Human-wildlife Conflict Management Conflict to Co-existence Strategy for Dekiling Gewog (2026-2030)

Divisional Forest Office, Sarpang
Department of Forests and Park Services
Ministry of Energy and Natural Resources

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Acronyms

Acronym	Full Form
C2C	Conflict to Co-existence
HWC	Human–Wildlife Conflict
DFO	Divisional Forest Office
DoFPS	Department of Forests and Park Services
WWF	World Wildlife Fund
IKI	International Climate Initiative
UNDP	United Nations Development Programme
NBC	National Biodiversity Centre
RWSS	Rural Water Supply and Sanitation
GC	Gewog Center
QRT	Quick Response Team
HEC	Human–Elephant Conflict
SoP	Standard Operating Procedures
SMART	Spatial Monitoring and Reporting Tool
RO	Range Officer
UI	Understanding Interactions
IUCN	International Union for Conservation of Nature
SSC	Species Survival Commission
NCD	Nature Conservation Division
FMID	Forest Monitoring & Information Division
NAAEE	North American Association for Environmental Education

Acknowledgement

The C2C Strategy for Dekiling Gewog is the result of a collective and dedicated effort by the staff of the Divisional Forest Office, Sarpang. The Division sincerely acknowledges the commitment, professionalism, and teamwork demonstrated by all officers and staff who contributed their time, experience, and technical inputs toward the successful formulation of this strategy. Their sustained engagement throughout the process ensured that the document is comprehensive, practical, and grounded in field realities.

The formulation of this strategy was made possible through the unwavering support and guidance of the Department and WWF, Bhutan. The Division is deeply grateful for their strategic direction, technical advice, and continuous encouragement. The Division further expresses its sincere gratitude to the IKI Project, *"Living Landscapes: Securing High Conservation Values in South-Western Bhutan,"* for its generous financial support, which enabled the conduct of comprehensive socio-economic and field surveys. The data generated through these assessments formed a critical foundation for evidence-based planning and significantly informed the management interventions contained in this strategy. WWF–Bhutan, together with the Project Coordination Unit, played a pivotal role in facilitating the timely procurement of essential equipment and field gear, and in delivering capacity-building programs. These interventions greatly strengthened the technical capacity of the field teams involved in the assessment.

The Division would like to extend special appreciation to Mr. Wangdi, Senior Forestry Officer of DFO-Sarpang, who played a crucial leadership role in guiding and coordinating the formulation of this strategy. His dedication, technical oversight, and leadership were instrumental in bringing the C2C planning process to completion. Finally, the Division extends its heartfelt thanks to all individuals, institutions, and stakeholders who, in various capacities, contributed to the development of this strategy. Their collective efforts have resulted in a key milestone that will guide Human Wildlife Conflict management and their co-existence in Dekiling Gewog in the years to come.

1. Introduction

HWC (HWC) is a critical challenge in Bhutan, a nation celebrated for its dedication to conservation and environmental protection. Although Bhutan has made significant strides in preserving biodiversity—with forests covering around 69.71% of its land (DoFPS, 2023) and over 11,000 documented species (NBC, 2019)—the coexistence of humans and wildlife presents ongoing difficulties. With more than 54% of the population relying on subsistence farming (UNDP, 2021), conflicts are especially severe in regions where farmlands and villages border wildlife habitats.

Sarpang Dzongkhag in southern Bhutan highlights these issues. Its vast forests and diverse ecosystems support species such as elephants, barking deer, peafowl, and wild pigs, which often clash with local communities. Crop destruction, property damage, and even human casualties undermine livelihoods and safety, hindering progress toward sustainable development goals like poverty reduction and biodiversity conservation.

To address these challenges, the Conflict to Coexistence (C2C) strategy, supported by WWF-IKI, has been introduced. This approach fosters collaboration among communities, service providers, and local leaders to turn conflicts into opportunities for peaceful coexistence. By combining field assessments, stakeholder involvement, and adaptive solutions, C2C aims to balance biodiversity protection with the needs of rural populations.

This strategy outlines findings from recent field studies and community discussions in Dekiling gewog, proposing a framework for sustainable harmony. By merging scientific research, traditional knowledge, and policy measures, Bhutan strives to create a model where thriving ecosystems and human communities coexist, offering a blueprint for managing shared landscapes worldwide.

2. Goal and Objectives

Goal: “To ensure harmonious co-existence between wildlife and people through holistic approach”.

Objectives

- Safeguard people and their livelihood/assets alongside wildlife presence.
- Secure wildlife and its habitat to sustain a healthy and resilient wildlife population.

3. Methodology

3.1 Description of site

Dekiling gewog, located within Sarpang Dzongkhag, covers an area of 113 km^2, with 88% forest coverage. It is situated 12 kilometers from Dzongkhag Headquarters, at an elevation ranging from 220 to 2102 masl. The gewog is home to 1164 households, supporting a total population of 5284 individuals, comprising males (n=2759) and females (n=2525). Fundamental services are exceptionally well-covered, with 100% access to drinking water, electricity and mobile networks for all residents.

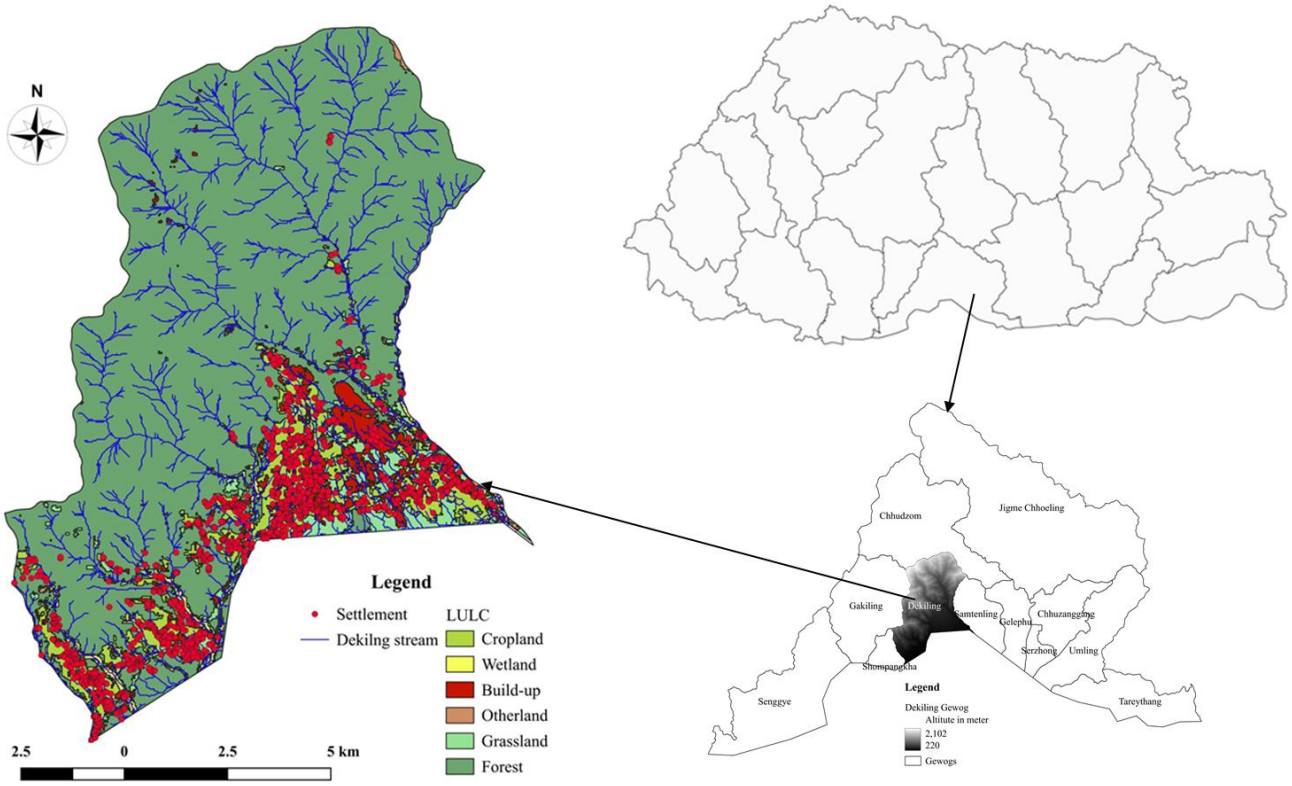

Figure 1: Location of C2C area

In terms of social services, Dekiling gewog has a healthcare infrastructure that includes two Primary Health Centers and one Outreach Clinic, though no hospitals or sub-posts are recorded. Healthcare services are supported by 11 village health workers and 37 individuals working under Rural Water Supply and Sanitation (RWSS).

The economy of Dekiling gewog is largely agricultural. It has a total of 587 acres of wetland (464 acres cultivated and 123 acres fallow) and a significant 2,700 acres of dryland (1,400 acres cultivated and 1,300 acres fallow). Irrigation is provided through 19 locations, with a total of 47 km of irrigation channels.

Crop protection is enhanced by 14 electric fences in various areas, with a combined total length of 34.04 km.

For transportation infrastructure, gewog has 1.4 kilometers of Gewog Center (GC) road and 18 farm roads, with a total length of 53.87 kilometers for farm roads.

3.2 Methods: C2C Framework

The C2C framework presents a holistic and structured approach to transforming HWC into sustainable coexistence. It centers on four interconnected outcomes: safeguarding human well-being, conserving wildlife, protecting livelihoods and assets, and preserving natural habitats. These outcomes reflect the need for balanced, win-win solutions that benefit both people and wildlife. For example, preventing elephant raids not only secures crops but also aids in elephant conservation. To achieve this, the framework outlines six interdependent management elements: strong policy and governance, proactive prevention measures, rapid response to conflicts, understanding human wildlife interactions through research and local knowledge, mitigation of immediate impacts, and continuous monitoring. These elements function in a cyclical and adaptive manner, evolving with ecological and social conditions.

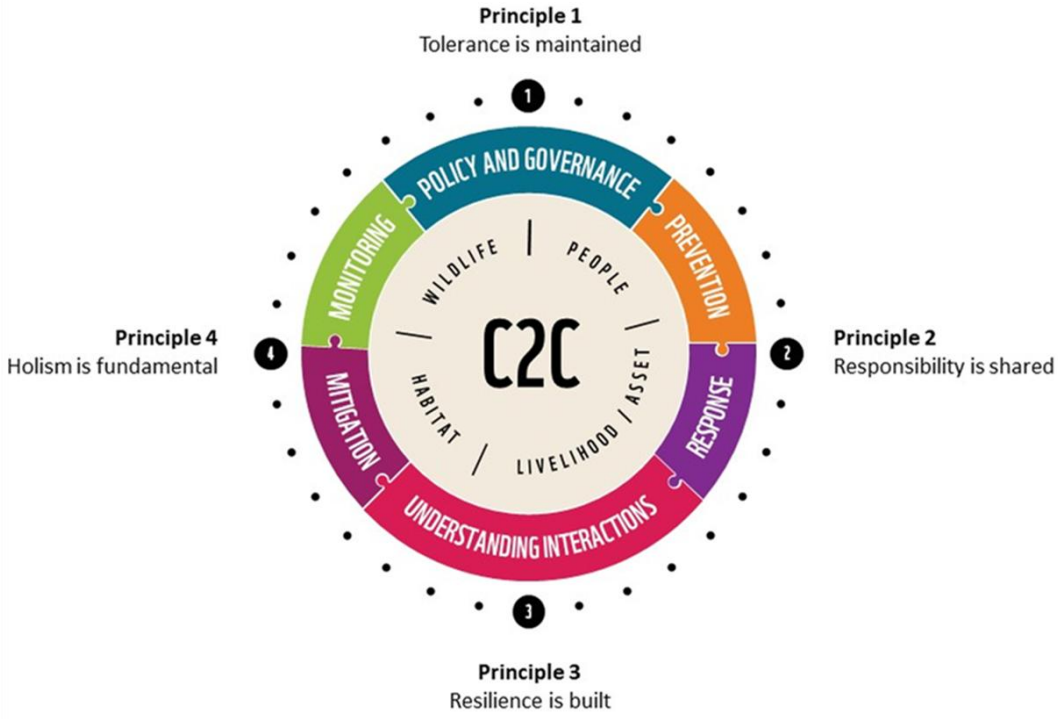

Figure 2: C2C: Conflict to Coexistence Framework

Primarily the framework are four guiding principles: tolerance, shared responsibility, resilience, and holism. Tolerance encourages communities to accept wildlife through education and cultural change, while shared responsibility ensures that governments, NGOs, and locals collaborate equitably in managing conflict. Resilience focuses on strengthening both ecosystems and human communities, and holism integrates conservation with broader socio-economic and cultural contexts. The C2C model fosters long-term change by building trust, leveraging local insights, and aligning conservation with community development. It serves as a comprehensive roadmap for turning conflict into coexistence, offering communities and conservationists the tools to create harmony between people and wildlife.

