weakest area is Knowledge Integration and Transfer (I3, 1.81).

- LaliGurans (Tehrathum): Stands out with the lowest scores for Livelihood and Well-being (I4, 1.62) and Governance and Social Equity (I5, 1.70), suggesting significant challenges in economic welfare and community participation. Biodiversity and Sustainable Management (I2, 1.92) is its strongest indicator.
- Sahidbhumi (Dhankuta): Exhibits relatively balanced performance, with Governance and Social Equity (I5, 2.11) as its strongest indicator. All other indicators are clustered around 2.00, suggesting a consistent and moderate level of SEPLS health.
- Sangurigadhi (Dhankuta): Shows notable strength in Landscape Diversity and Ecosystem Integrity (I1, 2.29), indicating relatively healthy natural systems. However, it records the lowest score for Biodiversity and Sustainable Management (I2, 1.56) and also struggles with Livelihood and Well-being (I4, 1.72).

Cluster Analysis

Based on the similarity of responses and elevation range of the selected wards within the Lower Tamor Landscape, six clusters were identified. When multiple municipalities within the same district or geographically proximate areas exhibit similar patterns of strength or weakness for a particular indicator, it suggests the influence of broader regional factors. For example, the consistently low scores for Landscape Diversity and Ecosystem Integrity (I1) across Chathar and LaliGurans municipalities may not be due to isolated local issues but rather a shared environmental challenge affecting the entire sub-region, such as widespread deforestation, impacts of climate change, or large-scale development projects. This implies that some challenges or opportunities transcend municipal boundaries and necessitate a coordinated, landscape-level approach rather than isolated, site-specific interventions.

- Cluster 1 (Barahakshetra and Sangurigadhi): Exhibits relative strengths in Landscape Diversity and Ecosystem Integrity (I1) and Biodiversity and Sustainable Management (I2), indicating a reasonably good natural resource base and management. However, it shows lower performance in Livelihood and Well-being (I4, ~1.3) and moderate levels in Knowledge Integration and Transfer (I3, ~1.7) and Governance and Social Equity (I5, ~1.5).

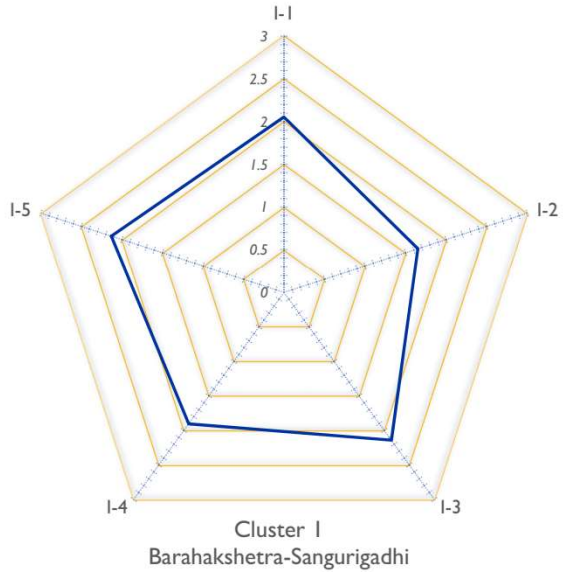


Figure 2: Spider chart illustrating indicator scores in cluster 1

- Cluster 2 (Dhangadi and Sahidbhumi): Presents strengths in Biodiversity and Sustainable Management (I2, ~2.0) and Knowledge Integration and Transfer (I3, ~2.0). Livelihood and Well-being (I4, ~1.2) is the weakest area, while Landscape Diversity and Ecosystem Integrity (I1, ~1.8) and Governance and Social Equity (I5, ~1.6) are moderate.

