

JKSNR



Divisional Forest Office Management Plan

for IKI Landscapes of Jigme Khesar Strict Nature Reserve: Gakiling & Sangbay

(January 2026 – December 2035)

Jigme Khesar Strict Nature Reserve

Department of Forests & Park Services
Ministry of Energy and Natural Resources
Royal Government of Bhutan



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Reviewed and endorsed by the 77th session of the Departmental TAC meeting.

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Approval Sheet

Period of the Plan

This plan is valid for the period of 10 years from 2026 to 2035

Submitted for approval:



Chief Forestry Officer
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**Technically reviewed & recommended
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Recommended for approval:



Director
Department of Forests
and Park Services

APPROVED



Secretary
Ministry of Energy and Natural Resources

Foreword



I am pleased to present the Divisional Forest Office Management Plan developed by Jigme Khesar Strict Nature Reserve (JKSNR) for its IKI landscapes, Gakiling and Sangbay. This plan, prepared under the ‘Living Landscapes: Securing High Conservation Values in Southwestern Bhutan’ project, funded by the International Climate Initiative and coordinated by WWF Bhutan, covers the period 2026–2035. It marks a significant milestone in sustainable forest management and enhancing local livelihoods.

The Divisional Forest Office Management Plan aligns with Bhutan’s constitutional mandate to maintain at least 60% forest cover. It provides a scientifically grounded framework for managing forest resources sustainably within JKSNR’s IKI landscapes, ensuring the preservation of their rich natural heritage for future generations.

A central focus of the plan is the identification and integration of High Conservation Values into official land use plans. This approach protects vital habitats, water sources, and cultural sites, safeguarding biodiversity and ecosystem services beyond protected areas. By doing so, the plan reinforces Bhutan’s leadership in addressing biodiversity loss and climate change.

Equally important is the plan’s emphasis on balancing conservation with the livelihoods of local communities. Through sustainable forest use and mitigation of human-wildlife conflicts, it fosters harmonious coexistence between people and wildlife. The plan also addresses climate change impacts, offering adaptive strategies to enhance ecosystem and community resilience.

I extend my heartfelt gratitude to the International Climate Initiative, WWF Bhutan, and all stakeholders for their unwavering efforts. Together, let us strive for a sustainable and resilient future for both people and nature.

Tashi Delek!

A handwritten signature in blue ink, consisting of stylized, overlapping loops and lines.

Director

Acknowledgement

This Management Plan is the result of a collective and dedicated effort of the staffs of Jigme Khesar Strict Nature Reserve (JKSNR). The office sincerely acknowledges the commitment, professionalism, and teamwork demonstrated by all officers and staffs who contributed their time, experience, and technical inputs toward the successful formulation of this plan. Their sustained engagement throughout the planning process ensured that the document is comprehensive, practical, and grounded in field realities.

The formulation of this Management Plan was made possible through the unwavering support and guidance of the IKI Task Force Members under the IKI Project. The Division is deeply grateful for their strategic direction, technical advice, and continuous encouragement throughout the planning process. 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 prescriptions contained in this plan. 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 both within and outside the country. These interventions greatly strengthened the technical capacity of the field teams involved in the assessment.

The office would like to extend special appreciation to Mr. Ugyen, Senior Forest Ranger I and Mr. Sonam Yonten, Forestry Officer, who played crucial roles in guiding and coordinating the formulation of this Management Plan. Their dedication, technical oversight, and leadership were instrumental in bringing the 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 Management Plan. Their collective efforts have resulted in a key milestone that will guide sustainable forest management and biodiversity conservation within Gakiling and Sangbay Gewogs of Haa in the years to come.

Abbreviations and Acronyms

ABG	Above Ground Biomass
BA	Basal Area
BC	Biological Corridor
BFL	Bhutan for Life
BGB	Below Ground Biomass
CBD	Convention on Biological Diversity
CF	Community Forest
CWD	Coarse Woody Debris
DFO	Divisional Forest Office
EMR	Existing Management Regimes
FNCA	Forest and Nature Conservation Act
FNCRR	Forest and Nature Conservation Rules and Regulations
HCV	High Conservation Value
HCVMA	High Conservation Value Management Area
HWC	Human Wildlife Conflict
JKSNR	Jigme Khesar Strict Nature Reserve
KBA	Key Biodiversity Area
LFMA	Local Forest Management Area
LULC	Land Use Land Cover
masl	Meters above sea level
NEC	National Environment Commission
NFI	National Forest Inventory
NFP	National Forest Policy
NWFP	Non-Wood Forest Product
PAs	Protected Areas
RBS	Rapid Biodiversity Survey
SFM	Sustainable Forest Management
SOC	Soil Organic Carbon
SqKm	Square Kilometer
SRF	State Reserve Forest
SW	South-west

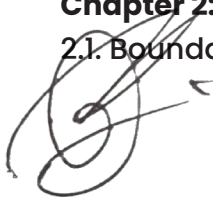
Glossary of Bhutanese terms

<i>Chiwog</i>	Sub-block/small administrative unit
<i>Chuzhing</i>	Wetland
<i>Dzongkhag</i>	Districts
<i>Geog</i>	Block/large administrative unit withing districts
<i>Kamzhing</i>	Dry land
<i>Pangpoe</i>	Local name for <i>Nardostachys jatamansi</i>
<i>Sokshing</i>	Forest land for collection of leaf litter
<i>Thanor</i>	Local cattle breed
<i>Tsamdro</i>	Grazing land
<i>Tshoesa</i>	Kitchen garden

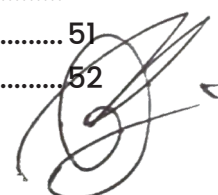
NOTE: This DFO Management Plan for Gakiling-Sangbay covers only areas outside the legally notified boundary of Jigme Khesar Strict Nature Reserve (JKSNR), Haa Dzongkhag. Forest areas within JKSNR remain under the jurisdiction of the approved JKSNR Management Plan.

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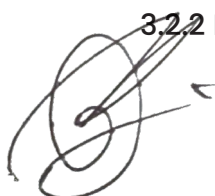
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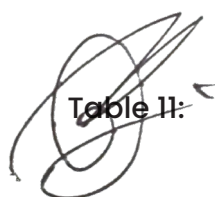
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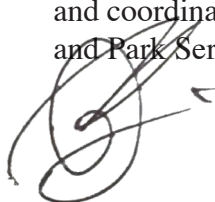
Rationale

Bhutan though a small country, is widely recognized across the world for its environmental conservation initiatives and as a carbon-negative country in 21st century. The intact natural resources that we have today is a testimony to the farsighted conservative visions of our successive monarchs and the sound environment conservation policies of the country. However, over the years the forest management policies have undergone significant changes from that of more conservation focused to sustainable utilization of forest resources. Though scientific management of our forest resources has adhered to the principles of sustainability, it has become more crucial than ever in the face of a changing climate and its impacts. Today climate change and its impacts has widely affected many countries. Bhutan by virtue of being located in a most fragile mountain ecosystem is even more poised to the impacts of climate change. Thus, Bhutan is one of the few countries in the world that enshrines forest and environmental conservation aspects in its Constitution. Article 5 of the Constitution of the Kingdom of Bhutan reflects commitment to ensure that, in order to conserve the country's natural resources and to prevent degradation of the ecosystem, a minimum of sixty percent of Bhutan's total land shall be maintained under forest cover at all time.

Divisional Forest Office, as the custodian of our forest resources in the Dzongkhags, plays an integral role in conserving and protecting our natural forest resources besides catering forestry services to the people of the country. It is one of the main players in implementing our sound environmental conservation policies and ensuring our commitment to remain carbon neutral and maintain 60% forest cover for all times to come. Though management of forest resources within the divisional jurisdiction is guided by the noble principles of sustainability, it is even more important to be scientific along with long term divisional goals and objectives. It is also equally important to review and evaluate such goals and objectives on a periodic basis. Therefore, in order to do so a comprehensive and holistic Divisional Forest Management Plan with time bound vision, mission, objectives and goals is imperative. It shall serve as an overarching scientific Forest Management Plan in scientifically managing the forest resources within the jurisdiction of the Forest Division.

Executive summary

The Divisional Forest Office (DFO) Management Plan for Gakiling–Sangbay, Haa Dzongkhag, has been prepared for a ten-year period (2026–2035) to provide a structured and strategic framework for sustainable forest and biodiversity management. This is the first DFO Management Plan developed for the Gakiling–Sangbay landscape. The plan was prepared under the project “Living Landscapes: Securing High Conservation Values in Southwestern Bhutan”, funded by the International Climate Initiative (IKI) and coordinated by WWF Bhutan, in close collaboration with the Department of Forests and Park Services (DoFPS).



The plan is fully aligned with Article 5 of the Constitution of the Kingdom of Bhutan, which mandates the maintenance of a minimum of 60 percent forest cover, and is guided by relevant national policies, acts, rules, and strategies related to forest management, biodiversity conservation, and climate change. It recognizes the vital role of forests in maintaining ecological stability, conserving biodiversity, supporting ecosystem services, and sustaining the livelihoods of local communities.

The plan was prepared based on the findings of robust assessment from the 13 biodiversity grids (4km x 4km) and socio-economic surveys and Climate Vulnerability and capacity Assessment of the 107 sampled resident local communities of Gakiling and Sangbay. A total of 152 species of plants belonging to 56 families, 50 fungi, 33 mammals, 208 bird species, 97 butterflies, 13 fish species, 24 reptiles (20 snakes, 4 lizards) and 7 amphibians (4 frogs, 3 toads), were recorded through the biodiversity assessments conducted in the 52 vegetation sample plots (20m x 20m). Species diversity analysis indicated a higher diversity index (H') of 2.629, evenness index (J) of 0.766 and species richness of 31, reflecting high biodiversity values within the management area.

The plan comprises seven chapters detailing the current status of forest resources, biodiversity and socio-economic dynamics within the landscape, key threats and challenges, and strategic management interventions for the plan period. Priority management areas include species conservation and protection, habitat management, human-wildlife conflict mitigation, climate resilience building of communities, and institutional strengthening. It underscores the importance of community participation in achieving conservation goals while ensuring sustainable resource utilization. Recognizing the challenges posed by climate change, the plan proposes adaptive strategies to mitigate risks like pests, diseases, and the drying of water sources. The plan integrates clearly defined programs and activities with corresponding budget allocations, implementation timelines, and monitoring indicators.

A key component of the plan is the identification and management of High Conservation Value Areas (HCVAs). Through a robust screening process, critical habitats such as the Red Panda conservation area in Tergola have been identified and prioritized for focused conservation and management interventions. The plan adopts a forward-looking approach, prescribing targeted interventions for biodiversity conservation, ecosystem services, and community resilience. The management prescriptions focus on safeguarding High Conservation Value Areas, promoting sustainable livelihoods, and reducing human-wildlife conflict. The implementation framework outlines clear strategies for achieving the plan's objectives, supported by a detailed financial outlay. Robust monitoring and evaluation mechanisms are incorporated to ensure accountability and adaptability in meeting conservation and management targets.

The 10-year management plan (2026–2035) for Gakiling–Sangbay carries a total projected budget of Nu. 116.68 million, of which Nu. 110.94 million is earmarked for IKI Landscape initiatives in Gakiling and Sangbaykha geogs, and Nu. 5.74 million is allocated to HCVA programs covering an area of 60001 ha.

The Gakiling–Sangbay DFO Management Plan serves as a strategic and operational tool for sustainable forest management within the IKI landscapes of Jigme Khesar Strict Nature Reserve. It contributes significantly to biodiversity conservation, climate change



mitigation and adaptation, and enhanced community livelihoods, while setting a benchmark for integrated and science-based forest management planning in Bhutan, in line with national and global conservation commitments.

Key words: Biodiversity conservation, Climate change impacts, Divisional Forest Office, High conservation value areas, Human-wildlife conflict, red panda, Sustainable Forest management, Sustainable livelihoods, Sustainable resource utilization.

Key Facts of Gakiling-Sangbay

Sl/No.	Forest Statistics	Units	
1	Total Forest Area	Ha	55773.26
2	Forest Cover	%	92.95
3	Conifer Forest	%	14.79
		Ha	8251.07
4	Juniper & Rhododendron Scrub	%	0.78
		Ha	436.84
5	Cool Broadleaved Forest	%	55.88
		Ha	31168.29
6	Warm Broadleaved Forest	%	28.54
		Ha	15917.05
7	Basal Area	m ² /Ha	37.11
8	Growing Stock	m ³ /Ha	327.18
9	Biomass Stock (AGB, BGB, CWD, Litter)	tonnes/Ha	339.62
10	Carbon Stock (AGB, BGB, CWD, Litter)	tonnes/Ha	255.11
Sl/No.	Protected Areas	Units	
1	Key Biodiversity Areas	Ha	3161
		No.	1
2	High Conservation Value Area	Ha	2722.5
		No.	1
Sl/No.	Sustainable Forest Management Regimes	Units	
1	Community Forest	Ha	1437.84
		No.	8
	Total CF Households	HHs	279
2	Local Forest Management Area	Ha	10,403.30
		No.	2
Sl/No.	Tourism Products	Units	
1	Tergola Red Panda Trail	KM	4.44
2	Jo-Baytsho Trail	KM	43



Chapter 1: Background

1.1. History and Significance

1.1.1. Importance of Forests

The Article 5 of the Constitution of the Kingdom of Bhutan states that: “Every Bhutanese is a trustee of the Kingdom’s natural resources and environment”. The Royal Government is enjoined in the Constitution to conserve and improve the environment and safeguard the country’s biodiversity. It is further directed to secure sustainable development while promoting economic and social development. The Constitution has mandated the Government to ensure that a minimum of 60% of the country’s land should be maintained under forest cover for all times to come. Bhutan is one of the few carbon-negative countries in the world, absorbing carbon more than it emits. The Royal Government of Bhutan (RGoB) has made an international commitment to remain carbon neutral for all times to come.

1.1.2. Overview of the Sustainable Forest Management

Sustainable Forest Management (SFM) is crucial for Bhutan, a country renowned for its rich biodiversity and deep-rooted environmental and cultural values. Bhutan has committed to maintaining at least 60% of its land under forest cover as mandated by its constitution, emphasizing the balance between development and environmental conservation. The country’s commitment to SFM is firmly embedded within its legal and policy frameworks, including the Forest and Nature Conservation Rules and Regulations (FNCRR) 2023, the Forest and Nature Conservation Act (FNCA) 2023, and the National Forest Policy (NFP) of 2011. These documents provide a structured approach to managing forest resources while balancing ecological integrity and community welfare.

Sustainable Forest Management within the IKI landscapes of Jigme Khesar Strict Nature Reserve (JKSNR): Gakiling and Sangbay, demonstrates an integrated approach that emphasizes both conservation and community participation. As a part of SFM, eight Community Forests (CF) have been established in the Gakiling and Sangbay, which empower local communities to sustainably manage resources, and two Local Forest Management Areas (LFMA) designed to promote forest health and productivity. Reforestation and ecological restoration efforts are supported by plantation programs. The designation of Key Biodiversity Areas (KBAs) and High Conservation Value Area (HCVA) highlights a strong commitment to preserving critical habitats and maintaining ecological connectivity. This comprehensive strategy ensures the balance of ecological integrity, community welfare, and sustainable resource utilization, fostering ecosystem resilience and improved livelihoods.