3.2.1 C2C Process

Step 1 Context Screening

The C2C Context Screening Form was used for assessing human-wildlife conflict (HWC) in Dekiling Gewog. This framework facilitates a comprehensive analysis of the landscape by integrating ecological, social, and policy dimensions. Prior to filling out the form, all available baseline information was collected from previous assessments, published literature, and social landscape mappings to ensure the accuracy of context screening. The screening process began with a detailed landscape description, capturing demographic data, land-use patterns, and the presence of protected areas within the site. Understanding the population density, community livelihoods, and tourism activities is crucial in determining how human settlements interact with wildlife and what factors contribute to conflict risks.

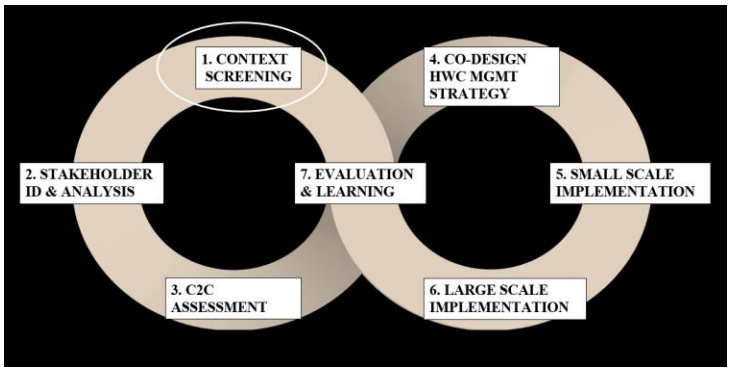

Figure 3: Step one context screening of HWC

A significant part of the screening focused on HWC trends, categorizing conflict species and assessing their impact on communities. The form documented the frequency and severity of encounters between humans and wildlife, analysing incidents such as crop raids, livestock predation, and infrastructure damage. It also identified hotspots where such conflicts were prevalent and evaluated community

tolerance levels toward wildlife. Additionally, available conflict management methods, both past and present, were recorded to assess their effectiveness. The identification of drivers of conflict both anthropogenic (such as land-use changes and illegal hunting) and natural (such as climate change and food scarcity) provided insights into the root causes influencing human wildlife interactions. These underlying factors helped shape targeted mitigation strategies that addressed conflict at its source.

Beyond ecological factors, the screening also explored social dynamics, examining community heterogeneity, governance structures, and stakeholder power dynamics in managing HWC. This assessment ensured that coexistence strategies are inclusive and participatory, fostering community engagement in conservation efforts. The wildlife dynamics section investigated species population trends, movement patterns, and behavioral adaptations that contributed to conflict. Changes in wildlife behavior, dispersal routes, and learned habits provide essential information for developing species specific mitigation strategies. Finally, the screening reviewed policy frameworks, governance structures, and institutional support mechanisms that influence HWC management in Dekiling Gewog. Legal instruments, funding availability, and administrative capacity were analyzed to determine the feasibility of long-term coexistence strategies.

By systematically evaluating these categories, the C2C Context Screening Form provided a holistic foundation for designing adaptive and evidence-based conflict mitigation measures.

Step 2: Stakeholder identification and Analysis

Stakeholder identification and analysis play a crucial role in the effective management of HWC, as different groups hold varying levels of interest, influence and availability in shaping mitigation strategies. In Dekiling Gewog, stakeholders were systematically assessed using the stakeholder analysis matrix (C2C Tool 5) to determine their roles and collaborative potential in the C2C approach. This structured evaluation grouped stakeholders based on their involvement, categorizing them into directly affected parties, management contributors, and influential entities.

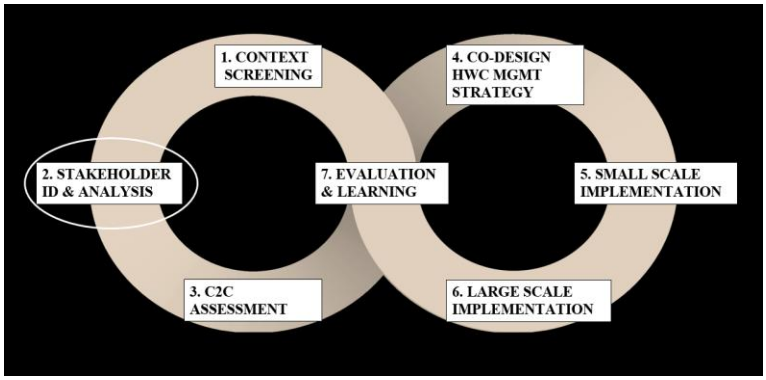

Figure 4: Step two stakeholder identification and analysis

The stakeholder identification process was carried out by a core team comprising the Deputy Chief Forestry Officer, IKI focal personnel, section heads, Range Officer, HWC focal, local government officials, Gewog Agriculture and Livestock Extension Supervisors, and Tshogpas from five Chiwogs. This diverse team ensured a holistic assessment, capturing perspectives from both conservation authorities and local governance representatives. The stakeholder matrix employed a systematic ranking approach, answering a series of questions on a scale of 1 to 5 to evaluate four key aspects: their interest in HWC management, their influence on the long-term success of conservation strategies, and their availability for active participation in the co-design and implementation of interventions.

Analysis of stakeholder engagement revealed a diverse range of influences and interest levels. Groups with high interest, high influence, and high availability, such as the Gup, Tshogpa, concerned Range Officer (RO), and Quick Response Team (QRT) members, were identified as key actors in shaping and implementing management strategies. These stakeholders play a decisive role in mobilizing community support, ensuring policy implementation, and facilitating ground level interventions.

Meanwhile, stakeholders with low influence such as farmers primarily contribute to ground level implementation, actively engaging in adaptive livelihood practices.

Step 3 HWC Assessment

Survey Design and Sample Size Determination

The Citizen-to-Citizen (C2C) assessment for Dekiling Gewog, Sarpang Dzongkhag, covered all five chiwogs within the gewog. Primary data were collected through structured household surveys administered to a representative sample of community households, complemented by interviews with relevant service providers and duty bearers.

Sampling Frame

The total number of registered households across the five chiwogs of Dekiling Gewog was **1,145 households**, which constituted the sampling frame for the survey.

Sample Size Calculation

The required sample size was determined using **Yamane's (1967) formula** at a 95% confidence level with a margin of error of 5% (e = 0.05):

$$\mathbf{n = N / (1 + N \cdot e^2)}$$

Where:

n = required sample size

N = total number of households in the gewog

e = margin of error (0.05 at 95% confidence level)

Substituting N = 1,145 and e = 0.05:

$$n = 1{,}145 / (1 + 1{,}145 \times 0.05^2)$$

$$n = 1{,}145 / (1 + 2.8625)$$

$$n = 1{,}145 / 3.8625$$

$$\mathbf{n \approx 296.44 \approx 296 \text{ households}}$$

Applying Yamane's formula yielded a required sample size of **296 community households**.

Proportional Allocation across Chiwogs

The total sample of 296 households was distributed across the five chiwogs using **proportional allocation**, ensuring each chiwog's share of the sample reflected its relative size within the gewog. The allocation formula was:

$$\mathbf{n_i = (N_i / N) \times n}$$

Where:

n_i = sample size allocated to chiwog i

N_i = total number of households in Chiwog i

N = total number of households in the gewog (1,145)

n = overall sample size (296)

Since proportional allocation produces non-integer values, chiwog-level figures were rounded using the **largest remainder method** — the standard statistical approach for whole-number allocation. Each chiwog first receives the floor of its exact allocation; the remaining household(s) are then assigned to the chiwog(s) with the highest fractional remainders, ensuring the total sums exactly to 296. For Dekiling Gewog, two chiwogs (Gawaithang and Dekiling) had the highest fractional remainders, and each received one additional household. The resulting distribution is presented in **Table 1**.

Table 1: *Distribution of Surveyed Households by Chiwog, Dekiling Gewog*

Sl. No.	Chiwog	Total Households	Households Interviewed
1	Gawaithang	135	35
2	Dekiling	230	60
3	Nubgang	90	23
4	Jigmeling	380	98
5	Chhoekhorling	310	80
	Total	**1,145**	**296**

Note: *Chiwog-level allocations were rounded using the largest remainder method to ensure the total sample sums exactly to 296.*

This stratified proportional approach ensured that the sample distribution faithfully reflected the relative household population of each chiwog within Dekiling Gewog, thereby maintaining the representativeness and statistical validity of the survey findings.

The HWC assessment was carried out with several key objectives. Its primary purpose was to determine the effectiveness of existing interventions that fell under the 6 elements (Understanding interactions, Policy, Prevention, Response, Mitigation and Monitoring) of HWC management, evaluating them against the 4 established outcomes (Habitat, People, Assets/Livelihoods and Wildlife).

Furthermore, the assessment aimed to identify any gaps in the current scale of those interventions. It also sought to understand the diverse perspectives of various stakeholders regarding HWC and its management. Finally, the assessment worked to understand and clarify any discrepancies that existed between the perspectives, knowledge, and overall understanding among different stakeholder groups.

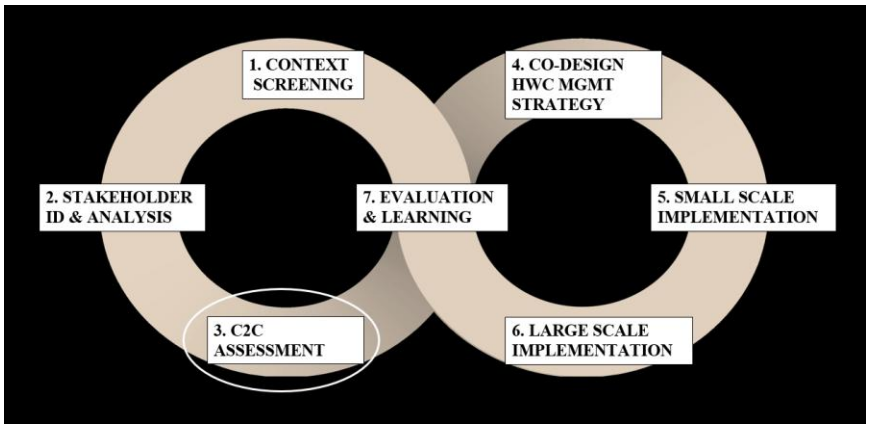

Figure 5: Step three HWC assessment

The assessment was carried out over seven days, engaging 16 Rangers across five Chiwogs. The survey utilized the SMART (Spatial Monitoring and Reporting Tool) App, in which the survey form was preloaded with questionnaires specifically developed for HWC assessment. These questionnaires were structured around a framework comprising six key elements and four intended outcomes. Interviews were conducted with two distinct groups: community members residing in Gewog and service providers working within the jurisdiction. Prior to their engagement in data collection, the field staff under the Divisional Forest Office (DFO) Sarpang were trained to familiarize themselves with the survey form in SMART.