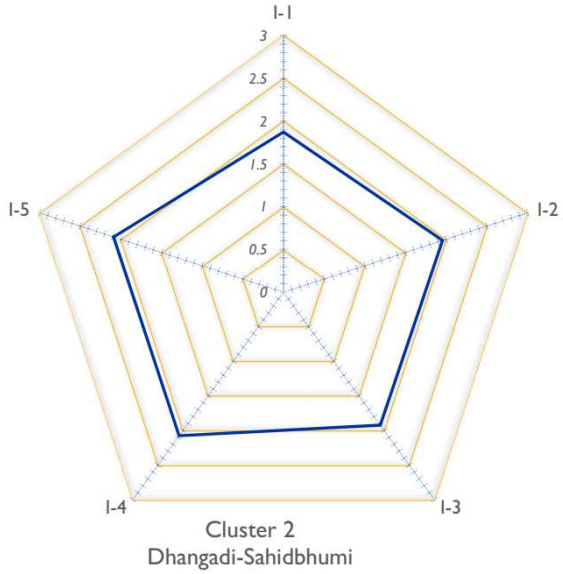


Figure 3: Spider chart illustrating indicator scores in cluster 2

- Cluster 3 (Chathar Jorpati): Shows strengths in Biodiversity and Sustainable Management (I2, ~2.0) and Governance and Social Equity (I5, ~1.8). Knowledge Integration and Transfer (I3, ~1.3) is the weakest area, with Landscape Diversity and Ecosystem Integrity (I1, ~1.8) and Livelihood and Well-being (I4, ~1.6) at moderate levels.
- Cluster 4 (Chathar): Displays strengths in Biodiversity and Sustainable Management (I2, ~2.0) and Knowledge Integration and Transfer (I3, ~1.9). Livelihood and Well-being (I4, ~1.0) is the weakest area, and Landscape Diversity and Ecosystem Integrity (I1, ~1.4) and Governance and Social Equity (I5, ~1.5) are moderate to slightly lower.
- Cluster 5 (LaliGurans Municipality wards 3, 6, and 8): Shows relative strength in Biodiversity and Sustainable Management (I2, ~1.75). Livelihood and Well-being (I4, ~1.0) is the weakest area, with Knowledge Integration and Transfer (I3, ~1.25) also low. Landscape Diversity and Ecosystem Integrity (I1, ~1.5) and Governance and Social Equity (I5, ~1.5) are moderate.