The Range offices of Gakiling and Sangbay play pivotal roles in the management and service delivery within their jurisdictions, contributing to effective forest governance and community support. Key services provided by these Range offices include the issuance of forestry clearances for essential rural needs such as timber, firewood, and Non-

Wood Forest Products (NWFP). They are responsible for the regular monitoring of CFs, LFMAAs and plantation programs to ensure sustainable practices are maintained.

Additionally, the Range offices conduct critical site inspections for infrastructure projects, including road construction, mining, and hydropower, to assess environmental impacts and ensure compliance with conservation standards. The offices are actively involved in addressing Human-Wildlife Conflict (HWC) areas by implementing mitigation measures and promptly responding to wildlife encounters, including the rescue and safe relocation of wild animals.

Through these comprehensive services, Gakiling and Sangbay Range offices not only facilitate sustainable resource management but also play a crucial role in environmental protection, community support, and maintaining ecological balance within their divisional jurisdiction.

1.2. Policies and Legislations

1.2.1. National Forest Policy 2011

The National Forest Policy 2011 was formulated to keep up with changing times and the evolution of forest management concept of the State Reserve Forests (SRF). Since 1957, Forest governance has transitioned from providing ‘free access’ to ‘almost no access’ to ‘managed access.’

The Forest Policy 2011 broadly stipulates to apply scientific management approaches to all of Bhutan’s forest and biodiversity resources for the benefit of people without compromising the conservation values and the constitutional mandate of maintaining a minimum of 60 % forest cover for all time.

The Policy while stating about different management regimes also has provisions on the forest-based industries and need of proper utilization and marketing in developing private sector and rural communities. Some of the main features of the Policy include a science-based participatory approach to forest governance and sustainable forest management with emphasis on efficient and environment friendly technologies for value-addition and waste minimization.

1.2.2. Forest and Nature Conservation Act of Bhutan (1969, 1995, 2023)

The Bhutan Forest Act 1969 is one of the first Acts passed by the RGoB. The Act nationalized “all land under which no person has acquired a permanent heritable and transferable right of use and occupancy” as forests. It further identified and provided directives regarding the forest rights, uses, royalties and penalties. The Act stipulated that at least 60% of the country should remain forested at all times.

The Bhutan Forest Act 1969 was repealed and ratified in 1995. The FNCA of Bhutan 1995 identified and outlined the requirement of management plan for production and protection of forest and wildlife. Emphasis was given to community and social forestry and, encouraged the participation of community and private individuals. The Act also provided the legal basis for defining management restrictions in the process of forest planning and function mapping.

The Forest and Nature Conservation Act of 1995 was revised in 2023 to address emerging conservation challenges while balancing the country's development needs and the well-being of its people. Additionally, the FNCA 2023 modernized outdated sections and introduced mechanisms for payment for ecosystem services.

1.2.3. Forest and Nature Conservation Rules (2000, 2003, 2006, 2017, 2020, 2023)

The Forest and Nature Conservation Rules 2000 was revised in 2003 and again in 2006 to mainly accommodate a broader scope of the power and duties vested by the FNCA 1995 which were not covered by earlier FNCR. The FNCA 1995 mandated the Department to manage SRF including CF, protect and conserve wildlife, soil & water and related natural resources of Bhutan. The FNCR 2006 issued authority and provisions for the preparation of management plans for Protected Areas (PA), Forest Management Units (FMU), CF, NWFP, Soil & Water conservation. Various amendments to the FNCR 2006 have been done over the year due to changing times but keeping in line with the provisions of the NFP 2011. Further, a separate amendment to the FNCR 2006 was carried out due to the adoption of the revised rule for the rural timber allotment as part of the implementation of the Government to citizen services programme. The FNCR 2006 was again revised in 2017, which was an amalgam of all the different amendments made to the FNCR 2006 and the provision on the rules on Biological Corridors (BC) 2007, which defined the protection status and prescription of the BC plan.

The FNCRR was revised in the year 2023 to align all the requirements vested in FNCA 2023. Major changes in the FNCRR are the deletion of the Chapter on Surface Collection of Sand and Stone as the mandate is transferred to the Department of Geology and Mines. In addition to finetuning provisions of the FNCRR 2017 the FNCRR 2023 underscores expediting public services delivery through online platforms. The amended FNCRR 2024 introduced targeted refinements to the FNCRR 2023 to address implementation challenges, clarify procedures, and simplify processes, enhancing practicality and efficiency without altering the core conservation objectives.

1.2.4. Land Lease Rules and Regulations of Bhutan 2018

The Land Lease Rules and Regulations of Bhutan 2018 implements the provision of the Land Act of Bhutan 2007 and necessitates the requirement of forestry clearance for issuance of lease of SRF Land. Further, it strongly discourages and forbids lease of land registered under Government institutions and areas which are under different management namely designated Parks, Nature Reserve, PA, BC, buffer zones, CF, critical watershed, wetland, high risk zones, Nyes, religious sites & important monuments and restricted zones. However, the Secretariat can make exemptions for only those critical infrastructures of national importance and public need under only special circumstances as deemed relevant by it.

1.2.5. Biodiversity Act of Bhutan (2003)

The Biodiversity Act of Bhutan 2003 provides for the conservation and sustainable utilization of biological resources & associated traditional knowledge and ensures Sui Gen-

eris protection of plant varieties. It also authorizes the implementation of the Access and Benefit-sharing regime to derive additional benefits in a fair and equitable manner.

1.2.6. Land Act of Bhutan 2007

The Land Act of Bhutan 2007 provides for the leasing of state land for economic and various other activities. All *Tsamdro* (grazing land) and *Sokshing* (forest land for collection of leaf litter) rights shall revert back to the State and convert to leasehold uses with management plans giving preference to previous rights holders.

1.2.7. National Environment Protection Act of Bhutan 2007

The National Environment Protection Act (NEPA) 2007 provides for the establishment of an effective system to conserve and protect the environment through the National Environment Commission (NEC) or its successors, designation of competent authorities and constitution of other advisory committees, so as to independently regulate and promote sustainable development in an equitable manner. The Act also calls for conservation and protection of wetlands, alpine regions, watersheds, and other vulnerable ecosystems in addition to the existing protected areas.

1.2.8. Waste Prevention and Management Act of Bhutan 2009

The Waste Prevention and Management Act of Bhutan 2009 promotes minimization and sound management of waste in the country through the three Rs (Reduce, Reuse and Recycle). The Act further identifies different agencies for regulation of waste in the country wherein it empowers the Ministry of Agriculture and Forests to ensure prevention and management of waste with respect to the agricultural sector, including live-stock and forestry.

1.2.9. Climate Change Policy of the Kingdom Bhutan, 2020

Bhutan, a landlocked country in the Eastern Himalayas, is highly vulnerable to the impacts of climate change due to its fragile mountain ecosystems, dependence on climate-sensitive sectors (like agriculture, hydropower, and forestry), and limited adaptive capacity. Despite being a net carbon sink, absorbing more greenhouse gases than it emits, Bhutan faces increasing risks from climate-induced disasters such as glacial lake outburst floods (GLOFs), erratic rainfall, landslides, and droughts.

To address these challenges and align with its international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, Bhutan adopted the Climate Change Policy of Bhutan 2020. This policy provides a strategic framework for coordinated action on climate change mitigation and adaptation, while ensuring that development remains sustainable and resilient. It also provides strategic guidance to ensure that Bhutan remains carbon neutral and protects the wellbeing of the people by adapting to climate change efficiently and effectively. Additionally, the policy also aims to address challenges and opportunities such as international support in the form of finance, technology, capacity building, research and awareness arising from recent developments in the national and international arena of climate change, which will be critical in implementing climate actions. This policy also

ensures meaningful participation of all relevant stakeholders in climate change actions in a coordinated and coherent manner with clear roles and responsibilities.

1.2.10. Nationally Determined Contribution, 2021

Bhutan's 2nd NDC was officially launched on June 5, 2021, coinciding with World Environment Day and ahead of COP26. It reaffirms Bhutan's pledge to remain carbon neutral, and outlines enhanced mitigation measures via sector-specific Low Emission Development Strategies (LEDS) and updates to the National REDD+ Strategy and Action Plan. Bhutan's 2nd NDC advances LEDS across multiple sectors to decouple development from emissions. It also highlights key sector specific adaptation and mitigation measures and initiatives that will be taken by Bhutan. In presenting the second NDC, Bhutan maintains the commitment to remain carbon-neutral where emission of greenhouse gases will not exceed carbon sequestration by our forests and sinks as first pledged in 2009 and reaffirmed in the first NDC. At the same time, Bhutan calls on the international community to continue and enhance the support for Bhutan's efforts to mitigate and adapt to climate change. While Bhutan's first NDC covered broad priority action areas, the second NDC further enhances our actions by elaborating priority mitigation actions in the form of LEDS, roadmaps and strategies.

1.2.11. National Adaption Plan of the Kingdom of Bhutan, 2023

The National Adaptation Plan (NAP) process was initiated by Bhutan in line with the UNFCCC Cancun Adaptation Framework (2010), which called on countries to formulate medium- and long-term strategies to address climate change impacts. While Bhutan had earlier prepared two National Adaptation Programmes of Action (NAPAs) focused on urgent and immediate needs, the NAP aims to provide a comprehensive, long-term framework for integrating climate change adaptation into national planning and development.

Bhutan began developing its NAP with support from the Green Climate Fund (GCF), the UNDP, and other partners around 2019. The objective is to identify, prioritize, and mainstream adaptation needs across key sectors such as agriculture, forestry, water resources, health, energy, and infrastructure, ensuring that climate resilience is embedded within the country's socio-economic development guided by the philosophy of Gross National Happiness (GNH). The NAP process also emphasizes strengthening institutional coordination, scientific data and climate information systems, and financing mechanisms to support sectoral adaptation. Importantly, it helps Bhutan align national adaptation planning with its Climate Change Policy (2020) and the Second Nationally Determined Contribution (2021).

1.2.12 Water Act of Bhutan 2011

The Water Act of Bhutan, 2011 provides the legal framework for the protection, conservation, development, and sustainable management of water resources in Bhutan. The Act recognizes water as a public trust and a vital national resource, ensuring its equitable and sustainable use for present and future generations. The Act establishes principles for integrated water resources management, regulates water abstraction and pollution, and sets out institutional roles for water governance at national and local levels. It also

provides for the protection of watersheds, water sources, and water quality, while promoting efficient water use, conflict resolution, and environmental sustainability in line with Bhutan's development and conservation priorities.

1.2.13 Mines and Mineral Act of Bhutan 1995 and Regulation

The Mines and Minerals Act of 1995 provides the legal framework for the exploration, extraction, management, and conservation of mineral resources in Bhutan. It recognizes minerals as a state-owned resource and aims to ensure their sustainable utilization while safeguarding the environment and supporting national development. The Act establishes licensing and permit systems for prospecting, mining, and processing of minerals, defines the roles and responsibilities of regulatory authorities, and sets out procedures for revenue collection, royalty payments, and enforcement of compliance. The Mines and Minerals Regulations operationalize the Act by detailing application procedures, safety and environmental standards, reporting requirements, and penalties for violations. Together, the Act and its Regulations aim to balance economic development, environmental protection, and responsible resource management in Bhutan.

1.2.14 Economic Development Policy of Bhutan 2016

The Economic Development Policy of Bhutan outlines the nation's strategy to achieve sustainable, inclusive, and equitable economic growth while maintaining the country's unique cultural heritage and environmental conservation priorities. Rooted in the philosophy of Gross National Happiness (GNH), the policy emphasizes that economic development must contribute not only to income generation but also to social well-being and ecological balance. Key objectives include diversifying the economy, promoting private sector development and entrepreneurship, fostering rural development, enhancing human capital and skills, and ensuring sustainable use of natural resources. The policy also encourages investment in infrastructure, innovation, and trade, while prioritizing environmental stewardship and social equity. Overall, it provides a roadmap for Bhutan to achieve balanced economic growth that aligns with its development philosophy and long-term national goals.

1.2.15 National Biodiversity Strategy and Action Plan of Bhutan 2025

This fifth edition of the NBSAP – The National Biodiversity Strategy and Action Plan (NBSAP) of Bhutan is a strategic framework aimed at conserving biodiversity, promoting sustainable use of biological resources, and ensuring equitable benefit-sharing. Aligned with the Convention on Biological Diversity (CBD), the NBSAP integrates Bhutan's development priorities, traditional knowledge, and conservation commitments into a coherent national plan.

The strategy focuses on ecosystem and species conservation, habitat restoration, and protection of genetic resources, while emphasizing community participation and mainstreaming biodiversity into sectoral policies such as agriculture, forestry, and tourism. The Action Plan outlines priority activities, targets, and institutional responsibilities to achieve these goals, ensuring that biodiversity contributes to both environmental sustainability and socio-economic development in Bhutan.

1.3. Purpose and Objectives

1.3.1. Vision

Sustaining Bhutan's forest resources and biodiversity for the happiness of present and future generations.

1.3.2. Mission

To conserve and manage Bhutan's forest resources and biodiversity to ensure social, economic and environmental well-being, and to maintain a minimum of 60% of the land under forest cover for all times to come.

1.3.3. Purpose

The purpose of the Divisional Forest Office (DFO) Management Plan for the International Climate Initiative (IKI) Landscapes of Gakiling-Sangbay is to provide a strategic framework for biodiversity conservation, sustainable forest management, and maintenance of ecological integrity. The plan aims to protect and restore critical habitats, address human-wildlife conflict, and support species conservation. It also promotes sustainable livelihoods and capacity development for local communities, while strengthening climate resilience and adaptive management to ensure long-term ecological and socio-economic sustainability.

1.3.4. Objectives

The objectives of the DFO management plan for the IKI landscapes of Gakiling-Sangbay are;

1. Ensure sustainable forest management through improved planning, monitoring, enforcement, and adaptive management.
2. Strengthen institutional capacity and governance for effective and efficient service delivery to nature & public.
3. Restore and protect degraded habitats for species persistence
4. Minimize Human-wildlife Conflict to promote harmonious coexistence
5. Build resilience and adaptive measures to climate change impact

Chapter 2: Current Status

2.1. Boundary and Area

The IKI landscapes of JKSNR: Gakiling and Sangbay lies towards the south-west (SW) of Haa Dzongkhag (District) between the geographical coordinates of 27°9'34.63"N and 89°8'23.13"E. The landscapes cover an area of 600.01 square kilometer (SqKm) with an altitude ranging from 750 masl to 4400 masl. The area falls outside of the JKSNR despite being managed by JKSNR. The landscapes comprise of 10 chiwogs (sub-block) with five chiwogs in each geog of IKI landscapes of JKSNR. The landscape shares border with Samtse DFO towards south and Gedu DFO towards east.

Gakiling and Sangbay features a diverse landscape with various land use and land cover (LULC) types (Figure 1). Broadleaf forests are the most extensive, covering 49,674.60 hectares (ha), and serve as an essential zone for biodiversity conservation. Mixed conifer forests span 6,139.88 ha, enhancing habitat complexity and ecosystem resilience. Alpine scrubs, found over 9.09 ha, represent unique high-altitude vegetation. Fir forests, encompassing 404.54 ha, add to the diversity of coniferous habitats. Meadows (571.19 ha) and shrublands (2,175.14 ha) provide important grazing areas for both wild and domesticated herbivores.