Step 4 Co-design

A total of 60 participants were involved in the co-design process. This included 10 representatives from each of the five chiwogs—Gawaithang, Dekiling, Nubgang, Jigmeling, and Chhoekhorling—along with 10 duty bearers and service providers, including the Gup, Mangmi, Gewog administration officials, Tshogpas, extension officers, and relevant sector representatives. The participation of both community members and institutional stakeholders ensured that the strategy incorporated local experiences, governance perspectives, and technical expertise.

Table 2: List of Participants involved in Co-designing

Sl. No.	Chiwog	Total Households
1	Gawaithang	10
2	Dekiling	10
3	Nubgang	10

Sl. No.	Chiwog	Total Households
4	Jigmeling	10
5	Chhoekhorling	10
	Duty Bearers / Service Providers	10
	Total	**60**

This approach recognizes that individuals with lived experiences are the true experts of their own circumstances. The co-design process itself is structured around a series of repetitive steps, beginning with engagement to foster mutual learning and define the core objective or challenge. This is followed by a crucial "understand" phase, where the focus shifts to discerning user needs, identifying assets, and gathering key insights.

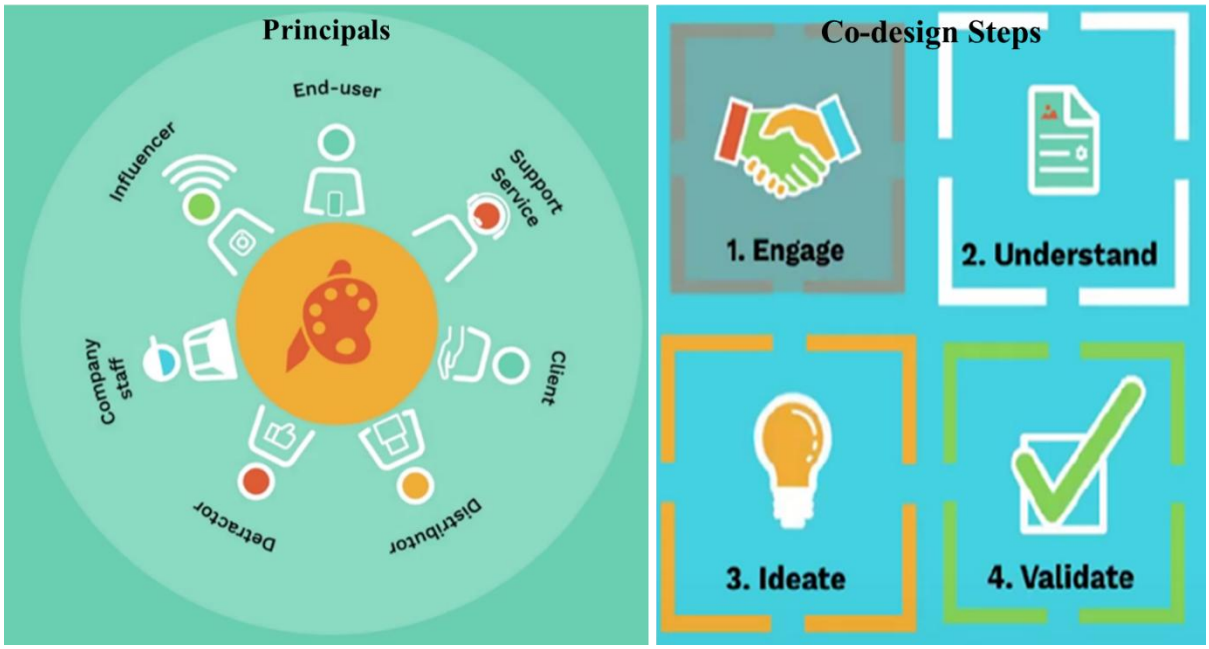

Figure 6: Co-design principals and steps

The third stage, "ideate," is where creativity takes center stage, involving the generation and development of ideas, the design of concepts, and the creation of samples. Finally, the "validate" step ensures that the proposed solutions are presented, tested, and thoroughly evaluated. It builds upon the foundational insights gained from prior stages, including context screening, stakeholder analysis, and the comprehensive C2C

assessment report. This integrated approach helps to determine the current situation, establish short, mid, and long-term goals, and collectively devise strategies to achieve those desired outcomes.

The C2C co-design process for this plan involved several distinct steps. It commenced with the meticulous preparation of the C2C assessment results. These key findings were then presented to both community members and service providers, ensuring broad dissemination of information. Subsequently, actions and interventions were collaboratively designed, directly informed by the assessment report. The participants were divided into groups (e.g., community members and duty bearers), each facilitated by a technical person such as forestry staff, to foster discussion and proposal of actions. The proposed actions from each group were then compiled and consolidated by the C2C core team. Finally, the compiled actions were validated leading to the drafting of the comprehensive C2C strategy.

4. Result and Discussion

4.1 Demography and Social information

A total of 253 respondents participated in the survey conducted across the five chiwogs of Dekiling, Gawaithang, Chhoekhorling, Jigmeling, and Nubgang. The respondents comprised 218 community members and 35 service providers and duty bearers, including local government representatives, extension officers, and other relevant stakeholders involved in local governance and development activities.

In terms of gender composition, 57% of respondents were male (n = 145) and 43% were female (n = 108), indicating a relatively balanced representation of both genders in the consultation process. The participation of both community members and institutional stakeholders ensured that the assessment captured diverse perspectives on local conditions, livelihood challenges, and human–wildlife conflict management.

Although the initial household survey targeted 296 households based on the calculated sample size, only 253 respondents were successfully interviewed during the field survey. The discrepancy between the planned sample size and the number of completed interviews was primarily due to limited availability of household members and duty bearers during the survey period. In several instances, households were not available at the time of the visit due to agricultural work, temporary absence, or other engagements. Similarly, some duty bearers and service providers could not be reached within the survey timeframe because of official duties or scheduling constraints.

Despite these limitations, the number of respondents interviewed was considered sufficient to provide a representative overview of community perceptions and institutional perspectives within the study area. The collected data therefore remains adequate for understanding the socio-demographic characteristics of respondents and informing the development of the C2C human–wildlife conflict management strategy.

The assessment showed that representation from various stakeholders and long-term community members is crucial for effective strategic planning in HWC interventions. Perspective from diverse stakeholders and long-term community members contributes to the effective planning, helping in the formulation of more comprehensive and inclusive solutions that address the ecological, economic, and policy-related aspects of conflict. Long-term community residents offer invaluable local knowledge, historical context, and insights from past wildlife interactions/interventions. Collectively, these representations improve the relevance, acceptance, and sustainability of HWC management strategies.

Farming, encompassing both crop cultivation and livestock rearing, are the primary source of livelihood. Other income sources included casual labor, trade or business, paid employment, family support, etc. Crop damage was the most frequently reported type of loss, impacting the majority of respondents. Other reported losses included property damage, livestock loss, and, in rare cases, the loss of life. Beyond physical losses, participants also noted other indirect impacts.

4.2 Overall Result for Dekiling Gewog

4.2.1 Conflict Species of the Gewog

Elephants (*Elephas maximus*) are identified as the species most frequently involved in conflicts, with 134 mentions. This is followed by wild pigs (131), birds (54), and snakes (8). Other species include barking deer (18), macaques (43), hare (27), and golden langur (6), indicating a diverse range of conflict species. Elephants and wild pigs are consistently noted as major contributors to crop damage and property loss. The presence of smaller fauna such as rodents, especially porcupines, and various birds highlights the complexity of HWC in this area.

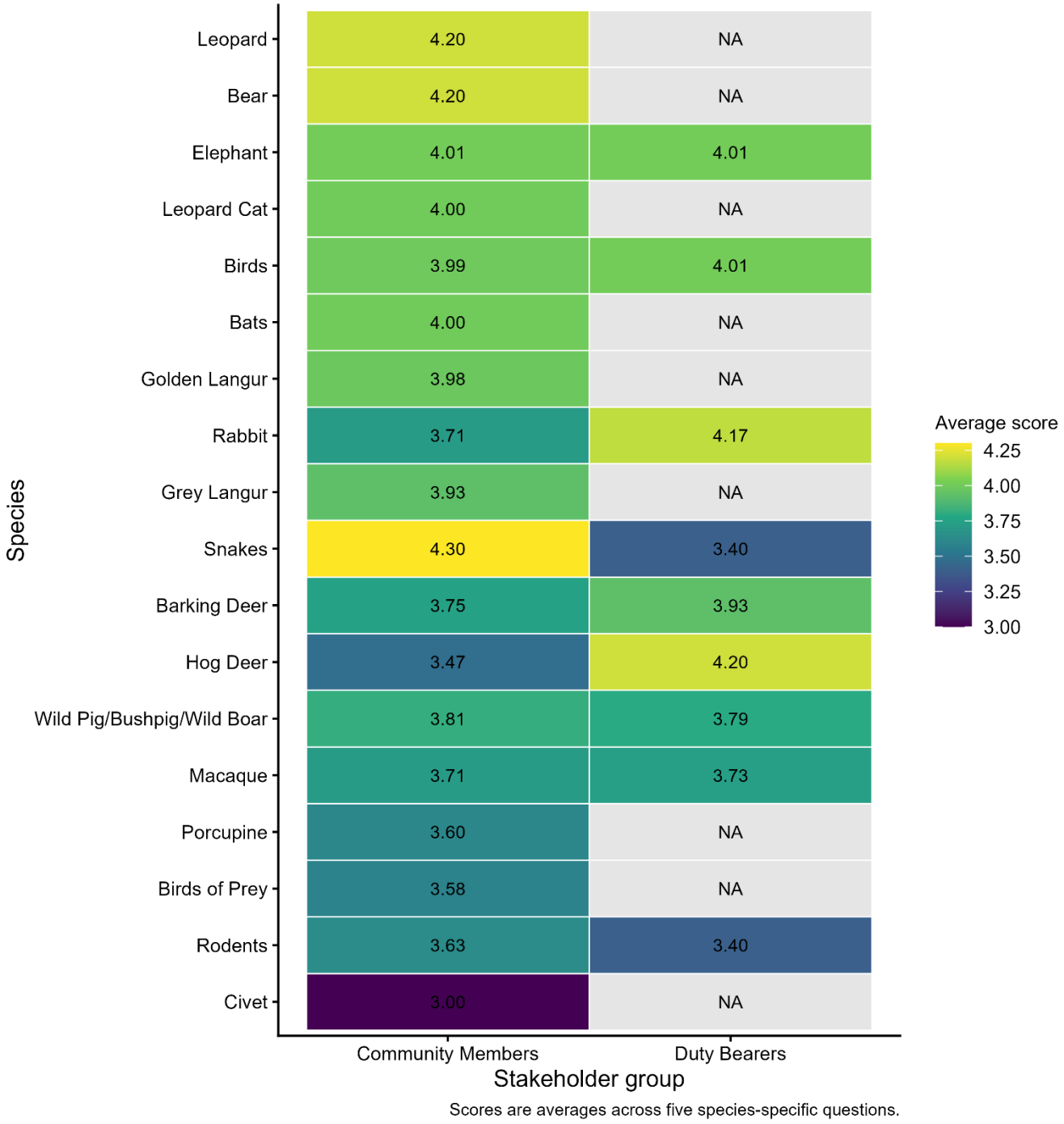

Figure 7. Species-specific human–wildlife conflict (HWC) scores by stakeholder group. Heatmap showing average scores for each species as reported by Duty Bearers/Service Providers and Community Members/Rights Holders. Scores represent the mean across five species-specific questions (people injured or killed in HWC, wildlife killed in HWC, knowledge of regulations, persecution, and restoration). Higher values indicate lower perceived HWC impact, whereas lower values indicate higher impact. Cells labelled "NA" denote cases where a stakeholder group did not identify that species as a conflict species.