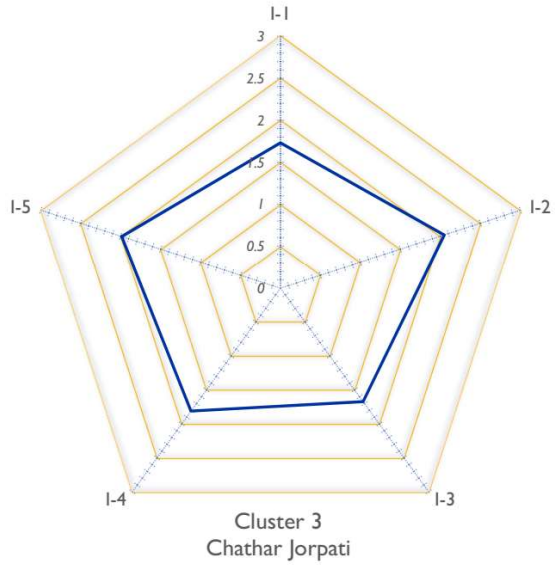


Figure 4: Spider chart illustrating indicator scores in cluster 3

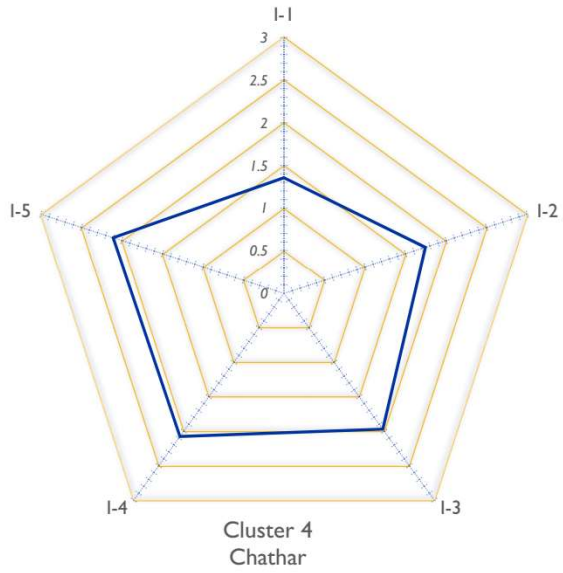


Figure 5: Spider chart illustrating indicator scores in cluster 4

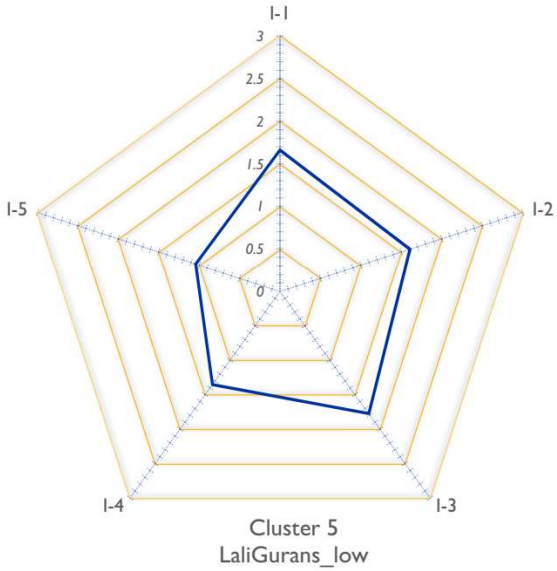


Figure 6: Spider chart illustrating indicator scores in cluster 5

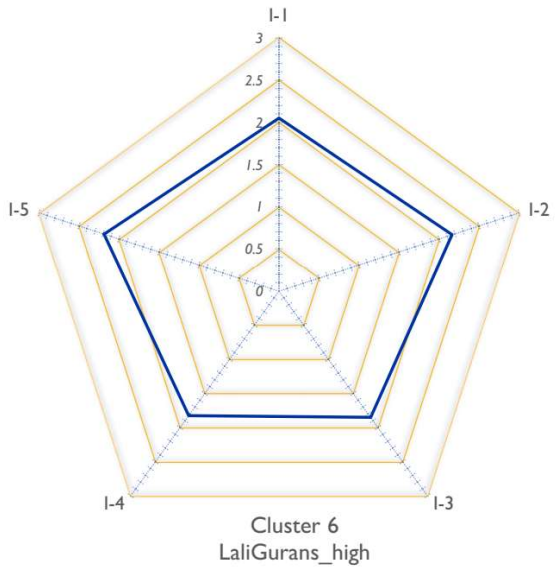


Figure 7: Spider chart illustrating indicator scores in cluster 6

Cluster 6 (LaliGurans Municipality wards 1, 7, and 9): Exhibits strengths in Landscape Diversity and Ecosystem Integrity (I1, ~2.0), Biodiversity and Sustainable Management (I2, ~2.0), and Knowledge Integration and Transfer (I3, ~1.9). Livelihood and Well-being (I4, ~1.3) is lower, and Governance and Social Equity (I5, ~1.5) is moderate.

The consistent pattern of lower scores for "Livelihood and Well-being" (I4) across multiple clusters and demographic groups, despite varying strengths in other indicators, suggests that economic vulnerability is a pervasive, cross-cutting challenge in the Lower Tamor Landscape. This indicates a systemic issue, not just isolated incidents. Therefore, while other areas (e.g., governance, knowledge transfer) may need strengthening, improving livelihoods must be a central and prioritized focus for COMDEKS interventions across the entire landscape, with targeted approaches for the most vulnerable groups.

Demographic Analysis

Understanding how different demographic groups perceive and experience the SEPLS indicators is vital for ensuring equitable and inclusive development. This section disaggregates indicator

performance by gender, age, and social group, revealing critical disparities and potential areas for targeted support.

Gender-Based Analysis

An analysis of indicator performance by gender reveals notable differences in the perceptions and experiences of male and female respondents across the Lower Tamor Landscape. While both genders generally report moderate scores, male respondents consistently show slightly higher average scores across all five indicators. The most significant differences are observed in Livelihood and Well-being (I4) and Governance and Social Equity (I5), where male average scores are 0.13 to 0.16 points higher than female scores. For instance, a male respondent from LaliGurans ward 5 scored 2.25 for Governance and Social Equity, while a female respondent from LaliGurans ward 6 scored 1.0 for the same indicator. This pattern indicates potential underlying systemic inequalities related to gender roles, access to resources, and participation in community decision-making. Women often face greater barriers in areas such as land ownership, access to credit, educational opportunities, and representation in local governance structures. These barriers directly impact their ability to secure livelihoods and influence the management of SEPLS. The observed disparities are not merely statistical variations; they reflect deeply entrenched social norms and power dynamics that can impede equitable and effective SEPLS management. If a significant portion of the population, such as women, is marginalized from decision-making processes or lacks adequate livelihood support, the full potential of SEPLS revitalization cannot be achieved. These findings highlight the necessity for gender-sensitive interventions, such as promoting women's leadership, ensuring their active inclusion in community resource management groups, and providing targeted livelihood support that addresses the specific needs and challenges faced by women.