The region also includes 539.45 ha of agricultural land, reflecting the harmonious blend of human activities within the natural environment and contributing to local livelihoods. This mosaic of habitats contributes to the rich ecological value of the IKI landscapes of JKSNR, supporting diverse flora and fauna, maintaining hydrological functions, and ensuring landscape resilience against environmental changes.

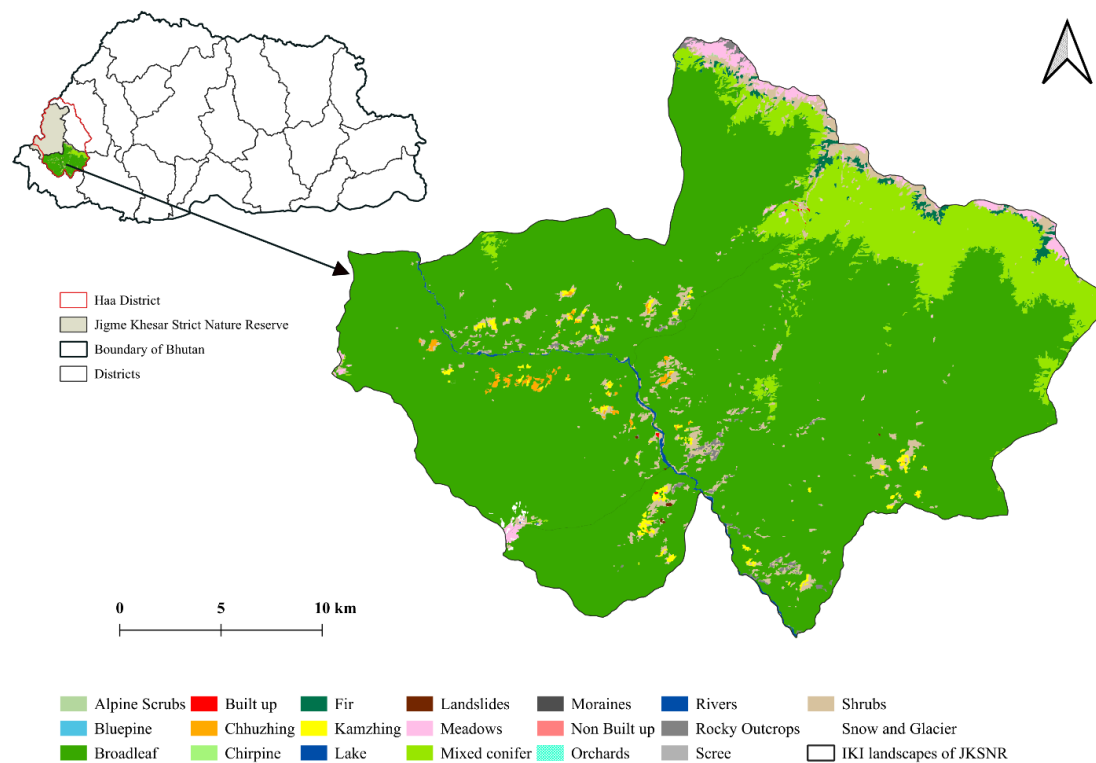


Figure 1: Map of IKI landscapes of JKSNR showing its location and land use land cover types

2.2. Administration

2.2.1. Administrative Set-up

The administration setup of the IKI landscape of JKSNR spans the geogs of Gakiling and Sangbay. The headquarters, located in the Haa district, is led by the Chief Forestry Officer (CFO), who oversees all activities. Each geog, Gakiling and Sangbay, has its own Forest Range Office. These offices are staffed with three technical professionals and one Elementary Service Personnel (ESP) staff member each. The technical staff are responsible for conducting forest and wildlife surveys, implementing conservation activities, managing forest resources, engaging with local communities to raise conservation awareness and overseeing the forestry related services of the communities. The ESP staff support these activities by promoting sustainable practices and facilitating community involvement.

2.2.2. Mandates

The Gakiling and Sangbay Range Offices have set of mandates designed to serve local communities while fostering the sustainable conservation of forest ecosystems. These mandates reflect a comprehensive approach to managing forest resources, addressing community needs, and ensuring the protection and conservation of environment for present and future generations. A primary mandate of the two Range Offices is to facilitate access to forest resources for local communities, ensuring that needs are met sustainably thereby issuing permits for timber and NWFPs. These permits help communities meet

essential needs for wood and other forest products while balancing resource use with conservation goals. Additionally, forestry clearance for mining and other development activities, such as farm road construction, is regulated through stringent permit processes. This is essential in ensuring that any developmental activities within these landscapes are planned and executed with minimal environmental impact.

One of the main activities is to undertake afforestation and reforestation programs to rehabilitate degraded areas. These programs not only help in restoring ecosystem functionality but also contribute to climate resilience by enhancing carbon sequestration and soil stability. Such efforts ensure that both local communities and wildlife benefit from increased forest cover and restored habitats. Afforestation projects focus on planting native species, fostering biodiversity, and enhancing ecosystem services like water regulation and soil conservation. Reforestation initiatives are designed to reclaim lands impacted by human activity or natural degradation, with a long-term goal of achieving self-sustaining forest cover.

The Range Offices also have core responsibility to oversee CFs and LFMAAs. This oversight includes the monitoring of resource use, forest health, and adherence to sustainable forest management practices by community forest groups. Community forests and LFMAAs serve as critical resources for local livelihoods.

The enforcement of forest laws and regulations is vital to protecting ecological integrity of the IKI landscapes of JKSNR. To fulfill this objective, we enforce the FNCA, along with other relevant regulations and policies, ensuring compliance with rules related to land use, resource extraction, and wildlife protection. Patrols, monitoring programs, and collaboration with local enforcement agencies help in curbing illegal logging, poaching, and other destructive practices within the communities of Gakiling and Sangbay.

We also emphasize on community engagement and capacity building thereby providing technical assistance to help local communities adopt sustainable practices. Training programs focus on sustainable harvesting techniques, agroforestry, forest fire management, and wildlife conflict mitigation. By empowering local communities, we foster a collaborative approach to conservation and resource management, ensuring that communities are equipped to contribute meaningfully to forest conservation efforts.

Human-wildlife conflict is a recurring issue in regions where communities and wildlife share close proximity. We coordinate wildlife rescue operations to protect endangered species and reduce conflict incidents. We also implement strategies to address HWC, including installing deterrents, raising awareness among communities, and providing timely assistance to prevent crop and livestock losses. These efforts help in maintaining harmony between human settlements and wildlife habitats, promoting coexistence.

To address the community concerns, including water scarcity, we work closely with Dzongkhag administration, local government and fund providers such Bhutan for Life (BFL). These collaborations focus on sustainable water resource management, helping communities access clean and reliable water sources. Water shortages are mitigated through watershed management practices and infrastructure development, such as the construction of water tanks.

2.2.3. Human Resource

Jigme Khesar Strict Nature Reserve has four staff (as of June 2025) in Professional and Management Category which includes CFO. Professional and Management Category officials oversee the management of various sections and projects, with support from five 'SS' level staff and 10 'S' level staff across the Range offices. Three Range offices are each led by 'SS' and 'S' level officials.

An Administrative Assistant supports the CFO with office tasks, while the division is further staffed by two 'O' level employees and three ESPs, all of whom contribute to the operational effectiveness. Notably, the technical team includes three female staff members. This staffing structure is designed to ensure comprehensive coverage of the jurisdiction of JKSNR, including Gakiling and Sangbay, in fulfilling its mandates.

2.2.4. Infrastructure

The Sangbay Range Office was constructed with funding support from the BFL project, while the Gakiling Range Office was built with funds provided by the European Union's Rural Development and Climate Change Response Programme. Additionally, two motorbikes were procured with funding from the BFL project, further ensuring timely and efficient public service delivery.

The establishment of these range offices marks a significant improvement in the infrastructure and capacity of the region. The Gakiling and Sangbay range offices are equipped with facilities designed to support a wide range of forestry services. This includes administrative buildings, field equipment, and transportation means, all aimed at enhancing the overall efficiency of forest management and conservation efforts.

The Jigme Khesar Strict Nature Reserve headquarter was established in 2018 and is housed in a two-story building that accommodates both the Headquarters and the Bjee Range Office. This co-location enhances coordination and efficiency between the headquarter and the Range Office, supporting seamless communication and collaboration within the division.

For field operations and public services, the office is equipped with two Toyota Hilux vehicles, both stationed at the JKSNR headquarter. These vehicles play a critical role in maintaining mobility across the IKI landscapes of JKSNR, allowing rapid response to emergencies and urgent needs. Their availability enhances the division's ability to provide timely services and support to the surrounding communities and Range Offices, underscoring the headquarters' commitment to effective service delivery in forest management and conservation efforts.

2.2.5. Budget and Revenue

The Budget and Revenue section highlights the various financial contributions supporting the Gakiling and Sangbay Range Offices beyond the budget approved by RGoB. Revenue is generated through mechanisms such as fees and service charges outlined in Annexure X of the FNCRR 2023, as well as penalties for offences detailed in Annexure XIX of the FNCRR 2023.

Key revenue streams in recent years (2022-2024) include concessional timber, NWFP,

commercial timber, fines, and service fees (Table 1). Gakiling and Sangbay Range Offices have generated revenue amounting to Nu. 0.399 million in last three years. All revenue collected is systematically deposited into the RGoB account via the Revenue Administration Management Information System.

Table 1: Source of revenue generated for last three years (2022–2024)

Source of revenue/year	2022	2023	2024
Concessional timber	1200	28590	3852
NWFP	0	92096	126458
Commercial timber	0	90	8590.47
Fines and penalty	0	3207.24	109636.3
Fee	0	300	25172.1
Grand Total	1200	124283.24	273708.87

2.3. Biodiversity Conservation

Biodiversity, or biological diversity, refers to the variety of life and encompasses variation across all levels of ecological organization (Gaston & Spicer, 1998). The United Nations Convention on Biological Diversity (CBD) has defined biodiversity as ‘the variability among living organisms from all sources, including inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part.’ Biodiversity is vital for human survival, offering ethical, cultural, aesthetic, utilitarian, and ecological values. In Bhutan, where Buddhism emphasizes respect for all life, biodiversity’s ethical and cultural significance is profound. Globally, biodiversity provides essential resources like food, medicine, and materials, with 85% of Bhutan’s population depending directly on these resources.

The Gakiling–Sangbay landscape is characterized by high biodiversity due to its diverse ecological zones, altitudinal gradients, and relatively intact habitats. The area supports a wide range of flora and fauna, including culturally and ecologically significant species such as tiger, red panda, musk deer, langur, and numerous bird and plant species. Forests, sacred landscapes, mountains, lakes, and wildlife are deeply interwoven with local spiritual and cultural practices, underscoring the strong linkage between biodiversity conservation and cultural heritage. Tergola, the gateway to Gakiling–Sangbay, is traditionally regarded as the “door to hidden treasures” and remains one of the ecologically and culturally rich yet relatively undisturbed areas within the landscape. The area represents an important repository of both natural and cultural heritage, with high conservation value ecosystems that require focused management and protection.

In addition to wildlife and forest biodiversity, the landscape supports important agro-biodiversity and indigenous genetic resources. Gakiling–Sangbay is home to the native Nublang cattle, an indigenous breed that holds cultural, agricultural, and spiritual significance. The breed is valued as a national heritage species, and conservation initiatives are being undertaken in collaboration with the Department of Livestock to safeguard its genetic integrity. Similarly, the indigenous Yubjha poultry breed, found in Sektena village under Gakiling, and traditional cereal crop varieties cultivated by local communities contribute to the conservation of agricultural biodiversity and traditional farming

systems. Given the ecological richness and socio-cultural importance of the area, the DFO Management Plan prioritizes integrated biodiversity conservation interventions which are identified under this plan are systematically integrated into the Management Implementation Framework and HCV management prescriptions framework, providing clear guidance for implementation, monitoring and compliance.

Through these interventions, the Gakiling–Sangbay DFO Management Plan aims to ensure the long-term conservation of biodiversity, maintain ecological balance, and support sustainable development, thereby safeguarding the natural and cultural heritage of the landscape for future generations.

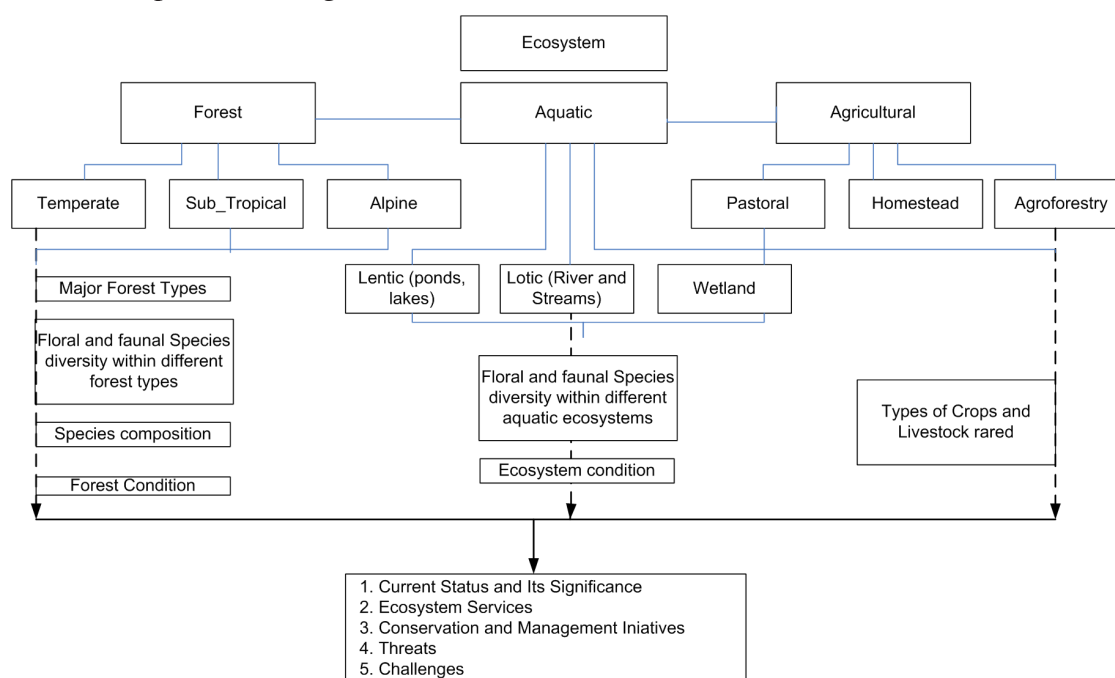


Figure 2: Thematic representation of major ecosystems (DoFPS, 2022, Guideline page 6)

2.3.1. Forest Ecosystems

2.3.1.1. Forest types

Gakiling and Sangbay geogs encompass a variety of forest types, excluding Chir Pine Forest, and cover an area of 55,773.26 ha, representing 92.95% of the total landscape area. The most prevalent forest type is Cool Broadleaved Forest, making up 34.72% of the total forest area, followed by Warm Broadleaved Forest at 26.77% (Figure 3). A detailed breakdown of forest area (in ha) and percentage forest cover for each type is provided in the Table 6 under section 2.5.1.1.