4.2.2 Status of Outcomes at Gewog level

Outcome ratings across the four domains: People, Livelihoods/Assets, Wildlife, and Habitat revealed distinct patterns of perceived vulnerability and stakeholder divergence (Figure 7). Among duty bearers/service providers, the lowest mean score was observed for Livelihoods/Assets (2.69), signifying this as the most vulnerable domain, while the highest rating was for Wildlife (3.90), indicating more optimistic perceptions regarding conservation outcomes. In contrast, community members/rights holders rated People the highest (3.74) and Livelihoods/Assets (3.27) the lowest, underscoring shared concerns about economic insecurity and human well-being in the face of HWC. Notably, the disparity in Livelihoods/Assets scores between groups suggests a stronger recognition of economic vulnerability among duty bearers compared to community members, whereas community perceptions were more favorable across all domains except Wildlife. These results highlight a convergence of concern regarding asset and livelihood losses but also reveal perceptual gaps in human-centric and conservation-related outcomes. This underscores the necessity for integrated management approaches that address both economic resilience and biodiversity protection, with targeted interventions for community-based livelihood support and strengthened stakeholder engagement in conflict mitigation planning.

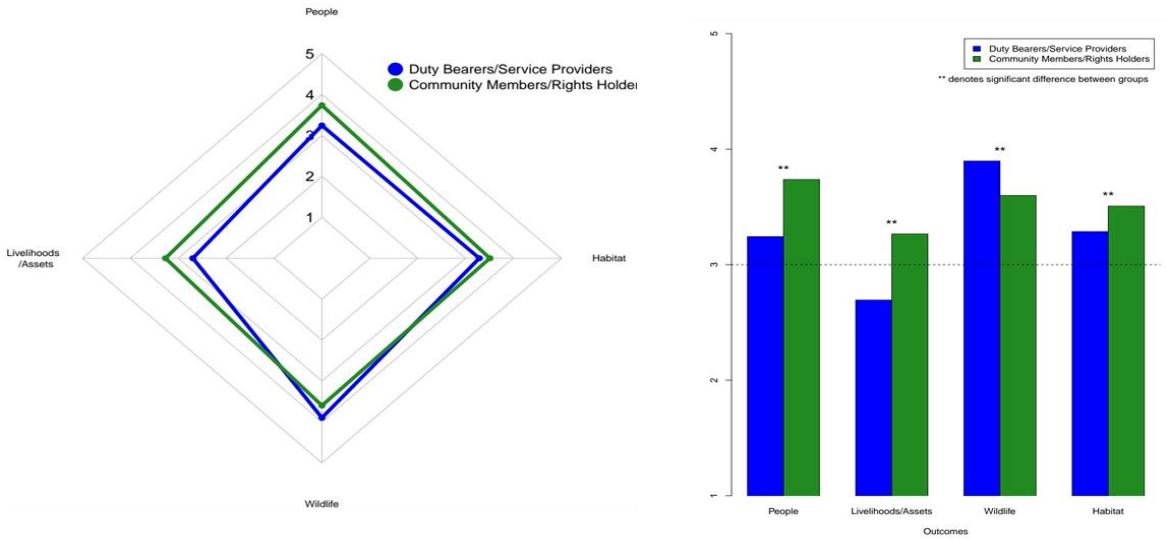

Figure 8: Graphical Representation of 4 outcomes

4.2.3 Status of Element at Gewog level

The C2C approach evaluates the effectiveness of human-wildlife coexistence strategies through six core elements: Understanding Interactions (UI), Policy, Prevention, Response, Mitigation, and Monitoring across four outcome domains.

People Able and Willing to Live Alongside Wildlife

Perceptions of coexistence were generally favorable among both stakeholder groups, with community members with Understanding Interactions (4.42) and Monitoring (4.07), indicating strong awareness and active engagement with wildlife issues. Duty bearers also reported relatively high scores for Response (4.09) and Monitoring (3.71). However, both groups rated Mitigation very low (1.88 by duty bearers; 1.85 by community members), suggesting widespread dissatisfaction with the adequacy of safety infrastructure or conflict prevention tools. The low Policy scores (2.88; 3.26) and moderate Prevention scores (3.71; 3.81) further underscore gaps in regulatory clarity and the need for more robust risk reduction measures. These findings indicate that while willingness and awareness are high, practical mitigation strategies and effective policy communication remain insufficient, highlighting a critical gap for targeted intervention.

i. Livelihoods/Assets Secured Against the Presence of Wildlife

Livelihood and asset security remain the most vulnerable outcome domain in Dekiling, reflected by the consistently low scores from both duty bearers and community members. Duty bearers reported particularly low scores for Understanding Interactions (1.29), Policy (2.57), and Response (2.32), indicating weak integration of local knowledge, limited policy impact, and inadequate compensation or recovery mechanisms. Community members, though rating some elements higher (UI: 2.66; Monitoring: 3.86), still reflected concern with the lowest mean scores for Policy (2.99) and Mitigation (2.86). Prevention (3.55 by community members; 3.04 by duty bearers) and Monitoring (3.01; 3.86) showed slightly better performance, but overall, both groups pointed to a lack of strong protection systems for livelihoods and assets. These results emphasize the urgent need for improved compensation schemes, scalable crop and livestock protection measures, and the meaningful involvement of local communities in co-designing livelihood resilience strategies.

ii. Wildlife Thrives Alongside Human Presence

Scores in the wildlife domain were among the highest reported, especially for Understanding Interactions (4.39 by duty bearers; 4.24 by community members) and Response (4.47; 3.65). These high ratings reflect a shared commitment to wildlife conservation and suggest effective response protocols for wildlife-related

issues. However, Mitigation (3.68 by duty bearers; 2.96 by community members) and Prevention (3.28; 3.07) were comparatively lower, indicating that preemptive strategies to minimize conflict, such as habitat management or early warning systems, may require further strengthening. The higher scores for Policy (4.13 by duty bearers; 3.84 by community members) and Monitoring (3.35; 3.56) point to a relatively enabling policy environment and ongoing investment in surveillance but also suggest a need for enhanced participation and transparency.

iii. Habitat Sufficient to Maintain Viable Wildlife Populations

Habitat outcomes exhibited moderately strong scores, with duty bearers and community members assigning the highest values to Response (3.74; 3.90) and Monitoring (3.44; 3.59). Prevention (3.56; 2.91) and Policy (2.75; 3.56) scores varied, indicating a perceptual gap regarding regulatory effectiveness and preventive habitat management. Mitigation remained low (2.59 by duty bearers; 3.58 by community members), signaling perceived limitations in efforts to address habitat degradation or encroachment. These patterns suggest that while there is broad recognition of the importance of habitat protection, efforts should be reinforced through more inclusive habitat management programs, participatory monitoring, and strengthened policy advocacy.

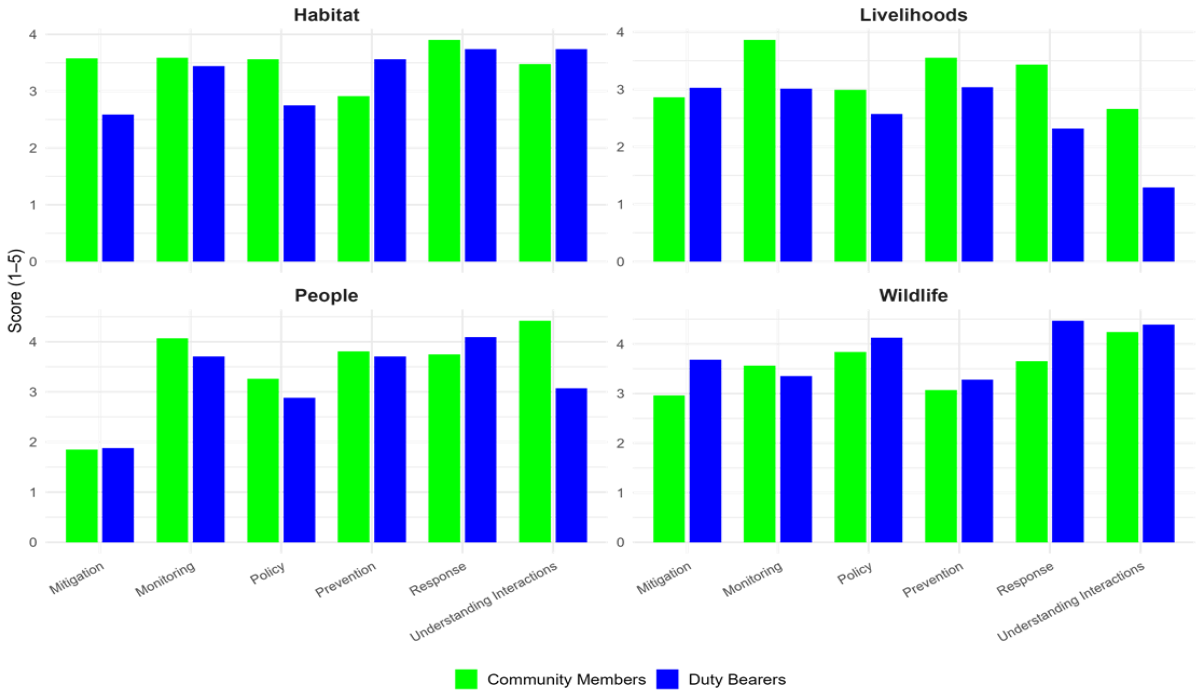

Figure 9: Grouped Bar Plots (Element-wise breakdown per outcome)

There are strong awareness and positive attitudes toward coexistence, especially in the People and Wildlife domains, but persistent vulnerabilities in livelihood and habitat security. The findings call for targeted investments in mitigation and policy interventions, enhanced local engagement, and the co-development of scalable conflict prevention solutions to ensure sustainable coexistence in Dekiling.

4.3 Chiwog-wise Results

4.3.1 Dekiling Chiwog

Respondents in Dekiling Chiwog identified elephants, wild pigs and birds as the most frequent and impactful conflict species, with wild pigs alone reported by over 131 individuals in terms of frequent impact, and 156 in terms of severe impact. Elephants also figured prominently, with 134 respondents citing them for frequent conflict and 93 for severe impact. Birds, macaques, and hares were consistently reported as contributors to both frequent and severe losses. While both community members and duty bearers recognized elephants and wild pigs as primary sources of conflict, the frequency and perceived severity of impacts reported by community members was notably higher, particularly for crops and asset damage. This indicates that local stakeholders experience more direct and repeated losses from wildlife, which may not always be fully reflected in official or duty-bearer records.