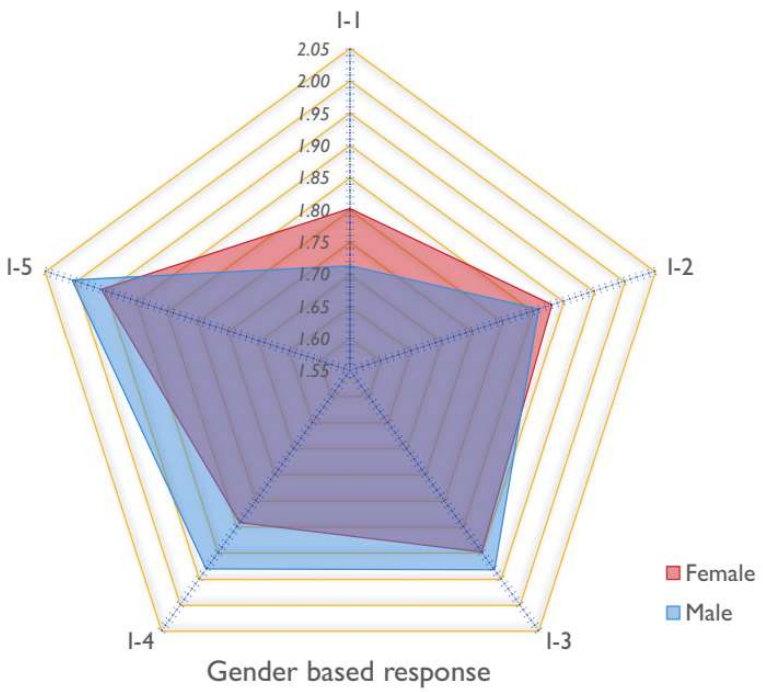


Figure 8: Spider chart illustrating indicator scores by gender

Age-Based Analysis

The analysis of indicator performance across different age groups reveals very close perceptions related to the indicators of SEPLS. Three age categories were defined: young adult (20-39 years), middle-age adult (40-59 years), and senior (60+ years). The observed patterns point to potential intergenerational differences in knowledge transfer and livelihood adaptation. Older generations often possess rich traditional ecological knowledge (TEK), which is crucial for sustainable landscape management. However, they may face difficulties in adapting to evolving economic landscapes or may be more vulnerable to economic shifts. Younger generations, while potentially more economically active or open to new ideas, might have a weaker connection to traditional land management practices or a different understanding of ecological indicators. This dynamic underscores the importance of fostering mechanisms for traditional knowledge to be passed down and integrated with modern sustainable practices. It also suggests the need for livelihood diversification strategies that cater to the specific needs of different age groups, ensuring that both traditional wisdom is preserved and new opportunities are created, thereby preventing the erosion of SEPLS values.