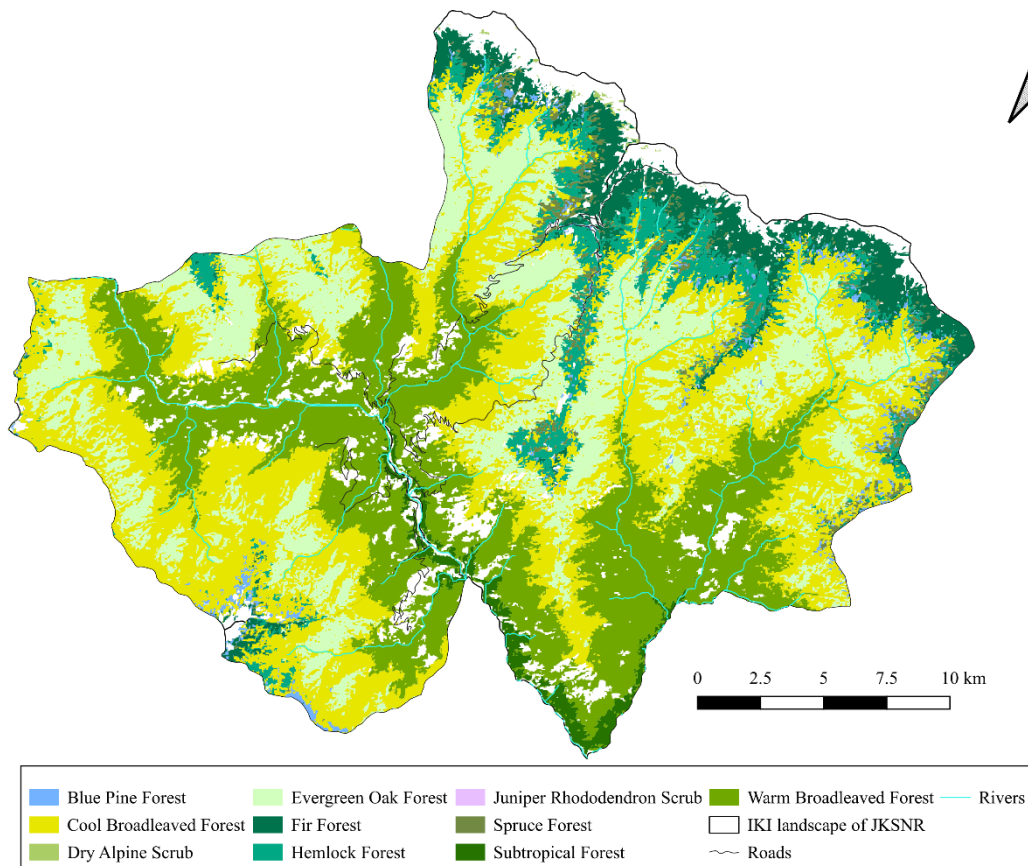


Figure 3: Forest types of Gakiling and Sangbay

2.3.1.2. Floral Composition and Diversity

The rapid biodiversity assessment (RBA) conducted in Gakiling and Sangbay recorded 152 plant species from 56 families, including 91 tree species across 35 families and 61 shrub species across 30 families. Analysis revealed that the Cool Broadleaved Forest demonstrated higher species diversity with significant values for diversity indices (H') and evenness (J), indicating a robust ecosystem. Warm Broadleaved Forests exhibited the highest species richness, contributing significantly to overall biodiversity. Conversely, Fir Forests showed the lowest diversity and evenness values, suggesting a less diverse ecosystem (JKSNR, 2023). The survey underscored that lower foothill ecosystems have comparatively higher species diversity than the Fir Forests, highlighting the varied ecological characteristics across forest types. These findings underscore the importance of maintaining and managing diverse forest ecosystems, as higher species diversity reflects greater ecosystem stability and resilience.

The findings of RBA, 2023 of IKI landscapes of JKSNR indicate a predominance of evergreen forests spanning from lower elevations of 800m up to the Fir Forests at 3700m. Relative Basal Area (RBA%) analysis revealed that evergreen forests were primarily dominated by the *Fagaceae* family, including species such as *Lithocarpus pachyphyllus*, *Quercus spp.*, *Castanopsis spp.*, *Quercus glauca*, and *Quercus lamellosa*. This was followed by the *Theaceae* family (*Schima wallichii*), *Lauraceae* (*Persea spp.*, *Cinnamo-*

mum spp., *Beilschmiedia* spp., and *Phoebe* spp.), *Ericaceae* (*Rhododendron arboreum*, *Rhododendron falconeri*), and *Juglandaceae* (*Engelhardia spicata*). Deciduous broad-leaved forests were mainly dominated by the *Leguminosae* (*Albizia* spp., *Albizia procera*), *Magnoliaceae* (*Magnolia campbellii*), *Rosaceae* (*Sorbus cuspidata*, *Sorbus* spp., and *Prunus* spp.), *Juglandaceae* (*Juglans regia*), and *Aceraceae* (*Acer campbellii* and *Acer thomsonii*). Conifer forests were largely represented by the *Pinaceae* family (*Abies densa*, *Tsuga dumosa*), *Cupressaceae* (*Juniperus squamata*), and *Taxaceae* (*Taxus wallichiana*). The shrub layer was dominated by *Symplocaceae* (*Symplocos* spp.), followed by *Rutaceae* (*Zanthoxylum* spp.), *Ericaceae* (*Rhododendron* spp.), and *Caprifoliaceae* (*Viburnum* spp.).

Life-form spectra analysis across the three forest zones based on relative basal area distribution showed that evergreen broad-leaved forests accounted for 41% (n=62), broad-leaved shrubs for 37% (n=56), deciduous broad-leaved forests for 20% (n=30) and conifer forest for 3% (n=4) (Figure 4).

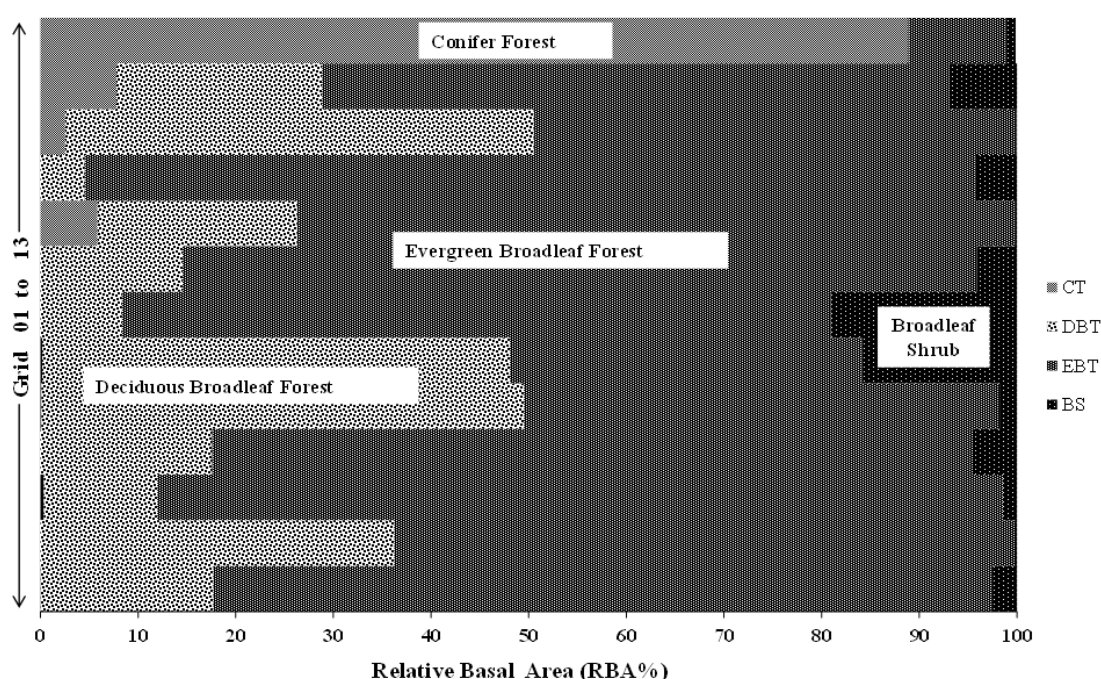


Figure 4: Distribution of four life-forms in three major forest types (800–3700m)

During RBA 2023, a total of 1,074 trees across 52 plots in three forest types, with an average DBH of 28.02 cm and average height of 11.35 m were recorded. Tree density was highest in the smallest DBH classes (5–30 cm), showing an inverse-J regeneration pattern indicative of a young, regenerating forest, especially in Gakiling and Sangbay under Haa (Figure 5). Larger DBH classes showed fewer trees, reflecting mature, old-growth stands with a uni-modal distribution. Some areas displayed sporadic diameter distributions due to disturbances like tree-falls and selective felling near settlements. Such patterns highlight the forest's regeneration, structural dynamics, and human pressure affecting sustainable forest management.

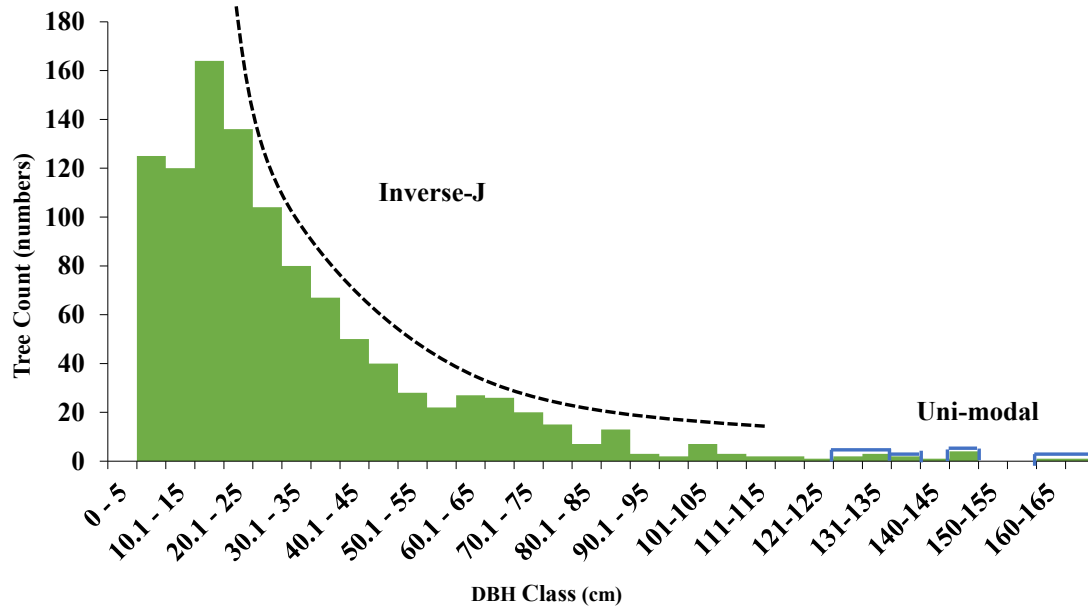


Figure 5: DBH class distribution which indicates inverse-J type of distribution

2.3.2 Ground layer plant composition

Ground vegetation composed of 109 different types of species with 42 families of which constituted perennial herb (86 species), Climber (9 species), evergreen sub-shrub (6 species), annual herbs (5 species) and deciduous sub-shrub (3 species). The dominant families recorded were Compositae (17 species), *Rosaceae* (10 species), *Polygonaceae* (6 species), *Rubiaceae* (5 species), *Gramineae*, *Orchidaceae*, *Primulaceae* and *Scrophulariaceae* (4 species each), *Arceae*, *Cyperaceae*, *gentianaceae* and *Urticaceae* (3 species each), *Acanthaceae*, *Crassulaceae*, *Ericaceae*, *Ranunculaceae*, *Violaceae* and *Zingiberaceae* (2 species each) and rest are with single species (Figure 6).

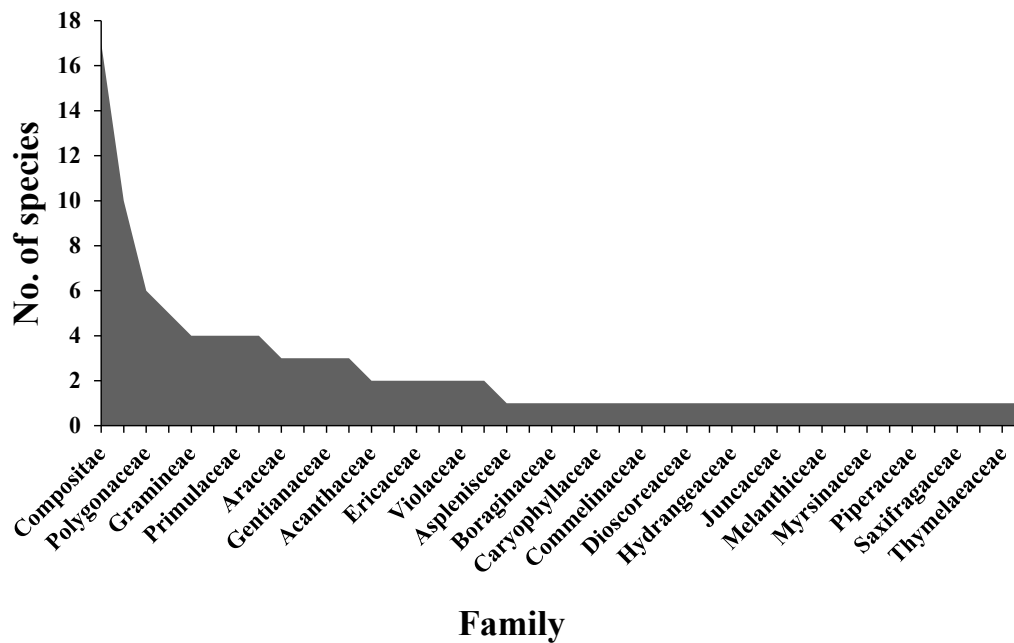


Figure 6: Family distribution of ground layer under Sangbay-Gakiling

Based on dominance analysis, dominance species are *Artemisia myriantha*, *Aconogonon molle*, *Ageratum conyzoides*, *Persicaria* sp., *Carex* sp., *Pouzolzia* sp., *Elatostema* sp., *Cynolossum furcatum*, *Gallium aparine*, *Plantago erosa*, *Rubus ellipticus*, *Commelina* sp., and *Thamnocalamus himaliacum* were recorded in 52 plots in three forest type habitats.

Floristically, perennial herb had maximum coverage with 79%, followed by climber with 8%, evergreen sub-shrub constituted about 6% and annual herb with 5% and deciduous sub-shrub was the lowest with 3% only (Figure 7). The lowest percentage of grass may be correlated with the habitat and forest cover since maximum plots was on broad-leaved forest and with orchid only few ground orchid were recorded at the time of survey.