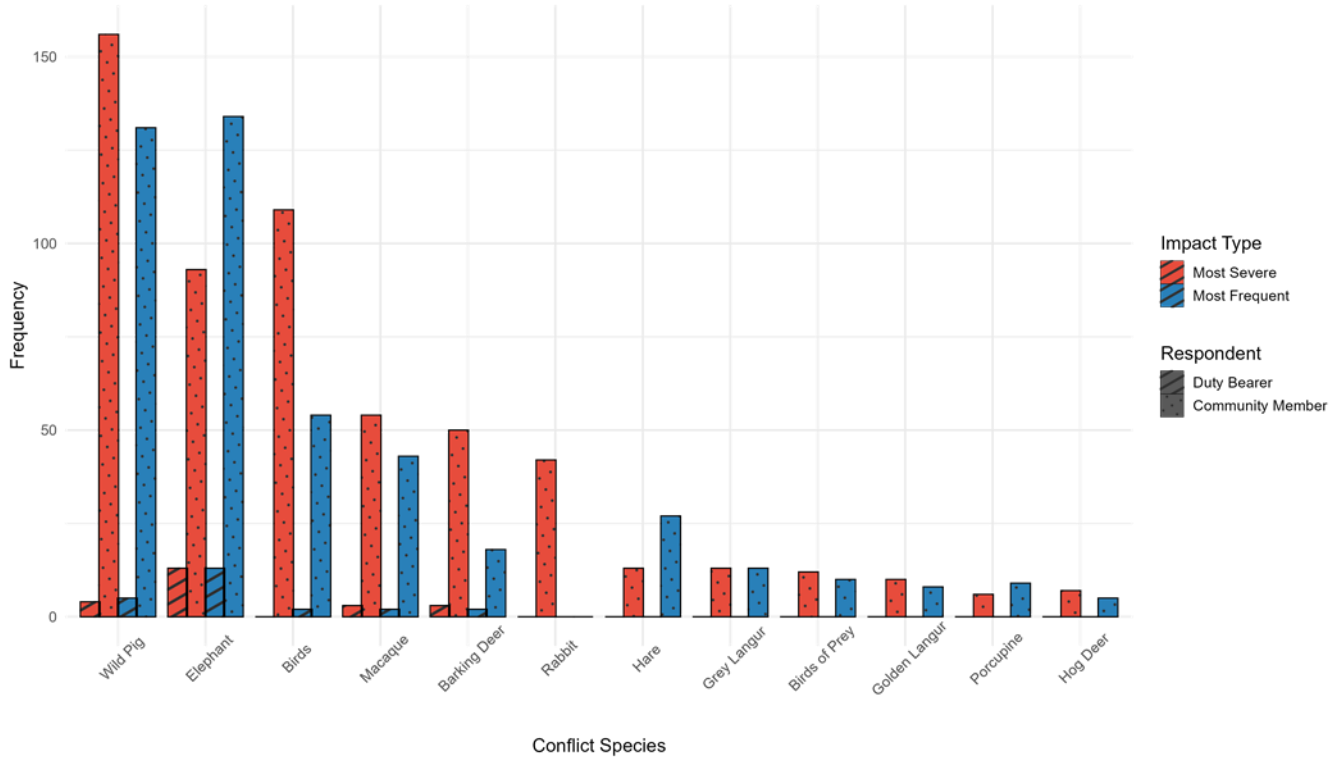

Figure 10: Graphical presentation of conflict species by stakeholder group

Additionally, species such as barking deer, rodents, snakes, and porcupines contributed to a broad spectrum of crop and livestock losses, reinforcing the need for multi-species management strategies. These differences in perception and reporting highlight the importance of participatory monitoring and enhanced communication between community members and service providers to ensure that mitigation responses are both comprehensive and locally relevant.

Figure 11: Graphical presentation of outcomes and element-wise perception

Across the C2C domains, both community members and duty bearers assigned the highest scores to the wildlife and habitat outcomes, suggesting relative stability in conservation status likely attributable to ongoing enforcement, habitat integrity, and policy support. However, the livelihoods/assets outcome received the lowest ratings from both groups, with community members registering particularly low scores, underscoring acute vulnerability in economic and food security linked to HWC. Analysis of the six C2C elements further reveals that mitigation and policy measures under the livelihoods and people outcomes are viewed as least effective, indicating a gap in institutional and infrastructural responses to

conflict. While community awareness and understanding interactions (UI) scored strongly in the people's domain, their effect was less apparent in protecting livelihoods, highlighting a need to translate awareness into actionable and context-specific asset protection. For future coexistence strategies in Dekiling, emphasis should be placed on strengthening mitigation infrastructure, developing robust compensation and insurance mechanisms, and fostering community-led policy frameworks to bridge the gap between experience and response, ultimately reducing disparities and enhancing resilience to HWC.

4.3.2 Gawaithang Chiwog

Wild pig (n=156) and elephant (n=93) are reported as the most frequently reported conflict species in Gawaithang, as perceived by community members. Birds (n=109) and macaques (n=54) were also notable contributors to HWC, primarily through crop damage and property losses. In contrast, duty bearers reported substantially fewer incidents across all species, with their recognition mainly limited to elephants and wild pigs. This disparity highlights a significant difference in conflict perception and reporting between local residents and service providers. Community members frequently experienced indirect negative impacts, such as anger, economic insecurity, and mental distress, as a result of ongoing wildlife conflict particularly related to crop losses (n=215) and livestock predation.

The experiences of affected households, especially regarding frequent crop raiding and property damage by wild pigs and elephants, are underrepresented in the formal discourse of wildlife management. These findings suggest an urgent need for targeted mitigation strategies, with a focus on wild pigs and elephants, to address the most pressing concerns of the Gawaithang community and bridge the gap between local realities and administrative responses.

In Gawaithang Chiwog, the assessment by community members reveals significant challenges to human-wildlife coexistence, particularly in the dimension of Livelihoods and Assets. This outcome consistently recorded the lowest mean scores across all contributing elements, most notably in "Understanding Interactions" and "Mitigation," both of which were rated below the midpoint of the Likert scale. These results reflect the persistent vulnerability of local households to wildlife-related impacts and highlight a lack of effective strategies to protect economic resources and ensure household security.

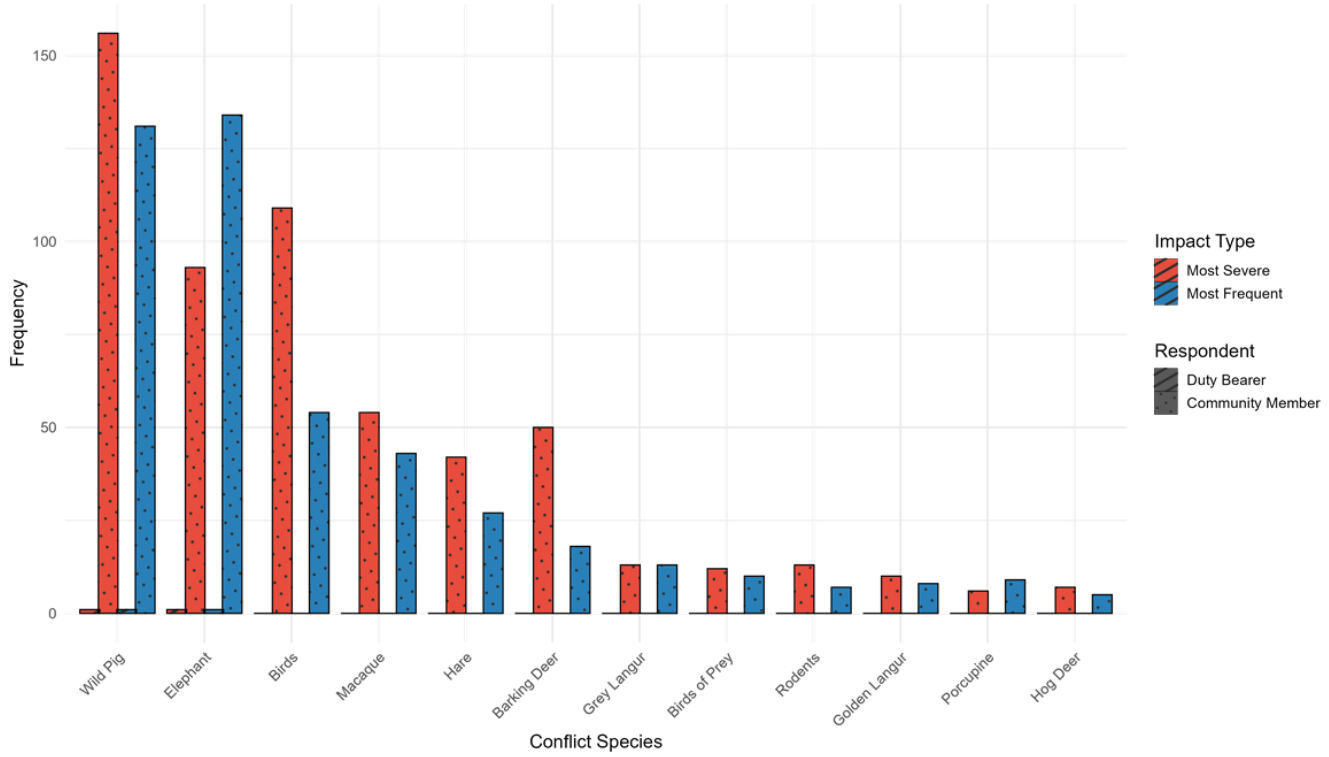

Figure 12: Conflict Species in Gawaithang Chiwog

While scores for People, Wildlife, and Habitat outcomes were moderately higher especially in the "Monitoring" and "Understanding Interactions" elements there remains a marked gap between ecological or awareness-based achievements and tangible improvements in community well-being. In particular, the low ratings for "Mitigation" and "Prevention" indicate that existing conflict reduction measures and policy support are not meeting the needs of Gawaithang's residents.

This ongoing imbalance, in which ecosystem and awareness outcomes outpace progress in livelihood security, underscores the urgent need for strategic, community-centered interventions. Priorities should include enhancing mitigation infrastructure (such as fencing, deterrent systems, or insurance schemes), strengthening participatory engagement in conflict management, and ensuring that policies are responsive to the day-to-day realities faced by local families.