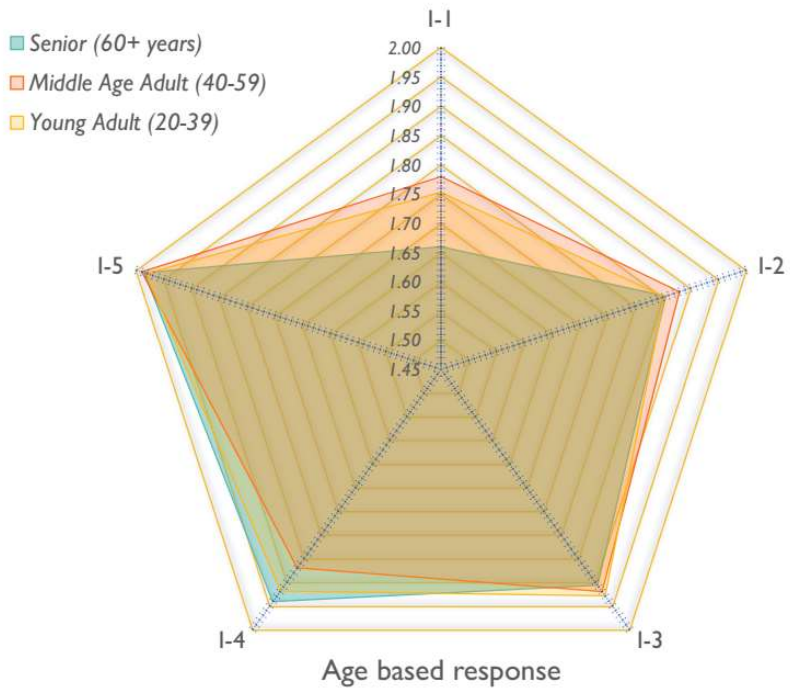


Figure 9: Spider chart illustrating indicator scores by age group

Social Group-Based Analysis

The analysis of SEPLS indicator performance across various social groups reveals significant disparities, highlighting the presence of structural inequalities and potential marginalization within the Lower Tamor Landscape. The dataset identifies groups such as Dalit, Hill-Brahmin, IPLCs (Indigenous Peoples and Local Communities), Kshetri, Others, and Yakthung/Limbu (though also IPLCs, their perception is separately presented due to higher numbers). The data indicates that certain social groups, particularly Yakthung/Limbu and 'Others', exhibit lower average scores in ecological indicators (I1) compared to other groups. The Kshetri and Hill-Brahmin groups show notably lower scores in Livelihood and Well-being (I4) and Governance and Social Equity (I5). Conversely, the Dalit group shows a relatively strong performance in Knowledge Integration and Transfer (I3), particularly reflecting water-based traditional practices, while IPLCs generally score well across ecological and governance indicators. If marginalized social groups, such as 'Dalit', consistently report lower scores across multiple indicators, particularly Livelihood and Well-

being and Governance and Social Equity, this indicates deep-seated structural inequalities and discrimination. For example, Parwati BK, a Dalit female from LaliGurans ward 8, scored 1.0 for both Livelihood and Well-being and Governance and Social Equity. Similarly, Anisha Jogi, categorized as 'Others' from LaliGurans ward 6, scored 1.0 for Governance and Social Equity. These groups often face historical disadvantages, including limited access to land, education, and political representation, which directly impacts their ability to participate in and benefit from various initiatives. This is a critical finding for equitable development, implying that SEPLS interventions must explicitly address issues of social justice and inclusion. Without targeted efforts to empower marginalized groups, the benefits of SEPLS initiatives may disproportionately accrue to dominant groups, thereby exacerbating existing inequalities.

Table 3: Indicator scores by social group

Indicator Name	Dalit	Hill-Brahmin	IPLCs	Kshetri	Others	Yakthung/Limbu
Landscape Diversity and Ecosystem Integrity (I1)	1.82	1.65	1.91	1.64	1.53	1.54
Biodiversity and Sustainable Management (I2)	1.87	1.77	1.94	1.84	1.81	1.86
Knowledge Integration and Transfer (I3)	2.12	1.93	1.89	1.93	1.85	1.87
Livelihood and Well-being (I4)	1.91	1.85	1.92	1.84	1.88	1.93
Governance and Social Equity (I5)	2.08	1.93	2.10	1.66	1.89	1.93

Source: Field survey 2025

These findings underscore the necessity of designing equitable and inclusive development programs that specifically target the needs of vulnerable or marginalized communities. This ensures that SEPLS benefits are shared fairly and that all voices are heard in governance and management processes.

Cross-Cutting Analysis and Interdependencies

Moving beyond isolated analyses, examining the inter-section of demographic factors with municipal performance and the interdependencies between indicators provides a more holistic

understanding of the complex dynamics within the Lower Tamor Landscape SEPLS. The cross-referencing of data reveals patterns of compound vulnerabilities and resilience hotspots. For example, the observation that Dalit women in LaliGurans municipality consistently report lower scores on Livelihood and Well-being (I4) and Governance and Social Equity (I5) illustrates a particularly disadvantaged sub-group. This is not merely a gender issue, a social group issue, or a municipal issue in isolation, but a combination of all three, creating heightened vulnerability. This level of analysis is critical for developing highly targeted and effective interventions. For vulnerable groups, interventions can be designed to address the specific intersection of their disadvantages, such as livelihood programs tailored for Dalit women, coupled with efforts to increase their representation in local decision-making. For resilience hotspots, the implication is to study and replicate their success factors, understanding what contributes to their thriving and how those lessons can be applied elsewhere. This approach moves beyond broad generalizations to pinpoint precise areas for action.