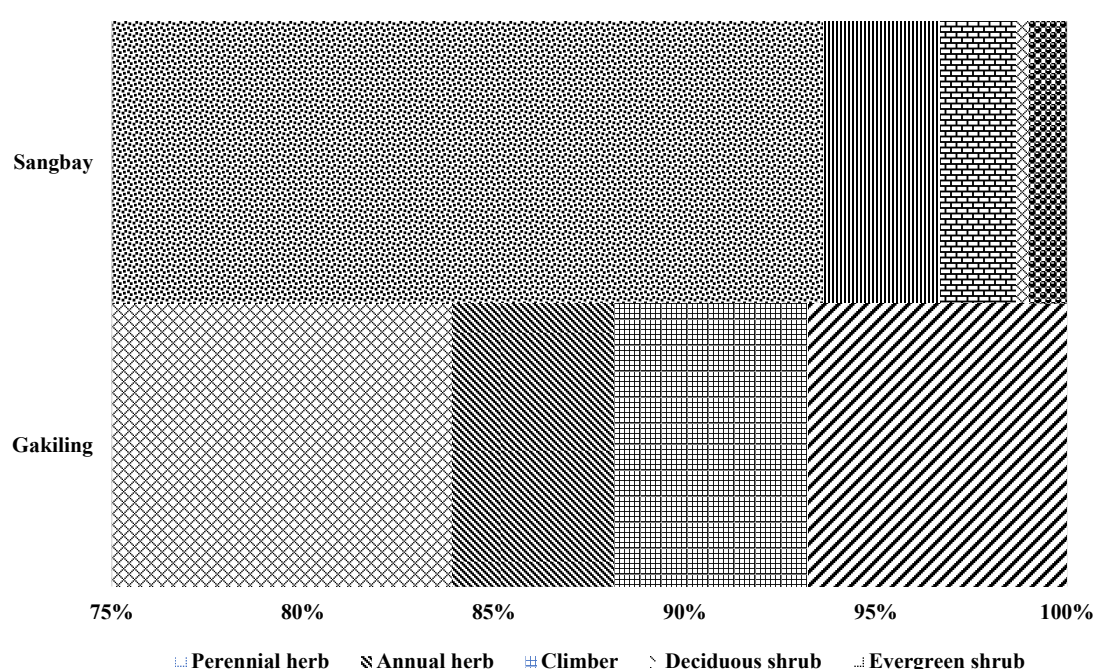


Figure 7: Distribution of major life-forms of ground layers

A vegetation survey was also focused on data collection on epiphytes which provides valuable insights into the diversity and distribution of these unique plants within a specific ecosystem. A total of 38 epiphytes plants that grow on the surface of land, logs, often on trees, and on boulders. Orchid has the highest record of 71% (=27), 11% deciduous shrub (n=4), 5% constitute of climber, fern and mosses (n=2), 5% climber (n=2) and 3% evergreen shrub (n=1).

2.3.3 Agriculture Ecosystem

The Renewable Natural Resources (RNR) sector comprising agriculture, livestock and forestry is a key component of Bhutan's economy and livelihood. Agriculture in Bhutan is still essentially a traditional subsistence-based mixed farming system integrating cropping, livestock rearing and forest products (FAO, 2019). Since 1961, Bhutan's agriculture sector has evolved significantly, providing livelihoods for 57.2% of the population (MoLHR, 2016). With a mandate to boost food production for household food

security, reduce poverty, and substitute imports, it also aims to generate surplus, improve incomes, and create jobs. The shift towards commercial farming seeks to attract youth, curb rural-urban migration, and ensure inclusive economic growth and equitable benefits.

The communities of Sangbay and Gakiling rely heavily on agriculture for their livelihoods, alongside other activities such as forestry, including the collection of NWFPs, and various small-scale businesses. Agriculture serves as the backbone of their economy, providing food security, income, and employment. Forestry, especially NWFPs like medicinal herbs, wild edibles, and bamboo products, supplements their income and sustains traditional practices. Additionally, local businesses, such as handicrafts and small trade, contribute to diversifying their economic base. Together, these activities create a resilient and self-sufficient way of life, blending tradition with modern livelihoods (JK-SNR, 2024).

The communities of Sangbay and Gakiling collectively own 539.45 ha of agricultural land, which includes both Chuzhing (agriculture wetland) and Kamzhning (dry land) (FRMD, 2017). Of this total, 183.19 ha are classified as wetland and 356.27 ha as dry land. In Gakiling, 34.40 ha are wetland while 203.18 ha are dry land, contributing to a combined total of 237.58 ha. Sangbay has 148.79 ha of wetland and 153.09 ha of dry land, totaling 301.87 ha (Table 2). This land distribution indicates that Sangbay holds a larger portion of agriculture land, which supports various agricultural activities. The overall land ownership supports the agricultural-based livelihoods of both communities, emphasizing the significance of land management for sustainable growth and food security. The division between wet and dry land also highlights potential areas for diverse agricultural practices suited to the land type in each region.

Table 2: Agricultural land owned by the communities of Gakiling and Sangbay

Type of land	Geogs	
	Gakiling	Sangbay
Chhuzhing (Agriculture Wetland)	34.40	148.79
Kamzhing (Dry land)	203.18	153.09
Total area (Ha)	237.58	301.87

2.3.4 Aquatic Ecosystem

The aquatic ecosystems of Gakiling and Sangbay are vital to the region, as several tributaries, including Sochu, Somchu, Chewchu, Dreychu, Tongchulumchu, Baychu and Charchu, feed into Ammo Chuu, which originates from Tibet. These streams and rivers support diverse aquatic life and play a crucial role in local livelihoods. The 18-megawatt Sochu Hydropower, built on one of these rivers, is an important infrastructure project. Additionally, these water sources are essential for drinking water, irrigation, and supporting local agriculture. They also contribute significantly to biodiversity, fostering a variety of aquatic species that depend on these freshwater ecosystems for survival.

2.4. Existing Management Regimes

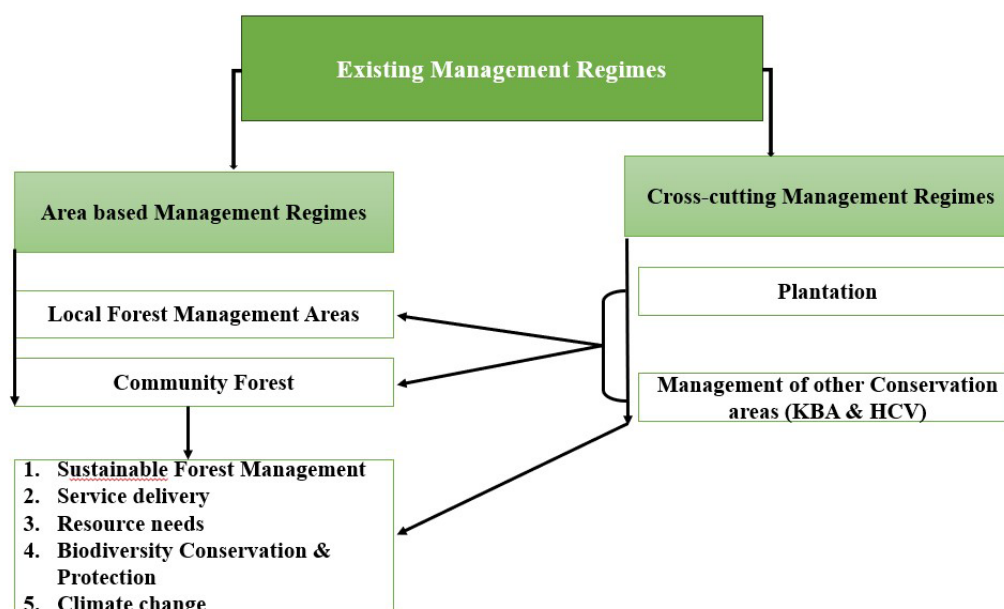


Figure 8: Thematic representation of Existing Management Regimes (DoFPS, 2022, Guideline page 7)

2.4.1. Area Based Management Regimes

Gakiling and Sangbay Range Offices are responsible for the stewardship of a diverse array of forest ecosystems across 10 area-based and four cross-cutting management regimes (Figure 9). This ecologically rich region, spanning from warm broadleaved forests to alpine meadows, is a sanctuary for a multitude of floral, faunal, and Avi-faunal species including the endangered Royal Bengal Tiger (*Panthera tigris*), Red Panda (*Ailurus fulgens*), *Nardostachys jatamansii* and Red poppy (*Meconopsis wallichii*).

To ensure the sustainable management of these precious resources, two range offices have established two LFMAs, eight CFs and two plantation sites. These initiatives empower local communities to actively participate in forest conservation and utilize resources responsibly.

However, the delicate balance of this ecosystem is under threat from various anthropogenic pressures. The construction of the Haa-Samtse secondary national highway, mining activities, and the increasing demand for timber and non-timber forest products, such as the highly valued *Nardostachys jatamansii*, pose significant risks to biodiversity and ecological integrity. The unsustainable harvesting of *Nardostachys jatamansii*, in particular, has led to habitat degradation and threatens the survival of numerous wildlife species.

To address these challenges and safeguard the future of this remarkable ecosystem, the range offices, in collaboration with local communities and relevant stakeholders, is implementing a comprehensive conservation strategy like designating the area as KBA and

HCVA which underscores the global significance of this region. This strategy aims to promote sustainable forest management practices, strengthen law enforcement to curb illegal activities, and raise awareness about the importance of biodiversity conservation.

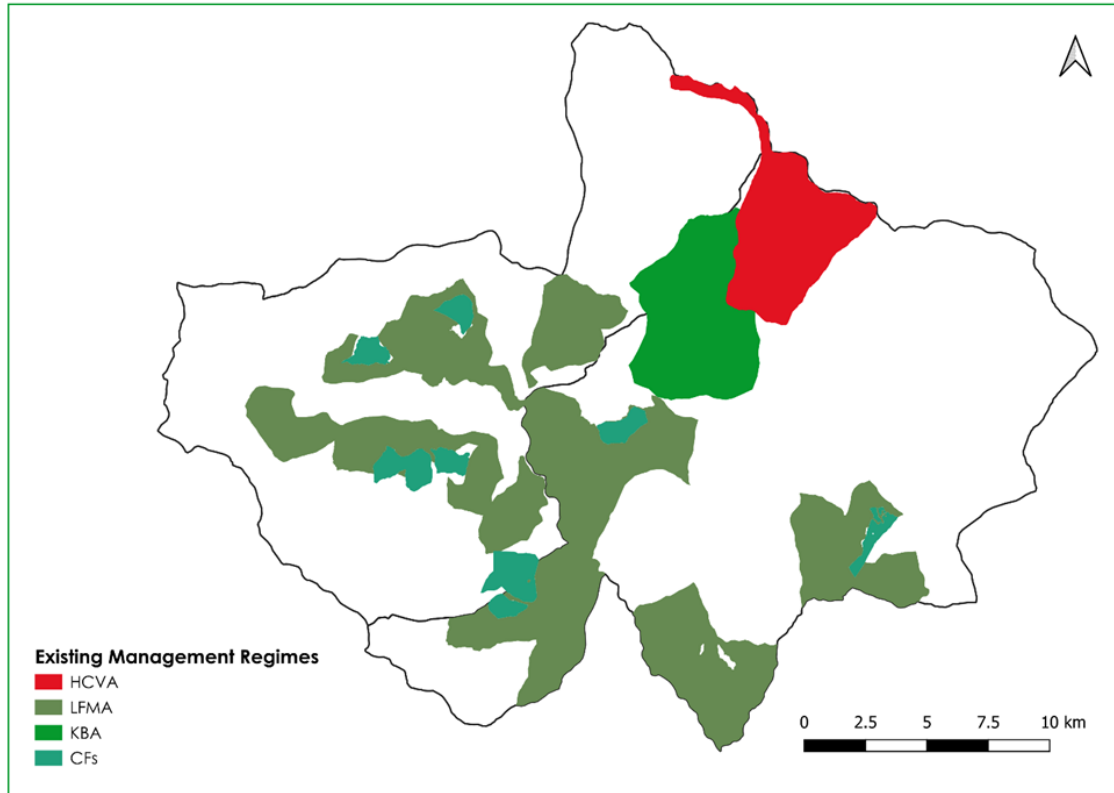


Figure 9: Existing Management Regimes of Gakiling and Sangbay Geogs

2.4.1.1. Local Forest Management Area

At present, the Range Offices: Gakiling and Sangbay, has established two LFMAs; one in Gakiling Gewog, overseen by the Gakiling Range Office, and another in Sangbay Gewog, overseen by the Sangbay Range Office.

Table 3: Local Forest Management Areas under Gakiling and Sangbay

Name of LFMA	Dzong-khag	Gewog	Year of Establishment	Total Gewog area (Ha)	Area Covered by the Plan (Ha)	Annual Allowable Cut (AAC) (m3)	Plan period	Plan Cycle
Gakiling	Haa	Gakiling	2019	36592.33	5442.4	1875	01/07/2019-30/06/2029	
Sangbay	Haa	Sangbay	2019	46266.50	4960.9	1848	01/10/2019-30/09/2029	

2.4.1.2. Community Forest

The JKSNR management has been actively promoting community-based forest management since 2015. As a result, eight CFs have been established: four in Gakiling Gewog

and four in Sangbay Gewog. These CFs, collectively managed by 279 members, cover a total area of 1,437.84 ha of SRF land. Each CF operates under a 10-year management plan, which outlines its specific objectives, strategies, and operational guidelines.

Table 4: Community Forests under Gakiling and Sangbay

Name of Community Forest	Year of establishment	Dzong-khag	Gewog	Members		Total area (Ha)	Area under Forest Cover (Ha)	Annual allowable cut (AAC)-m3	Plan period	Plan Cycle
				M	F					
Dorithasa CF	2022	Haa	Gakiling	21	2	169.3	131.207	102	2022-2032	
Gyalong CF	2023	Haa	Sangbay	21	7	134.39	124.72	134	2023-2033	
Mochu CF	2023	Haa	Sangbay	16	9	125	106.25	51.2	2023-2033	
Sertena CF	2023	Haa	Gakiling	23	11	163.07	151.72	102.5	2023-2033	
Sherpa CF	2022	Haa	Gakiling	22	9	101.16	38.92	110	2022-2032	
Zomtokha CF	2020	Haa	Sangbay	29	21	270	224	200	2020-2030	
Charchuthang CF	2022	Haa	Gakiling	30	19	333.22	292.34	268	2022-2032	
Nakha CF		Haa	Sangbay	22	10	141.70				

2.4.1.3. Cross Cutting Management Regimes

The Range Offices oversee several cross-cutting management regimes to address critical conservation and development needs. These include KBA focused on protecting the habitat of the critically endangered Red Panda and HCVA aimed at conserving ecologically significant sites and safeguarding wildlife species affected by habitat degradation, unsustainable resource extraction, etc.

To address the growing demand for timber and promote sustainable forest management, two plantation sites, each covering 2.5 hectares, have been established in Gakiling and Sangbay. In collaboration with Green Bhutan Corporation Limited (GBCL), these plantations are being developed to reforest degraded lands with high-value timber species. This initiative aims to reduce pressure on natural forests, ensure a sustainable supply of timber for local communities, and contribute to the overall ecological health of the region.