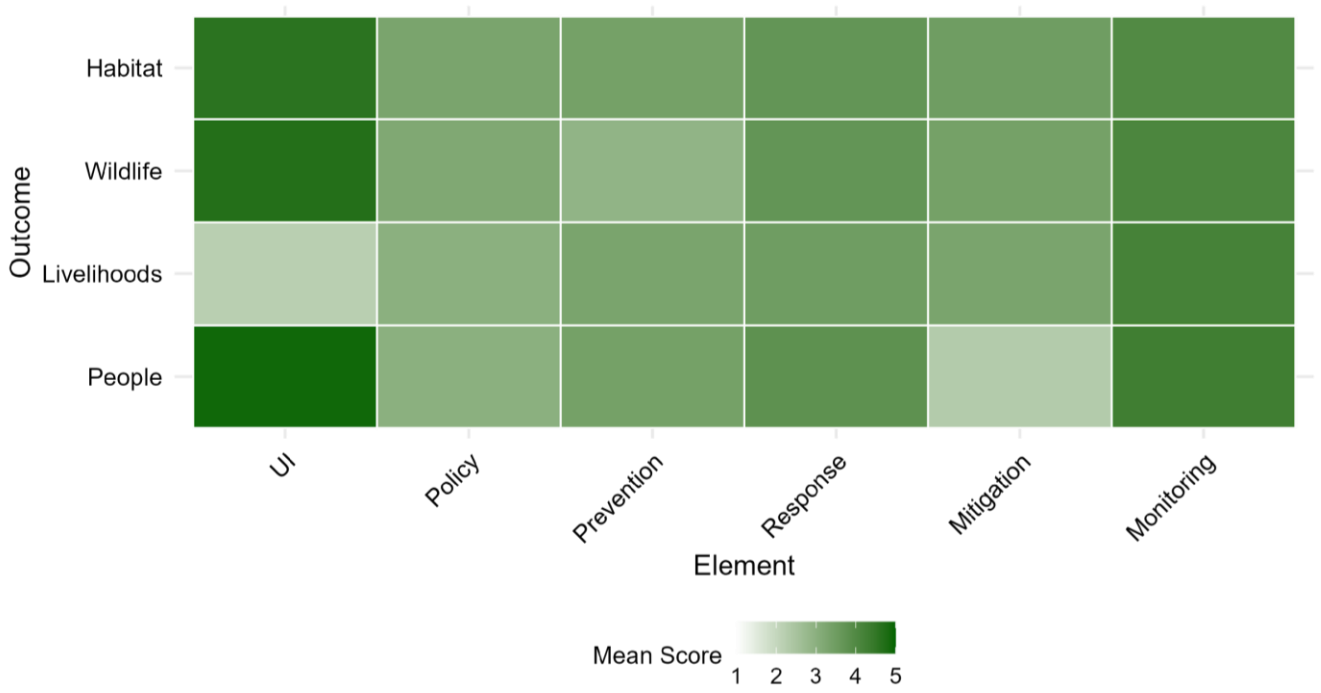

Figure 13: Graphical presentation of results by outcome and element

Ultimately, bridging the gap between conservation success and community resilience in Gawaithang will require both technical investment and social innovation. Building trust, co-designing solutions, and investing in the human dimensions of coexistence are essential steps toward transforming wildlife conflict from a persistent challenge into an opportunity for shared stewardship and sustainable development.

4.3.3. Chhoekhorling Chiwog

In Chhoekhorling Chiwog, community members reported wild pig (156 reports), elephant (93), birds (109), macaques (54), hare (42), and barking deer (50) as the most frequent conflict species. In contrast, duty bearers' reports were lower across all species, with wild pig/bushpig/wild boar (9), elephant (11), birds (7), and snakes (8) as the main species cited. This clear disparity suggests that local residents experience and perceive a much higher intensity and diversity of HWC than is captured in formal records by duty bearers. The underreporting or lower acknowledgment of key conflict species by duty bearers, especially wild pig and macaques, highlights the need for strengthened participatory monitoring and collaborative data verification to ensure responsive and effective conflict mitigation strategies in Chhoekhorling.

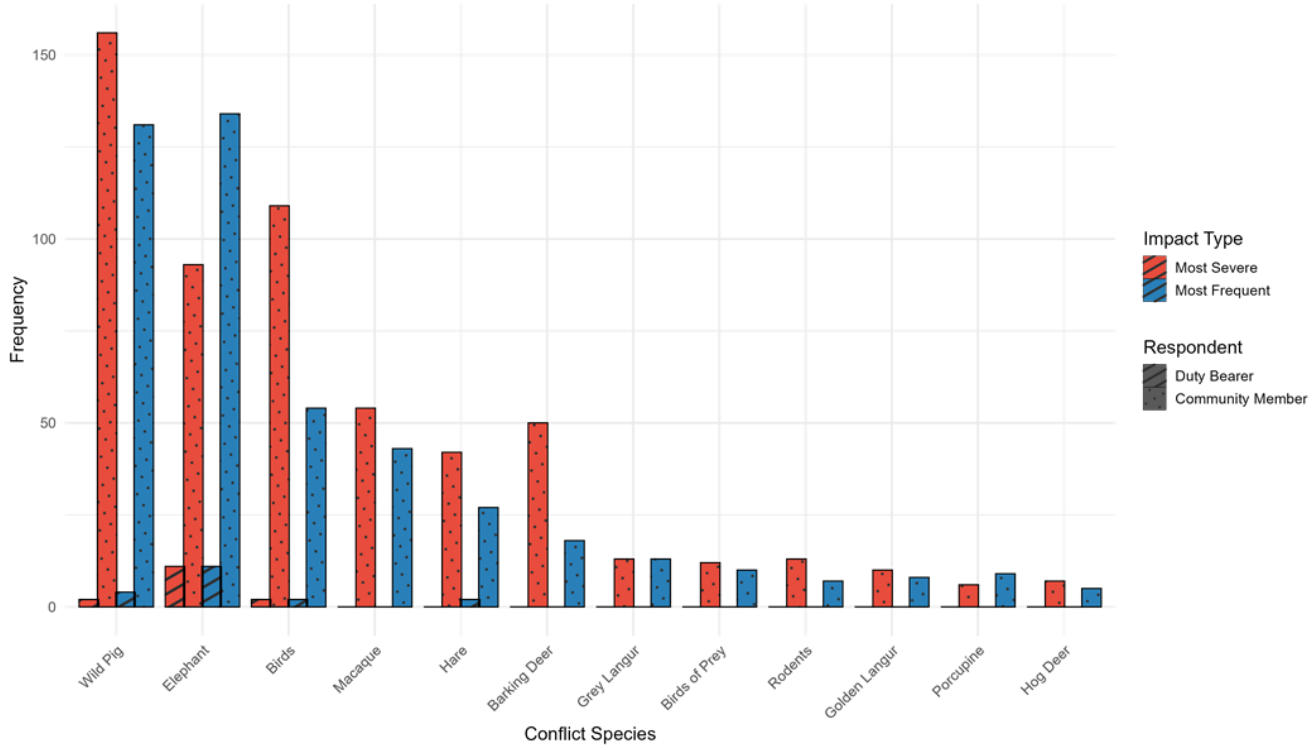

Figure 14: Conflict species in Chhoekhorling Chiwog

In Chhoekhorling Chiwog, both community members and duty bearers identified livelihoods and assets as the most vulnerable outcome, with low scores for elements such as mitigation, policy, and understanding interactions (UI). This points to ongoing challenges in protecting agriculture and livestock from wildlife and suggests that practical knowledge exchange and context-specific mitigation remain insufficient despite existing strategies. Notably, community members rated institutional response elements including monitoring, response, and prevention lower than duty bearers, indicating a gap in perceived effectiveness and trust.

Conversely, outcomes related to wildlife and habitat were rated more positively by both groups, reflecting greater confidence in conservation actions and habitat management. Overall, the findings highlight a need to strengthen livelihood-focused interventions especially mitigation and local knowledge-sharing while maintaining the current strengths in wildlife and habitat conservation to achieve balanced coexistence in Chhoekhorling.

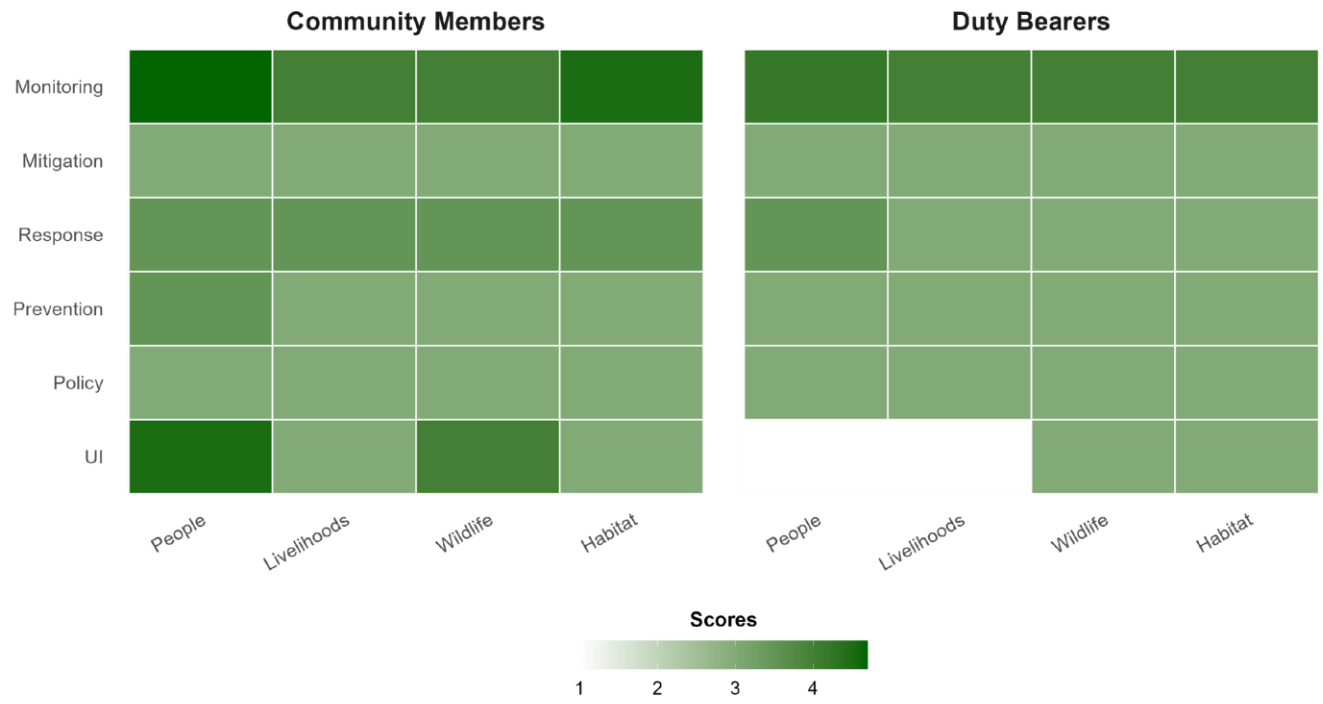

Figure 15: Graphical presentation of results by outcomes and elements for Chhoekhorling Chiwog

4.3.4. Jigmeling Chiwog

In Jimeling Chiwog, community members most frequently report conflict with wild pig (156), elephant (93), birds (110), barking deer (50), hare (42), and macaques (54). By contrast, duty bearers report significantly lower frequencies for all conflict species, with wild pig/bushpig/wild boar, elephant, and birds each cited only 9 times, and other species like barking deer (6), macaques (2), and rabbit (2) reported infrequently.

This substantial difference suggests that residents perceive and experience a much higher intensity and diversity of HWC than what is captured in formal records. For example, wild pig/bushpig/wild boar is reported more than six times as often by community members compared to duty bearers (56 vs 9), and elephant conflict is cited over four times as frequently (40 vs 9).

Crop damage is the most prevalent type of loss (215 cases), followed by property damage (50), and livestock predation (16). Indirect negative effects are also widespread, including anger over losses (129), fears for safety (113), and frustration over the need to adjust daily activities (107).

These patterns highlight a clear gap between the community's lived experiences and official recognition of conflict, pointing to potential underreporting or differences in monitoring and engagement by duty bearers. Addressing this disconnect will require more participatory and transparent conflict monitoring, targeted mitigation particularly for wild pigs and elephants and enhanced support systems that reflect the actual scale and impact of conflict faced by Jimeling households.