Furthermore, the analysis suggests interdependencies and feedback loops between the indicators. For instance, municipalities or demographic groups with lower scores in Landscape Diversity and Ecosystem Integrity (I1) often also exhibit lower scores in Livelihood and Well-being (I4). This suggests a direct link where a degraded environment impacts the ability of communities to derive sustainable livelihoods. The low scores for I1 across Chathar (1.31) and LaliGurans (1.71) could indicate that these areas face environmental pressures that directly affect the natural resources essential for local livelihoods. Conversely, if strong governance (I5) is consistently associated with higher scores in Biodiversity and Sustainable Management (I2), it indicates that effective local institutions are crucial for environmental stewardship. These are not isolated phenomena but components of a complex socio-ecological system where changes in one element can ripple through others. For example, improved knowledge integration (I3) could lead to better sustainable management practices (I2), which in turn contributes to healthier ecosystems (I1) and more resilient livelihoods (I4). This understanding is crucial for designing integrated SEPLS interventions, as addressing a single indicator in isolation may not be effective. Interventions should aim to strengthen positive feedback loops and break negative ones, ensuring that efforts contribute to the holistic revitalization of the SEPLS.

Proposed Strategic Phasing of Implementation

The implementation strategy recognizes that the Lower Tamor Landscape encompasses diverse socio-ecological conditions that require differentiated approaches rather than uniform interventions across all areas. Based on the baseline survey analysis, six distinct socio-ecological clusters have been identified that reflect similar response patterns and elevation ranges, enabling targeted interventions that address specific strengths and weaknesses within each cluster while contributing to overall landscape resilience.

Cluster 1, encompassing Barahakshetra and Sangurigadhi areas, exhibits relative strengths in Landscape Diversity and Ecosystem Integrity but demonstrates lower performance in Livelihood and Well-being. This pattern suggests that while natural resource bases remain relatively healthy, communities struggle to translate these assets into sustainable economic benefits. Priority interventions for this cluster focus on income-generating projects that can capture value from existing ecological resources, including ecotourism development, sustainable NTFP harvesting and processing, and value chain development for traditional products that can access premium markets.

Cluster 2, including Dhangadi and Sahidbhumi areas, shows notable strengths in Biodiversity and Sustainable Management and Knowledge Integration and Transfer but faces significant challenges in Livelihood and Well-being. This combination suggests that communities possess strong traditional knowledge and effective resource management systems but lack market access and economic opportunities to benefit from their stewardship efforts. Interventions for this cluster prioritize market linkage development, cooperative formation, and enterprise development that can provide economic returns for conservation activities while maintaining sustainable management practices.

Cluster 3, represented by Chathar Jorpati, presents strengths in Biodiversity and Sustainable Management and Governance and Social Equity but shows weakness in Knowledge Integration and Transfer. This pattern indicates effective local institutions and sustainable practices but limited mechanisms for knowledge sharing and capacity building that could enhance overall effectiveness. Priority interventions include establishment of farmer field schools, inter-community exchange programs, and documentation of traditional practices that can strengthen knowledge systems while building upon existing governance strengths.

Cluster 4, encompassing Chathar areas, demonstrates strength in Biodiversity and Sustainable Management and Knowledge Integration and Transfer but faces critical challenges in Landscape Diversity and Ecosystem Integrity and Livelihood and Well-being. This combination suggests that while communities possess knowledge and some management capacity, the underlying ecological foundation requires restoration while economic opportunities remain limited. Ecosystem restoration becomes the priority intervention, combined with livelihood diversification that can provide alternative income sources while ecological systems recover.

Clusters 5 and 6, covering different wards within LaliGurans Municipality, show varied profiles that require differentiated approaches despite geographic proximity. Cluster 5 exhibits relative strength in Biodiversity and Sustainable Management but faces challenges across all other indicators, requiring comprehensive interventions that address ecosystem restoration, livelihood development, and governance strengthening simultaneously. Cluster 6 shows relative strengths in multiple indicators but still requires targeted support for livelihood enhancement and governance improvement.

This cluster-based approach enables strategic phasing that addresses the most critical needs first while building upon existing strengths and creating demonstration effects that can be replicated across other areas. The phasing recognizes that some interventions must precede others to maximize effectiveness and ensure sustainable outcomes.