Table 5: Cross cutting management regimes under Gakiling and Sangbay

Cross Cutting Management Regimes/ Interventions	Location	Gewog	Year of operation	Total area (ha)	Key Management Interventions	Plan Period
Key Biodiversity Area	Tergola	Gakiling & Sangbay	2023	3161	Thriving population of Red panda in the wild	July 2023-June 2033
High Conservation Value Area	Tergola	Gakiling & Sangbay	2025	2722.5	Protection of Red panda's habitat	2025-2034
Plantation	Sheb-jithang, Sangbay Drung-khag area	Gakiling	2020	2.5	Afforestation, reforestation and enrichment plantation	2020-2025
Plantation	Sektena -15 Tangya -45	Gakiling	2025	60	Enrichment plantation	2025-2029
Plantation	Bejbi	Sangbaykha	2026	15	Enrichment Plantation	2025-2029
Plantation	Nebji goenpa	Sangbay	2020	2.5	Afforestation, reforestation and enrichment plantation	2020-2025
CF Plantation	Sektena CF	Gakiling	2021	1 ha	CF rehabilitation Plantation	2023-2033
	Zom-tokha CF	Sangbeykha	2024	09 ha	CF rehabilitation Plantation	
Habitat Management	Sang-beykha			11 Nos.	Waterholes	2019-2021
	Gakiling			1 No.	Waterhole	2020-2021

2.5. Forest Resources and Utilization

2.5.1. Forest Resources

2.5.1.1. Forest Cover

Grierson & Long (1983a) have classified forest types of Bhutan into 11 categories: Sub-tropical Forest, Warm Broadleaved Forest, Chir Pine Forest, Cool Broadleaved Forest, Evergreen Oak Forest, Blue Pine Forest, Spruce Forest, Hemlock Forest, Fir Forest, Juniper Rhododendron Scrub, and Dry Alpine Scrub. Forcover means land covered by forest and/or scrub forest (MoAF, 2011).

The Gakiling and Sangbay have all types of forests, except for Chir Pine Forest, with an area of 55773.26 ha (92.95%) of the total area of the landscapes. Cool Broadleaved Forest accounts for 34.72% of the total forest followed by Warm Broadleaved Forest (26.77%). Spruce Forest, Subtropical Forest, Blue Pine Forest and Juniper Rhododendron Forest has the smallest area coverage constituting 1.78%, 1.77%, 1.31% and 0.38% of the total Forest respectively. The total forest area (ha) and forest cover (%) for each forest type are shown in Table 6.

Table 6: Forest types of Gakiling and Sagnbay

Forest types	Forest area (ha)	Forest cover (%)
Cool Broadleaved Forest	19365.30	34.72
Warm Broadleaved Forest	14930.43	26.77
Evergreen Oak Forest	11802.99	21.16
Fir Forest	3461.01	6.21
Hemlock Forest	3066.92	5.50
Spruce Forest	992.91	1.78
Subtropical Forest	986.62	1.77
Blue Pine Forest	730.23	1.31
Juniper Rhododendron Scrub	436.84	0.78
Total forest area	55773.26	

2.5.1.2. Stem Density

Stem density refers to the number of tree stems or plants per unit area or any other forest stand parameters (FMID, 2023). In this section, estimates of the tree count per hectare of each forest type is reported. The tree count per unit area measures how closely spaced individual trees are in the given area. This is important information to assess the effectiveness of the forest management and optimize management interventions to improve stand growth (FMID, 2023).

For estimating stem density, Volume I of the NFI Report (2023) was used as the primary reference. Data on tree count per hectare for each forest type were extracted from Table 4.11 of the report. The total tree count for Sangbay and Gakiling Geogs was then derived by multiplying the tree count per hectare by the corresponding forest area of each forest type. Forest area statistics were obtained from the Forest Types of Bhutan shapefile provided by DoFPS.

Overall, Cool Broadleaved Forest dominates the tree count (36.11%) with Warm Broadleaved and Evergreen Oak Forest constituting 47.04% of all estimated trees. Total tree count is smallest in the Spruce Forest, Blue Pine Forest, Subtropical Forest and Juniper Rhododendron Scrub contributing only 1.78%, 1.39%, 1.37% and 0.53% respectively to the total tree count in the Forest (Table 7).

Table 7: Total tree count by forest types (tree count/ha were referred from table 4.11 of National Forest Inventory (NFI) report, vol I, 2023)

Forest types	Forest area (ha)	Tree count/ha	Total tree count
Blue Pine Forest	730.231	426	311078
Cool Broadleaved Forest	19365.302	417	8075331
Evergreen Oak Forest	11802.991	417	4921847
Fir Forest	3461.008	402	1391325
Hemlock Forest	3066.923	406	1245171
Juniper Rhododendron Scrub	436.839	269	117510
Spruce Forest	992.913	401	398158
Subtropical Forest	986.62	310	305852
Warm Broadleaved Forest	14930.433	375	5598912
Grand Total	55773.26		22365185

2.5.1.3. Basal Area

Basal area (BA) of a tree is the cross-sectional area of a tree and is used to estimate the stand basal area and the total basal area in the country. The stand basal area is indicative of the number and size of the tree present in the stand. Basal area and diameter measurements are also key to estimating the growth of individual trees (FMID, 2023).

Basal area estimates were derived from the NFI Report, Volume I (2023), with basal area per ha values extracted from Table 5.6. The total BA for each forest type was calculated following the same approach applied for stem density estimation, by multiplying the BA per ha by the corresponding forest area of each forest type.

Total BA of Gakiling and Sangbay is estimated at 2069694.49 square metre (m²). Cool Broadleaved Forest has the greatest total basal area followed by Evergreen Oak Forest and Warm Broadleaved Forest while Juniper Rhododendron Scrub has the smallest total basal area (Table 8).

Table 8: Total basal area by forest types (BA (m²)/ha were derived from table 5.6 of NFI report, vol I, 2023)

Forest types	Forest area (ha)	BA (m ²)/ha	Total BA (m ²)
Blue Pine Forest	730.231	23.14	16897.55
Cool Broadleaved Forest	19365.302	42.89	830577.80
Evergreen Oak Forest	11802.991	38.07	449339.87
Fir Forest	3461.008	44.47	153911.03
Hemlock Forest	3066.923	46.51	142642.59
Juniper Rhododendron Scrub	436.839	15.34	6701.11
Spruce Forest	992.913	36.95	36688.14
Subtropical Forest	986.62	20.08	19811.33
Warm Broadleaved Forest	14930.433	27.67	413125.08
Grand Total	55773.26		2069694.49

2.5.1.4. Growing Stock

Growing stock refers to the standing volume of all living trees in a given area of Forest (FRMD, 2016b). It is the most important information measured by forest inventories for informed policy decision-making and management planning (Gschwantner et al., 2022; Huang et al., 2022). Assessment and monitoring of the growing stock are important for the sustainable management of the forest (FMID, 2023).

Growing stock estimates were obtained from the NFI Report, Volume I (2023), with data on growing stock volume (m³/ha) extracted from Table 6.6. The total growing stock for each forest type was calculated using the same procedure adopted for stem density estimation, by multiplying the growing stock per ha by the corresponding forest area of each forest type.

Total growing stock of Gakiling and Sangbay is estimated at 18247665.30 cubic metre (m³). Cool Broadleaved Forest has the greatest total growing stock followed by Evergreen Oak Forest and Warm Broadleaved Forest. Juniper Rhododendron Scrub has the lowest total growing stock (Table 9).

Table 9: Total growing stock by forest types (Growing stock (m³/ha) were derived from table 6.6 of NFI report, vol I, 2023)

Forest types	Forest area (ha)	Growing stock (m ³ /ha)	Total growing stock (m ³)
Blue Pine Forest	730.231	209.17	152742.42
Cool Broadleaved Forest	19365.302	379.15	7342354.25
Evergreen Oak Forest	11802.991	341.01	4024937.96
Fir Forest	3461.008	398.82	1380319.21
Hemlock Forest	3066.923	442.70	1357726.81
Juniper Rhododendron Scrub	436.839	101.04	44138.21
Spruce Forest	992.913	384.84	382112.64
Subtropical Forest	986.62	160.90	158747.16
Warm Broadleaved Forest	14930.433	228.03	3404586.64
Grand Total	55773.26		18247665.30

2.5.1.5. Forest Biomass

Forest biomass encompasses all parts of the plant such as the branches, leaves, bark, trunk, needles, roots, etc., which can be converted to energy (FMID, 2023). Biomass of the IKI landscapes of JKSNR is estimated using the NFI report volume II, 2023. For this report, biomass for five carbon pools- (i) Above Ground Biomass (ABG), (ii) Below Ground Biomass (BGB); (iii) Coarse Woody Debris (CWD); and (iv) Litter have been estimated (Table 10).

Table 10: Total biomass and biomass by forest types (Biomass (tonnes/ha) for AGB, BGB, CWD, litter, were derived from NFI report, vol II, 2023)

Pools	AGB	BGB	CWD	Litter	Total
Total Biomass (million tonnes)	10.91	2.99	0.37	0.87	18.94
Biomass(tonnes/ha)	195.55	53.56	6.72	15.67	339.62
Biomass (million tonnes) by Forest types					
Forest types	Forest area(ha)	AGB	BGB	CWD	Litter
Blue Pine Forest	730.23	0.14	0.04	0.00	0.01
Cool Broadleaved Forest	19365.30	3.79	1.04	0.13	0.30
Evergreen Oak Forest	11802.99	2.31	0.63	0.08	0.18
Fir Forest	3461.01	0.68	0.19	0.02	0.05
Hemlock Forest	3066.92	0.60	0.16	0.02	0.05
Juniper Rhododendron Scrub	436.84	0.09	0.02	0.00	0.01
Spruce Forest	992.91	0.19	0.05	0.01	0.02
Subtropical Forest	986.62	0.19	0.05	0.01	0.02
Warm Broadleaved Forest	14930.43	2.92	0.80	0.10	0.23

2.5.1.6. Carbon Stock

Table 11 and 12 shows the total carbon stock and total carbon density by Forest Types respectively in different carbon pools. The total carbon stock is greatest in Cool Broadleaved Forests with 4.856 million tonnes and smallest in Juniper Rhododendron Scrub with 0.063 million tonnes.

Table 11: Carbon stock for Gakiling and Sangbay (Carbon (tonnes/ha) for different carbon pools is for Haa Dzongkhag and derived from NFI Report, Vol. II, 2023).

Pools	AGB	BGB	CWD	Litter	Total
Total carbon (million tonnes)	5.94	1.56	0.22	0.44	14.23
Carbon (tonnes/ha)	106.59	27.95	3.9	7.85	255.11

Table 12: Total carbon density (million tonnes) by Forest types for IKI land-scapes of JKSNR (the carbon stock (million tonnes) for different carbon pools have been calculated with regard to NFI report vol II, 2023)

Forest types	Forest area(ha)	AGB	BGB	CWD	Litter	Total
Blue Pine Forest	730.23	0.042	0.012	0.002	0.010	0.101
Cool Broadleaved Forest	19365.30	2.384	0.618	0.077	0.154	4.856
Evergreen Oak Forest	11802.99	1.394	0.360	0.016	0.067	2.813
Fir Forest	3461.01	0.397	0.104	0.018	0.035	0.885
Hemlock Forest	3066.92	0.376	0.097	0.025	0.025	0.807

Juniper Rhododendron Scrub	436.84	0.016	0.004	0.000	0.002	0.063
Spruce Forest	992.91	0.115	0.029	0.003	0.002	0.239
Subtropical Forest	986.62	0.051	0.014	0.001	0.005	0.106
Warm Broadleaved Forest	14930.43	1.253	0.326	0.037	0.086	2.525

2.5.1.7. Biomass Increment

The biomass increment is estimated for tree above-ground carbon pool only, and no estimates are made for other carbon pools. Table 13 shows the periodic annual biomass increment in the forest types of Gakiling and Sangbay. The biomass increments ranges from 253.37 tonnes per year in the Juniper Rhododendron Forests to 41655.91 tonnes per year in the Warm Broadleaved Forests.

Table 13: Biomass increment by forest types (Biomass Increment (tonnes/ha/yr) were derived from NFI report vol II, 2023)

Forest types	Forest area (ha)	Biomass Increment (tonnes/ha/yr)	Total increment
Blue Pine Forest	730.23	3.45	2519.30
Cool Broadleaved Forest	19365.30	2.13	41248.09
Evergreen Oak Forest	11802.99	0.77	9088.30
Fir Forest	3461.01	2.19	7579.61
Hemlock Forest	3066.92	2.44	7483.29
Juniper Rhododendron Scrub	436.84	0.58	253.37
Spruce Forest	992.91	3.2	3177.32
Subtropical Forest	986.62	2.94	2900.66
Warm Broadleaved Forest	14930.43	2.79	41655.91

2.5.1.8. Carbon Increment

Table 14 shows the periodic annual carbon increment in the forest types of Gakiling and Sangbay. The biomass increments ranges from 117.95 tonnes per year in the Juniper Rhododendron Forests to 19558.87 tonnes per year in the Warm Broadleaved Forests.

Table 14: Carbon increment by forest types (carbon increment (tonnes/ha/yr) were derived from NFI report vol II, 2023)

Forest types	Forest area (Ha)	Carbon Increment (tonnes/ha/yr)	Total increment
Blue Pine Forest	730.23	1.62	1182.97
Cool Broadleaved Forest	19365.30	1.00	19365.30
Evergreen Oak Forest	11802.99	0.36	4249.08
Fir Forest	3461.01	1.03	3564.84
Hemlock Forest	3066.92	1.15	3526.96
Juniper Rhododendron Scrub	436.84	0.27	117.95
Spruce Forest	992.91	1.51	1499.30
Subtropical Forest	986.62	1.38	1361.54
Warm Broadleaved Forest	14930.43	1.31	19558.87

2.5.1.9. Carbon Sequestration

Carbon sequestration is the process of the removal of carbon dioxide from the atmosphere and storing it in the form of biomass/carbon in plants, soils, geologic formations, and the ocean (FMID, 2023). Forests play an important role in climate change mitigation through sequestration of atmospheric carbon and storing in the form of biomass. The carbon sequestration potential of the Forest is determined by the process-based method and stock change method (IPCC, 2006). In this report, total carbon sequestration is estimated and reported as per the NFI report volume II, 2023.

The total carbon sequestration by the forests of Gakiling and Sangbay is 153376.47 tonnes of CO₂ per year with sequestration rate of 2.75 tonnes CO₂ ha⁻¹ yr⁻¹ (Table 15).

Table 15: Rate of sequestration and total carbon sequestration by the forests of IKI landscapes of JKSNR

Carbon sequestration (tonnes/ha/yr) (for Haa Dzongkhag)	2.75
Total carbon sequestration (tonnes/yr) (for IKI landscapes of JKSNR)	153376.47

(Note: Carbon sequestration rate for Haa Dzongkhag has been used to calculate the total carbon sequestration by different forest types of IKI landscapes of JKSNR).

2.5.1.10. Key Flora and Fauna Species

With a significant altitude range from 800 to 3700 masl and a variety of complex vegetation zones, Sangbay and Gakiling, located in the lower part of Haa, support an impressive diversity of fauna. This area is home to many threatened species. In total, 33 mammal species, 208 bird species, 97 butterfly species, seven fish species, 24 reptiles, and seven amphibians have been recorded in the Sangbay and Gakiling gewog. Additionally, macro-invertebrates from six orders across 23 families have been documented in seven streams.