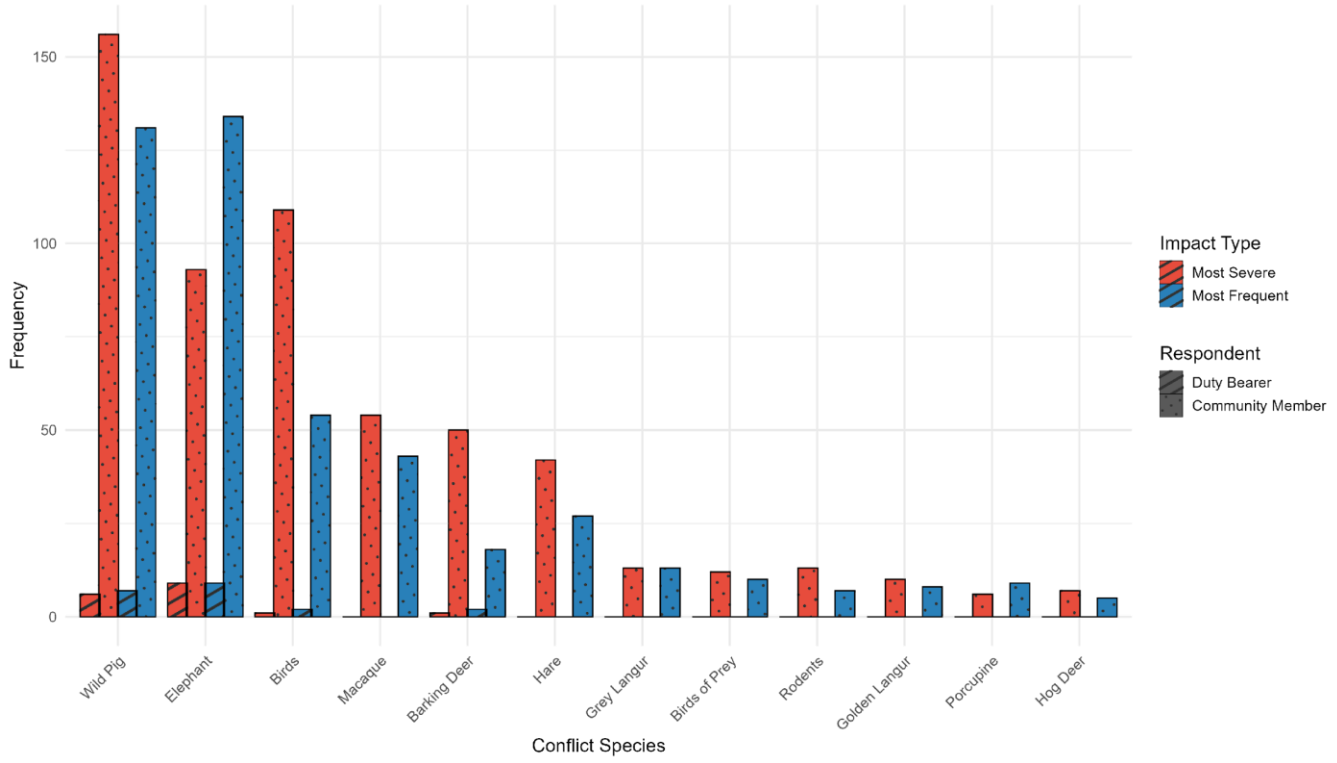

Figure 16: Frequency of reported conflict species by stakeholder group in Jigmeling Chiwog

In Jimeling Chiwog, the livelihoods/assets outcome again scored the lowest among the four coexistence outcomes, highlighting continued vulnerability for local agriculture and livestock. Both community members and duty bearers recognized this weakness, with duty bearers assigning slightly higher scores for most elements. Notably, "understanding interactions" (UI) remained the weakest-rated element in the livelihood's domain, particularly among community members, indicating persistent gaps in knowledge-sharing and practical engagement to address HWC. While elements like mitigation and prevention were rated moderately, the overall pattern underscores the need for locally appropriate livelihood protection strategies, such as crop protection, livestock enclosures, and improved compensation or support mechanisms.

Conversely, outcomes related to wildlife and habitat received higher ratings from both groups, reflecting more robust conservation efforts and lower perceived threats to wildlife and their environments. Duty bearers generally rated response and monitoring elements higher, suggesting that institutional mechanisms for managing wildlife are present but may not be fully trusted or understood by the community. This difference points to a need for participatory approaches that strengthen trust and communications such as joint monitoring, targeted awareness programs, and inclusive planning processes to bridge the gap between institutional support and community needs, ultimately improving human-wildlife coexistence in Jimeling.

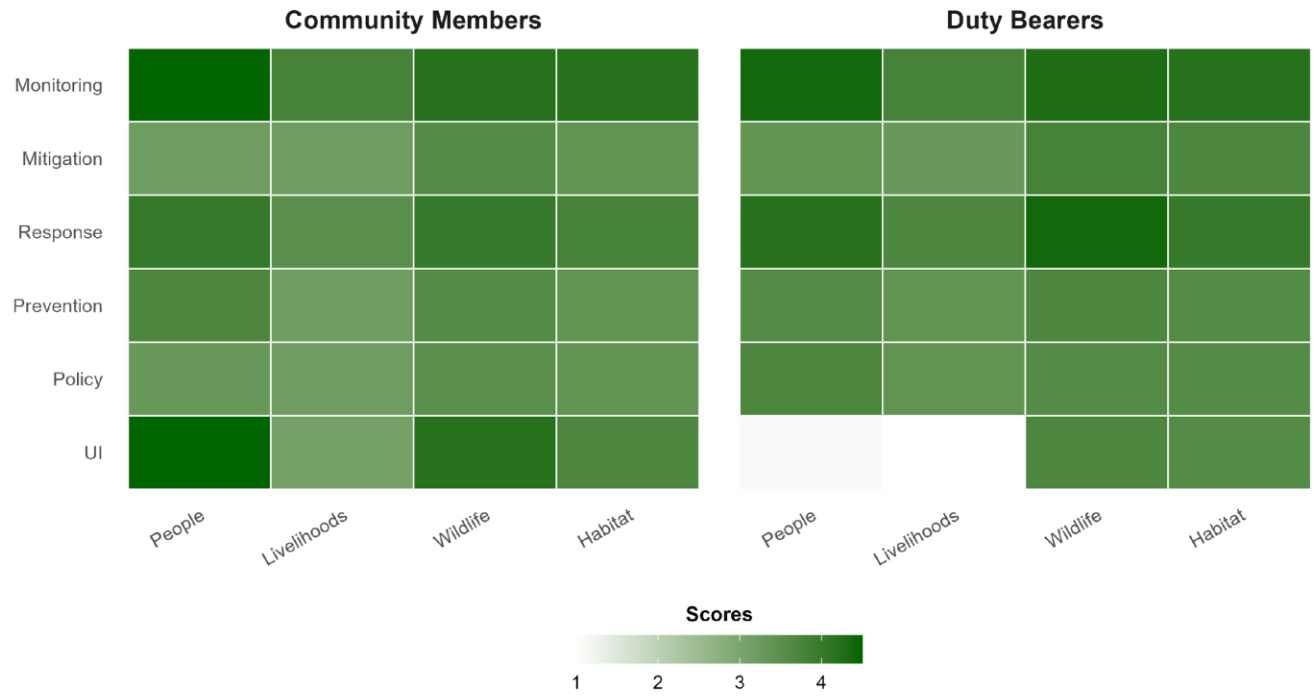

Figure 17: Element-wise contribution to outcomes for each stakeholder group in Jigmeling Chiwog.

4.3.5. Nubgang Chiwog

In Nubgang Chiwog, community members most frequently report conflict with Elephant (n=12), wild pig (n=156), barking deer (n=50), macaques (n=54), birds (n=109), and hare (n=42). These species present the greatest challenges to local livelihoods, primarily through repeated crop damage and other negative interactions. Elephants and wild pigs, in particular, are cited equally as the leading sources of conflict, indicating persistent and widespread incidents of crop raiding and property damage. Other conflict species, including porcupine and birds of prey, are noted with moderate frequency, while species like golden

langur, grey langur, and serow are reported less often. These findings highlight the urgent need for targeted mitigation measures that address the most impactful species, particularly elephants and wild pigs, to reduce the burden of HWC on Nubgang's households.

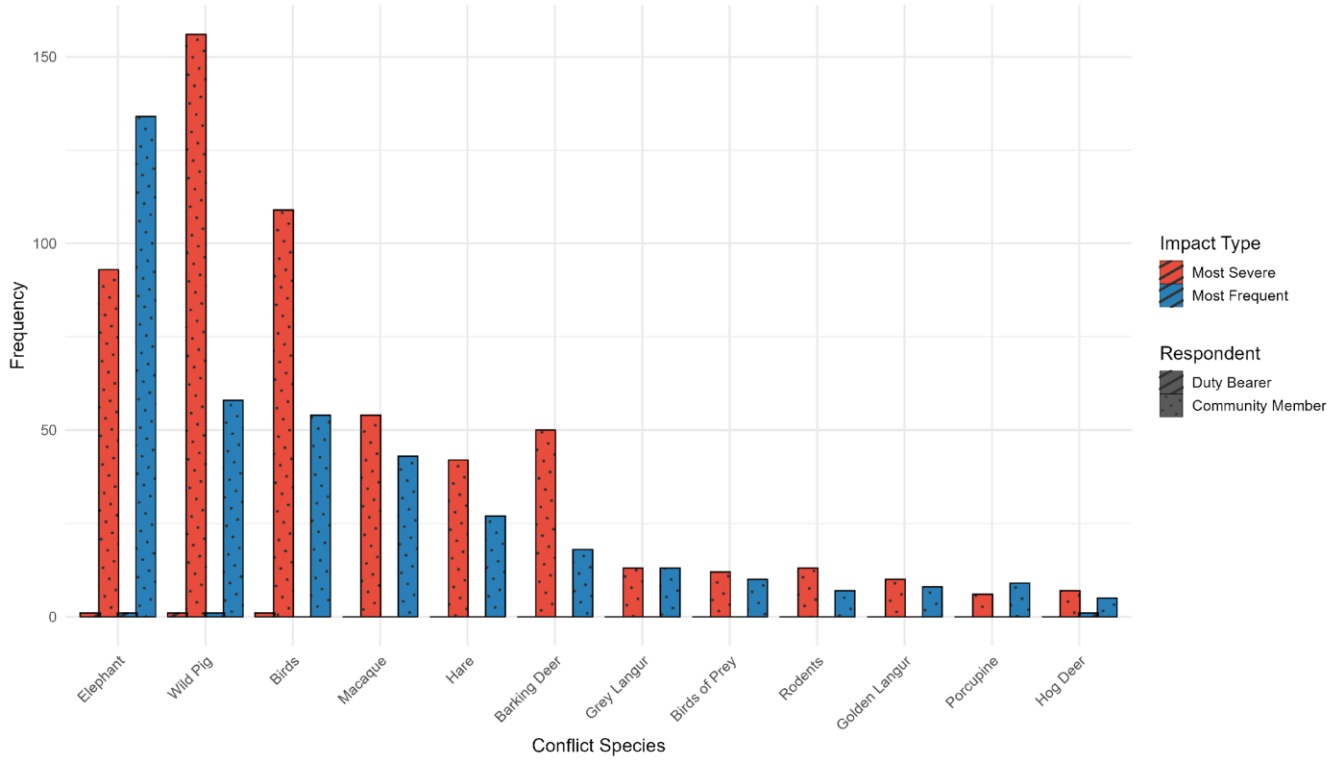

Figure 18: Conflict species in Nubgang Chiwog

The Livelihoods/Assets dimension emerges as the most vulnerable aspect of human-wildlife coexistence in Nubgang Chiwog, receiving the lowest scores from both community members and duty bearers compared to the People, Wildlife, and Habitat outcomes. This consistent pattern underscores the urgent need for targeted interventions to safeguard rural livelihoods from wildlife-induced losses. Within this dimension, particularly low ratings for "Understanding Interactions" and "Mitigation" highlight ongoing gaps in knowledge exchange and the practical implementation of strategies to minimize impacts on agriculture and livestock.