Table 16: IUCN mammals list under Sangbay & Gakiling

Common Name	Scientific Name	IUCN Status	FNCA 2023 Schedule
Tiger	<i>Panthera tigris</i>	Endangered	SC I
Alpine Musk Deer	<i>Moschus chrysogaster</i>	Endangered	SC I
Himalayan Red Panda	<i>Ailurus fulgens</i>	Endangered	SC II
Wild Dog	<i>Cuon alpinus</i>	Endangered	SC II
Clouded Leopard	<i>Neofelis nebulosa</i>	Vulnerable	SC I
Common Leopard	<i>Panthera pardus</i>	Vulnerable	SC II
Asiatic Black Bear	<i>Ursus thibetanus</i>	Vulnerable	SC II
Himalayan Gaur	<i>Bos gaurus</i>	Vulnerable	SC II
Sambar	<i>Rusa unicolor</i>	Vulnerable	SC II
Asiatic Golden Cat	<i>Catopuma temminckii</i>	Near Threatened	SC II
Marbled Cat	<i>Pardofelis marmorata</i>	Near Threatened	SC II
Eurasian Otter	<i>Lutra lutra</i>	Near Threatened	SC II
Mountain Weasel	<i>Mustela altaica</i>	Near Threatened	SC III
Himalayan Serow	<i>Capricornis thar</i>	Near Threatened	SC II
Himalayan Goral	<i>Naemorhedus goral</i>	Near Threatened	SC II
Assamese Macaque	<i>Macaca assamensis</i>	Near Threatened	SC III
Malayan Giant Squirrel	<i>Ratufa bicolor</i>	Near Threatened	SC III
Leopard Cat	<i>Prionailurus bengalensis</i>	Least Concerned	SC II

2.5.2. Function Mapping

Forest function mapping is a crucial step in sustainable forest management planning. This process involves categorizing the forest management area based on its functions. A forest function map delivers valuable information on the total area designated for sustainable production, conservation zones, and areas with significant ecological, environmental, and social importance that require protection with specific management restrictions (DoFPS, n.d).

The forest functions of Gakiling and Sangbay have been categorized as ‘Production circle’, ‘Protection circle’ and ‘Non production circle’ for areas within and outside of the existing management regimes (EMR) (Figure 10 and Figure 11). In the protection circle,

timber extraction is prohibited to safeguard vital ecological processes, biodiversity, and landscapes that are sensitive or critical for environmental stability. Production circle refers to the stable forest landscape from where timber can be sustainably produced without affecting the ecological, environmental and social functions. Areas other than forests and protection circle are being included under the non-production circle.

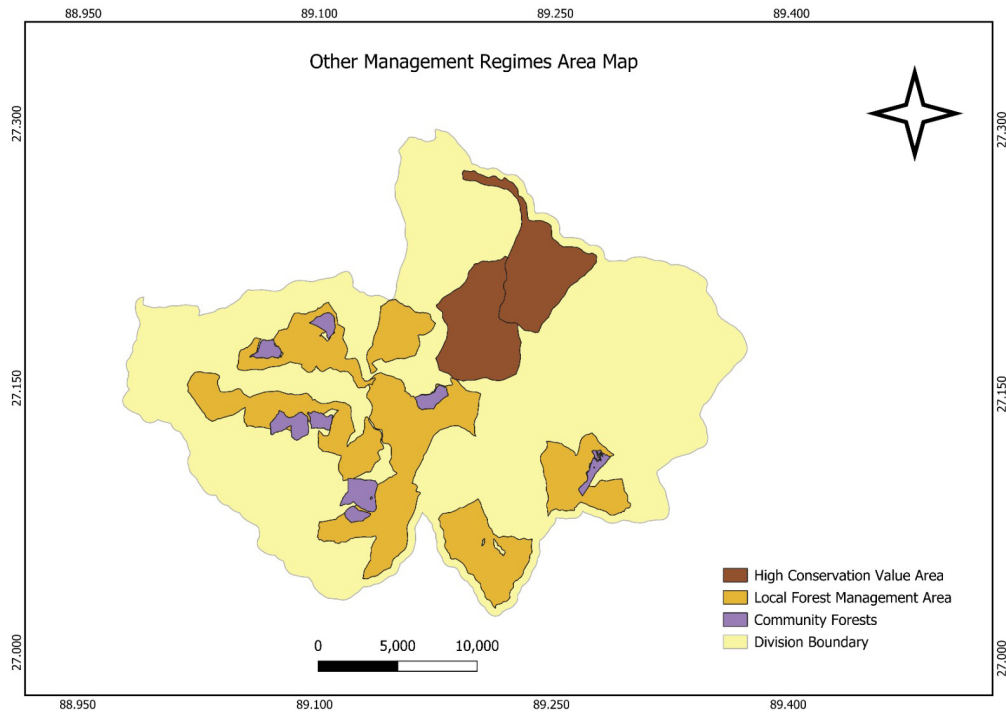


Figure 10: Forest function maps (management circles)

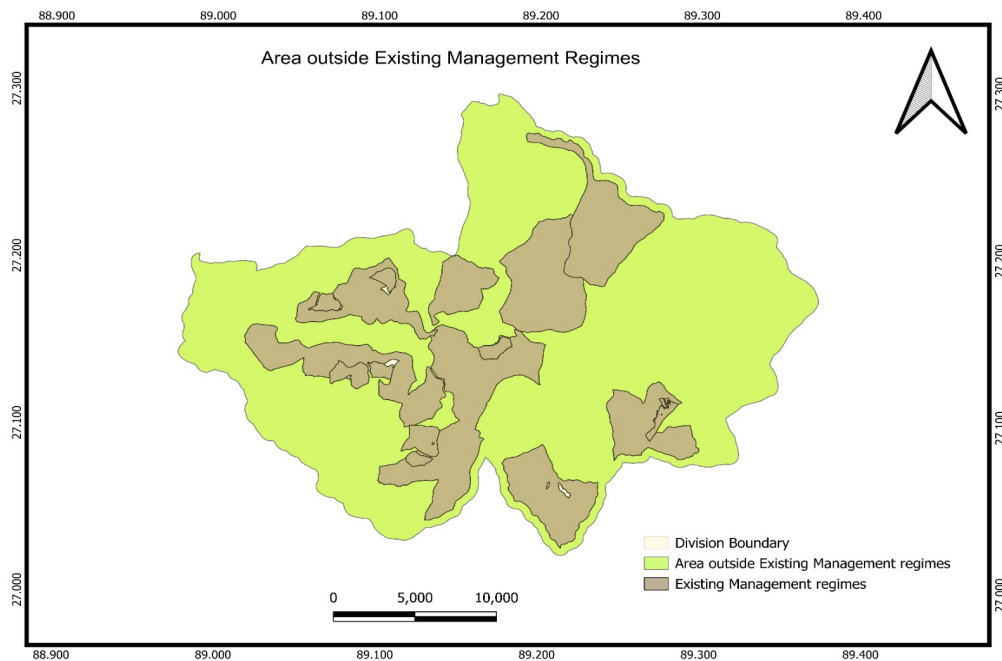


Figure 11: Forest function maps for areas outside the EMR

2.5.3. Forest Resource Utilization

2.5.3.1. Rural timber

Jigme Khesar Strict Nature Reserve has allotted a significant quantity of timber to the communities of Gakiling and Sangbay over the last five years. The record reveals that a total of 18371.75 m³ of timber were allotted for rural purposes from 2019–2023. In 2019, 5983.14 m³ of timber were allotted for rural purposes at subsidized rate. Of which, 3511.54 m³ were allotted for new house construction, 336.68 m³ for house renovation/extension, 3.92 m³ for Fencing posts, 112 m³ for firewood for rural purpose.

Table 17: Volume (m³) of rural timber allotted from 2019–2023

Purpose	Year				
	2019	2020	2021	2022	2023
New Construction	3511.54	793	1096	731	967.92
Renovation	336.68	159	40		55.55
Firewood	112	24	56	16	81.72
Fencing post	3.92				
Poles				168	55
Other construction				31.15	251.27
Total in (m³)	5983.14	2996	3213	2968.15	3434.46

2.5.3.2. Non-wood forest products

The Range Offices have allotted NWFPs for various purposes from 2020-2024, but could not get reliable data for year 2020–2021. There isn't huge amount of NWFP collection. The most collected NWFP is *Edgeworthia* with the quantity of 3000kgs collected in 2023 followed by *Nardostachys* with 500 kilograms (kg).

Table 18: List of NWFP allotted over the last five years (2020–2024)

Product Type	Unit	Year				
		2020	2021	2022	2023	2024
Burr	Numbers				3	
Cane (head load)	Head load					152
Edgeworthia	Kg				3000	
Firewood	m ³			1	131	3
Juniper spp(Leaf needles-Head load)	Head load			50		
Large Bamboo (Truck load)	Truck load				5	
Leaf Mould	Truck load				1	
Nardostachys (Pangpoe)	Kg			500		
Orchid	clump					30

Piper nigra fruit	Kg					6
Rhododendron anthopogon (Baloo)_Collection only	Kg			50		
Rubia sp.	Kg					280
Small bamboo	Bundle			500	1010	2000

2.5.3.3. Surface collection

From 2020–2024, a total of 25960 m³ were allotted for surface collection purposes. However, in 2023, a total of 22288 m³ were allotted for surface collection. Of which, the major quantity has been allotted as boulders (17608 m³) followed by sand (3816 m³) and gravel (728m³) respectively. The least quantity has been allotted as GSB (8 m³).

Table 19: Volume of surface collection allotment from 2022–2024

Product Type	Unit	Year		
		2022	2023	2024
Boulders	m ³	304	17608	
Gravel	m ³	88	728	
GSB	m ³		16	
River bed materials	m ³	120		
Sand		3112	3816	8
Stone chips/aggregates	m ³		120	
Top Soil	m ³	40		
Total		3664	22288	8

Note: Handed over to Department of Geology and Mines since January, 2024

2.5.3.4. State Reserve Land

A total of 178.64 ha of SRF land was allotted for developmental activities purposes. However, in 2023, a total of 111.4 ha of SRF land was allotted for developmental activities, of which, the major chunk of SRF land has been allotted for mining (62.24 ha) followed by the transmission line (18 ha) and other purpose (10 ha) respectively. The least area of SRF land has been allotted for Tower construction (0.02 ha).

Table 20: SRF land allotted for developmental activities from 2022–2024

Land allotment purpose	Year		
	2022	2023	2024
Archery Range			0.42
Cable Crane line		4.15	
Foot Trail		2.40	
Irrigation Channel			1.14
Land acquisition by Government Institution	0.2		

Land Leasing	0.26		2.16
Mining		62.24	
Others (Specify)-	5.54	10.0	33.7
Road	0.27	6.4	9.49
Sand Quarry		7.7	5.67
Stone Quarry	1.03		
Surface Collection from State Reserved Forest Land	0.02		
Tower		0.02	0.04
Transmission line	1.9	18.43	5.42
Total	9.21875	111.406	58.036

2.5.4 Local People and Livelihood

2.5.4.1 Demography

Population estimates of Gakiling and Sangbay as per the Population and Housing Census of Bhutan (PHBC) 2017 is 2203 people. The male population is slightly higher than the female population with the sex ratio of 55:45 (male to female) (JKSNR, 2024).

Table 21: Population estimates of Gakiling and Sangbay (PHCB, 2017)

Sl.No	Geog	Male	Female	Total
1	Gakiling	743	549	1292
2	Sangbay	472	439	911
Grand Total				2203

The population of Gakiling and Sangbay is dominated by the people between the age group of 25–29 (11.2%) and least dominated by the aged people in the age group of 70–74 (1.8%) (Figure 12).

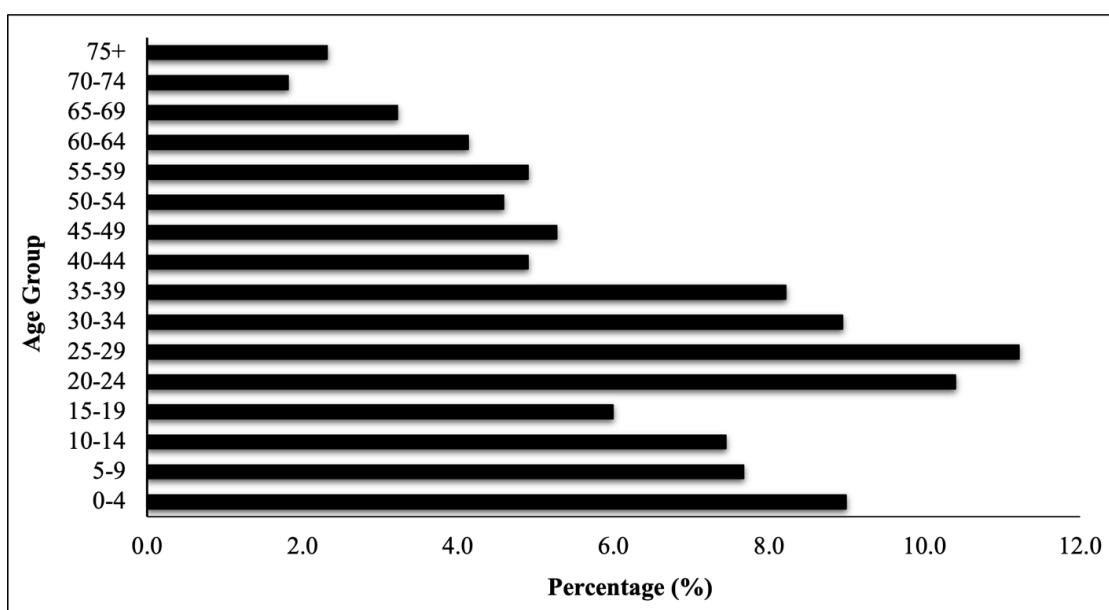


Figure 12: Population distribution by age group

According to the Socio-economic status and Climate Vulnerability report of IKI landscapes of JKSNR, 2024, households led by male exhibit both higher literacy and illiteracy rate at 31% and 39% respectively, whereas those led by women show both lower literacy and illiteracy rate of 14% and 15% respectively. Among household heads, individuals with a primary education background have the highest literacy rate at 12%, followed by Non-Formal Education and Middle secondary with rates of 10% and 11% respectively. The literacy rate is notably lower for those with a formal monastic education, standing at approximately 2% (Figure 13).