On the contrary, both groups assigned higher scores for Monitoring and Policy in the Wildlife and Habitat domains, indicating a stronger institutional focus and confidence in biodiversity conservation efforts. However, to achieve more balanced coexistence, future interventions must prioritize strengthening livelihood resilience through participatory planning, enhanced communication between stakeholders, and

a broader rollout of practical mitigation measures such as crop protection fencing, wildlife insurance schemes, and compensation mechanisms to reduce vulnerability and foster greater trust in human-wildlife coexistence initiatives in Nubgang.

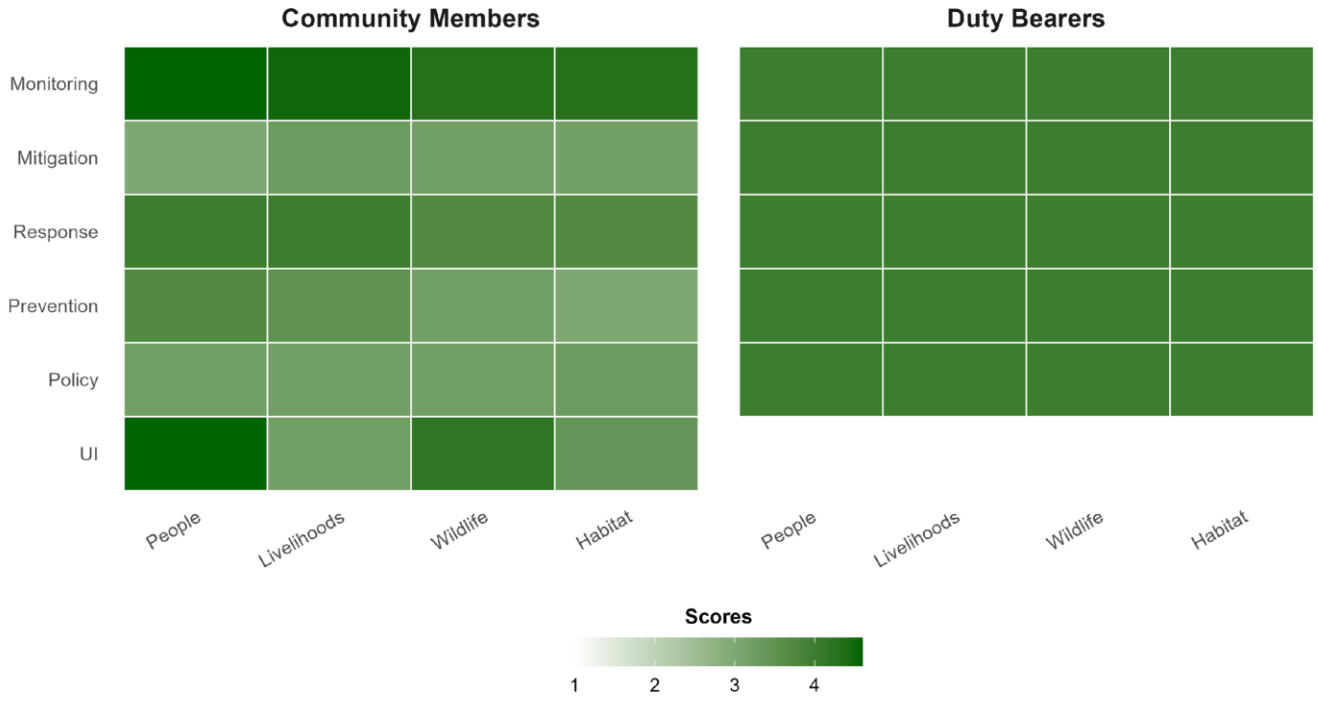

Figure 19: Element-wise contribution to outcomes for each stakeholder group in Nubgang Chiwog.

5. Conflict to Coexistence Strategy

To address this, the C2C strategy offers a participatory, adaptive framework that balances human needs with wildlife conservation. It empowers communities through education, safeguards livelihoods via sustainable alternatives and barriers, and ensures safe wildlife movement and habitat enrichment. Built on a co-management model, C2C involves assessing conflict, designing and implementing targeted actions, and continuously monitoring and adapting strategies. Its long-term success hinges on deeper understanding of elephant behavior, mitigating habitat fragmentation, strengthening cross-border collaboration, leveraging technology, securing sustainable funding, and providing capacity building, and maintaining robust communication and compensation mechanisms all aimed at fostering lasting human-wildlife coexistence.

A targeted action plan has been developed to strengthen human-wildlife coexistence in all Chiwogs of Dekiling, with proposed **budget of Nu 10.8 million** to be implemented by 2030. The plan emphasizes protecting livelihoods, improving safety, enhancing habitats, and increasing community awareness. The livelihoods/Assets and Habitat outcomes are most vulnerable, and mitigation measures are targeted to address these vulnerable outcomes.

- Key activities include:
  - Livelihood/Assets Protection:
    - Installation, maintenance, and enhancement of combined chain-link and electric fencing across all Chiwogs, alongside regular monitoring and the development of local by-laws to sustain these interventions.
    - Exploring ecotourism opportunities to diversify income and boost the local economy.
  - People's Safety and Capacity Building:
    - Training QRT members and forestry staff in human-elephant conflict (HEC) response and developing Standard Operating Procedures (SoP) to ensure safety for both people and elephants.
  - Strengthening Quick Response Teams (QRTs) and supplying field gear for effective incident response.
  - Habitat Enrichment:

- Planting fodder and palatable species, controlling invasive species, and creating waterholes to support wildlife needs and reduce conflict pressure on agricultural areas.

❖ Cross-Cutting Interventions:

- Conduct awareness programs on HWC management for all stakeholders.
- Studying the impact of mitigation strategies to continually refine approaches.

Implementation Responsibility:

Local Government, Local Communities, and the Divisional Forest Office (DFO) Sarpang will collaboratively implement these actions, following the stipulated timelines from 2026 to 2030.

Table 3: Implementation Plan and Financial Outlay

Sl. No	Outcome	Action / Activities	Chiwog	Responsibility	Budget (Nu in million)	Timeline	Remarks
1.	Livelihood / Assets	Installation, Maintenance and enhancement of combined chain-link-electric fencing	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	7.5	By 2027	**Public Consultation Note:** -The height of the chain-link fence should exceed that of the one installed at Singye. -A cement foundation should be provided for the chain-link fencing
2.	Livelihood / Assets	Periodic monitoring and evaluation of electric fencing	All Chiwogs	Local Govt / DFO-Sarpang	0.3	Every year	To monitor maintenance and functionality of electric fencing
3.	Livelihood / Assets	Formulate by-laws for management of electric fencing	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.3	By 2027	**Public Consultation Note:** The wild pig population in the gewog has grown significantly and is causing considerable nuisance to local communities, particularly in the form of crop depredation and property damage. It is therefore imperative to explore feasible population management strategies to mitigate HWC and ensure community safety and food security
4.	Livelihood / Assets	Study ecotourism potential in gewogs to boost local economy	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.1	By 2030	

5.	People	Train QRT members and Forestry staff on HEC Response Techniques and Develop SoP for responding to HEC (Risk Management)	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.25	By 2026	For safety of people and elephants during elephant chasing
6.	People/Wildlife	Conduct awareness programs on HWC	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.25	By 2028	
7.	People / Livelihood / Assets	Strengthening of Quick Response Team (QRT) and supply of field gear	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.9	By 2029	
8.	Habitat	Habitat Enrichment (Plantation of fodder trees and palatable species and control of invasive species, waterholes, etc.)	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	1	By 2029	
9.	People / Livelihood / Assets/Wildlife	Study impact of mitigation strategies	All Chiwogs	Local Govt / Local Communities / DFO-Sarpang	0.2	By 2030	
				Total	**10.8**		

6.1. Monitoring and Evaluation

Timely and systematic monitoring and evaluation are critical to ensuring the effective implementation and delivery of strategic actions. This section outlines the approach for tracking progress, assessing performance, and facilitating adaptive management throughout the implementation period. A comprehensive Monitoring and Evaluation Framework (see Table 4) has been developed in alignment with the broader implementation strategy. This framework includes clearly defined indicators to measure the performance of the strategy and evaluate its impact. Output indicators will primarily track the completion and effectiveness of the actions outlined in Section 6, supporting transparency, accountability, and continuous improvement.

6.1 Monitoring

Monitoring is a continuous process that provides stakeholders with regular updates on the progress, delays, or challenges encountered during implementation. For the five-year strategic plan, the Division Management Team will conduct annual monitoring exercises. These assessments will help ensure that activities remain aligned with the intended outcomes, enabling timely course corrections and informed decision-making.

6.2 Evaluation

Evaluation serves as a periodic assessment to determine the overall relevance, effectiveness, and impact of the strategy. Two formal evaluations will be conducted during the planned period:

A midterm review in the last quarter of the second year, and

A final review for the last quarter of the fifth year.

Both evaluations will be carried out by a joint team comprising internal members from DFO, along with external evaluators, including representatives from the concerned Functional Division. This collaborative approach ensures a balanced and objective assessment of implementation performance and strategic outcomes.

Table 4: Monitoring and Evaluation Framework

Sl. No	Outcome	Action / Activities	Indicator	Baseline	Unit	Yearly Target				
						2026	2027	2028	2029	2030
1	Livelihood / Assets	Maintenance and enhancement of combined chain-link-electric fencing	Length of fencing installed	4.5	Km		4.5			
2	People	Develop SoP for responding to HEC (Risk Management)	Brochures developed and shared with the public	0	Nos	200	200	200	200	200
3	People/Wildlife	Conduct awareness programs on HWC	No. of Awareness conducted	4	Nos	1	1	1	1	1
4	People / Livelihood / Assets	Strengthening of Quick Response Team (QRT) and supply of field gear	No. of members equipped	0	Nos	50		50		50
5	Habitat	Plantation of fodder trees and palatable species	Area (Ha)	0	Ha	2	2	2	2	2
6	Livelihood / Assets	Study ecotourism potential in gewogs to boost local economy	No. of Report produced	1	Nos				1	
7	People / Livelihood / Assets/Wildlife	Study impact of mitigation strategies	No. of Report produced	0	Nos					1
8	Livelihood / Assets	Periodic monitoring and evaluation of electric fencing	No. of Monitoring conducted	0	Nos			4	4	4
9	Livelihood / Assets	Formulate by-laws for management of electric fencing	By-Laws formulated	0	Nos			1		

Conclusion

The C2C Strategy for Dekiling Gewog presents a comprehensive, participatory framework for addressing the persistent and complex challenges of HWC, with a particular focus on human-elephant conflict. Rooted in robust field assessments, stakeholder consultations, and community engagement, this strategy seeks to harmonize biodiversity conservation with human well-being. By aligning ecological integrity with socio-economic needs, the C2C approach empowers local communities, enhances institutional coordination, and promotes sustainable coexistence.

With a total planned investment of Nu. 10.8 million, the strategy outlines targeted interventions across key outcomes—People, Livelihoods/Assets, Wildlife, and Habitat. Its success hinges on inclusive planning, adaptive management, and continuous learning. Through the integration of physical infrastructure, knowledge-based tools, responsive governance, and nature-based solutions, Dekiling Gewog can serve as a national model for coexistence. Effective implementation, backed by sustained funding, cross-sector collaboration, and consistent monitoring and evaluation, will be vital in achieving the vision of a resilient landscape where people and wildlife thrive together.

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