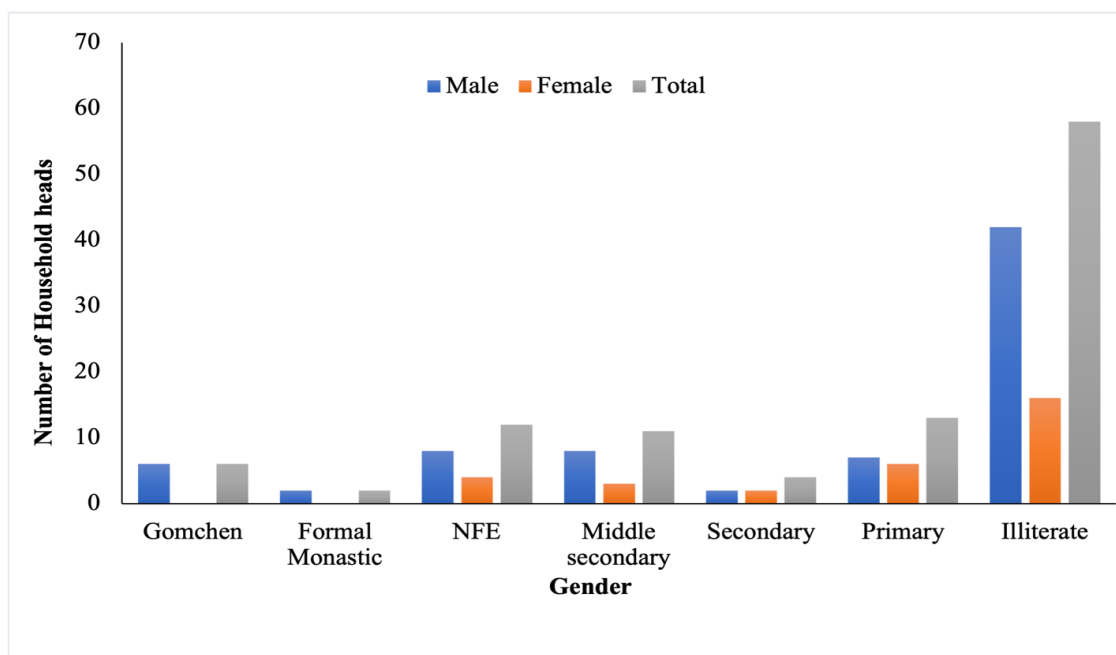


Figure 13: Literacy and gender representation of the head of households interviewed

2.5.5 Annual household income

The income generation of the household is crucial in determining the livelihood status of the two communities. The average annual income of the communities of Gakiling and Sangbay is estimated to be Nu. 48432.13 (JKSNR, 2024). Horticulture, labor wage, livestock, agriculture, business and bee keeping were main source of income for the communities. Horticulture contributed most to the annual household income with an annual average income of Nu. 84688.52 where 62 households reported it as a source of income. The least was contributed by the bee keeping with an annual estimated income of Nu. 5000 where only single household reported it as a source of income (Table 22: Annual household income for Gakiling and Sangbay).

Table 22: Annual household income for Gakiling and Sangbay

Source of income	Total Households	Avg. estimated income (Nu.)
Horticulture	61	84688.52
Other source	15	136400.00
labor wage	27	46648.15
Livestock	54	22481.48

Agriculture	58	13793.10
Business	5	42600.00
Bee keeping	1	5000.00

2.5.6 Landholding

Communities of Gakiling and Sangbay hold four different types of land viz., Chuzhing (wetland), Kamzhing (dry land), Tshoesa (kitchen garden), and orchards. A total of 699.08 acres of different types of land are owned by the local communities, of which 61.9% and 38.1% of land are owned by the communities of Sangbay and Gakiling respectively. Communities own 538.03 (76.96%) acres of dry land, 109.17 (15.62%) acres of wetland, 42.39 (6.06%) acres of orchard and 0.8 (0.11%) acres of kitchen garden (Table 23).

From the total registered land, 603.87 acres are under effective cultivation by the land owners which accounts for 86.38% of the land type utilization category and 79.38 acres which is 11.35% are left uncultivated (fallow).

Table 23: Landholding types by the communities of Gakiling and Sangbay

Geogs	Land category				Total
	Kamzhing	Chuzhing	Orchard	Kitchen Garden	
Sangbay	300.6	90.2	41.4	0.3	432.5
Gakiling	237.4	19	1	0.5	257.9
Total	538	109.2	42.4	0.8	690.4

2.5.7 Livestock

Farmers rear nine different types of livestock including dog and cat. Local cattle breed is the most reared livestock with 87 households rearing 608 numbers of local cattle breed. The least reared livestock are mithun (n=3) with only one household rearing it and horse (n=5) with two households rearing it (Table 24).

Table 24: Types of livestock reared by the communities

Livestock type	Numbers	Number of Households	Geog	
			Gakiling	Sangbay
Cat	33	19	8	25
Dog	22	16	2	20
Goat	33	3	33	0
Horse	5	2	0	5
Jersey	65	22	6	59
Local cattle breed	608	87	319	289
Mithun	3	1	0	3
Pig	8	5	8	0
Poultry	143	24	87	56

2.6. Human Wildlife Conflict

Over the last three years, i.e., 2021–2023, the communities of Gakiling and Sangbay experienced a cumulative loss of 34 livestock attributable to predation by seven distinct predator species. Communities suffered the loss of six distinct types of livestock, with the majority (76.5%) of the depredation attributed to local breed cattle. The majority (n=24) of the adult livestock were lost to wild predators (Table 25).

Table 25: Types of livestock depredated by the wild predators

Types of livestock killed	Adult	Young	Heifer	Total
Brown swiss	1	0	0	1
Cat	1	0	0	1
Jersey	2	0	0	2
Local breed cattle	17	3	6	26
Mithun	2	0	0	2
Poultry	1	1	0	2

The primary contributor to livestock depredation was Dhole where it has killed 13 livestock over the last three years followed by the Himalayan Black Bear which accounted for eight livestock losses (JKSNR, 2024).

On an average, a financial loss of BTN. 107373.1 was incurred due to the depredation of 34 livestock by the wild predators over last three years. The highest financial loss was incurred for the loss of two Jersey cows experienced with an average estimated loss of BTN. 42,500 per incident followed by local cattle breeds (n=26) with an average estimated loss of BTN. 35423.1 per incident (JKSNR, 2024).

Crop damage by wild herbivore and other species are common in the communities of Gakiling and Sangbay where 69.2% of the total households surveyed reported incidences of crop damage by the wild animals. The majority of the crop damage incidences by the wild animal were reported for maize (n=63), followed by vegetables (n=15) and least for potatoes (n=2) and fruit trees (n=1). Crop damage by the wild animals were contributed by nine major wild animal species. Asiatic Black Bear followed by Barking Deer were among the major pests for crop damage in the landscapes (Figure 14).

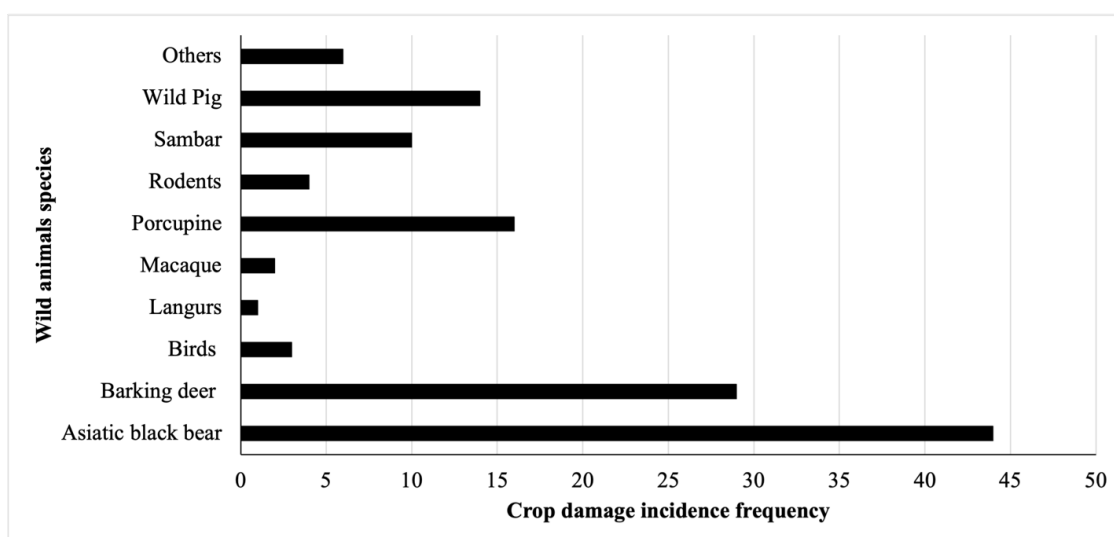


Figure 14: Crop damage frequencies by each wild animal

The financial loss of BTN. 121474.1 on an average was incurred due to crop damaged by the wild animals. Majority of the financial loss is attributed to the Rodents, Langurs and Asiatic Black Bear and least to the birds.

2.7. Climate Change and its impacts

Many global challenges are closely tied to climate-related issues, including fundamental necessities such as food, water, health, and shelter. Rising temperatures, sea level increases, shifts in precipitation patterns, and more frequent or severe extreme weather events pose significant threats to these basic needs. The effects of climate change will vary among individuals and groups, with certain populations being particularly vulnerable. These include the elderly, the sick, children, indigenous and tribal communities, and those with low incomes. Additionally, climate change may jeopardize critical natural resources, undermining water and food security. Such disruptions can lead to conflicts, mass migrations, health crises, and environmental pressures that may extend beyond a single nation, affecting neighboring countries and entire regions. While climate change is a global issue, its impacts will not be evenly distributed across the world. The scale and pace of these effects will vary by continent, country, and region, with some nations likely facing more severe consequences than others (ICIMOD, 2016).

Despite maintaining 70% of its land area under forest cover and being a net sequester of greenhouse gases, Bhutan is increasingly witnessing the visible impacts of climate change, many of which are transboundary in nature. The country's mountainous terrain and unique geography make it highly vulnerable to various extreme weather events, including floods, landslides, and glacial lake outburst floods. Additionally, Bhutan regularly faces seasonal droughts, windstorms, and heavy snowfall. Among these, heavy rainfall is the primary driver of floods and landslides across the nation (NCHM, 2024).

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report highlights a rising trend in temperatures across the Himalayas, with the increase becoming more pronounced at higher altitudes. Most mountain glaciers have been retreating since

the early 21st century, accompanied by noticeable seasonal shifts, such as the earlier onset of spring. Global warming has also led to increased streamflow in low-elevation mountain catchment areas. In Bhutan, unpredictable rainfall patterns and fluctuating glacial melts have triggered floods and landslides in some regions, while other areas face the depletion of water resources. These changes are evident in the growing frequency of extreme weather events, with a decadal analysis, conducted by NCHM in 2024, revealing a significant rise in climate-related extreme events in Bhutan over the last decade compared to earlier periods.

2.7.1. Pests and diseases

In recent years, the growing threat of pests has become an important consequence of climate change. As global temperatures rise and weather patterns become increasingly unpredictable, ecosystems undergo changes that create new opportunities for pests and diseases to thrive. This phenomenon seriously threatens agricultural systems, biodiversity and human health as it is often considered an outbreak of pests and diseases due to climate change (Alfizar & Nasution, 2024).

According to the socio-economic survey conducted in 2024, the communities of Gakil-ing and Sangbay have reported a wide range of pests and diseases affecting their crops, posing significant challenges to agricultural productivity. Commonly observed issues include chilli blight, cabbage aphid, cabbage moth, and fall armyworm, which have had considerable impacts on key crops. Other pests and diseases such as potato viruses, red ants, rice blast, and rice sheath blight have also been noted, highlighting the diversity of threats faced by farmers. Additionally, less frequent occurrences of pests like citrus trunk borer, woolly aphid, and lychee erinose mite, along with diseases such as premature leaf fall and turcicum leaf blight, reflect the complexity of managing crop health in the region. The presence of various pests and diseases underscores the urgent need for effective and localized pest and disease management practices to safeguard livelihoods and food security.

2.7.2. Extreme events

Global land surface air temperature has risen 1.53°C since the preindustrial period of 1850–1900, with considerable variation in regional warming; this increase is much larger than the observed warming combined over land and oceans (0.87°C). Climate models project robust differences in regional climate characteristics, including extremes (Ebi et al., 2021). The 2019 Intergovernmental Panel on Climate Change Special Report on Climate Change and Land concluded that warming since the period 1850–1900 has resulted in an increased frequency, intensity, and duration of extreme events in most land regions, including the following observations; the intensity of heavy precipitation events increased across the globe, the frequency and intensity of droughts increased in some regions, desertification in some dryland areas was associated with increased land-surface air temperature and evapotranspiration and decreased precipitation amounts in interaction with climate variability and human activities and the frequency and intensity of dust storms increased over the last few decades due to land use and land cover changes and climate-related factors in many dryland areas.

Over the past decade, the communities of Gakiling and Sangbay have experienced a range of extreme climatic events, including flash floods, landslides, heatwaves, windstorms, and seasonal droughts. These events are attributed to various interconnected factors such as increasing temperatures, unpredictable rainfall patterns, and developmental activities. Additionally, deforestation, heavy grazing, and occasional natural phenomena like earthquakes have further exacerbated the region's vulnerability. The combined impacts of these factors have not only heightened environmental stress but also posed significant risks to the livelihoods and safety of local communities.

The communities have faced significant negative impacts due to extreme climatic events and environmental changes. Key issues include a loss of crop yield, which has directly threatened food security and livelihoods. This is compounded by the decline in soil quality, which undermines agricultural productivity and exacerbates land degradation. Furthermore, habitat loss and degradation have disrupted ecosystems, leading to a reduction in wild foods, an increase in invasive species, and shifts in plant and animal populations. These challenges have collectively intensified human-wildlife conflicts, decreased freshwater availability, and contributed to overall ecological imbalance, posing long-term risks to both human and environmental well-being.

2.7.3. Drying up of water sources

Climate change has significantly contributed to the drying up of water resources, posing a major challenge to ecosystems and communities. Rising global temperatures have accelerated evaporation rates, reduced snowpack, and altered precipitation patterns, leading to diminished surface water and groundwater levels. Prolonged droughts and shifting seasonal rainfall further strain water availability. These changes threaten agriculture, biodiversity, and human livelihoods, underscoring the urgent need for sustainable water management and climate adaptation strategies.

Currently, there is no major observation regarding the drying up of water sources in Gakiling and Sangbay. However, the communities of Thangdhokha village under Gakiling have faced acute water shortages. To address this, the JKSNR management, in collaboration with the community, identified a potential water source and constructed a water tank with funding support from BFL. This intervention has alleviated the water scarcity to some extent, providing much-needed relief to the affected community.

2.7.4. Invasive species (Flora)

Biological invasion has now become a global problem causing huge losses to economy through negative impacts on crops, animal and human health, and more importantly biodiversity loss (Choudhury et al., 2016). For instance, in the United States, the annual cost of crop losses and the management of invasive plants exceeds US\$ 40 billion (Pimentel et al., 2000). In developing countries, agriculture remains a key economic sector, but pests and pathogens significantly reduce crop productivity (Paini et al., 2016). Invasive species also negatively impact biodiversity by disrupting ecosystem services, often out-competing native species through habitat modification (Simberloff & Von Holle, 1999).

Gakiling and Sangbay are home to several invasive species that pose threats to local biodiversity. Among these, *Ageratina adenophora*, *Clerodendrum sp.*, and *Galinsoga*

parviflora are some of the notable invaders. Additionally, species like *Parthenium sp.*, *Persicaria nepalensis*, and *Persicaria runcinata* are also present in the region. These invasive species compete with native plants, disrupt ecosystem functions, and threaten the balance of the local environment, which requires effective management and control strategies to protect the area's biodiversity.

2.7.5. Climate Vulnerability

The climate vulnerability assessment conducted for Gakiling and Sangbay geogs in 2024 indicates that Sangbay geog is more exposed to climate vulnerability than Gakiling geog. Gakiling geog has the highest sensitivity, with an index score of 0.32, while Sangbay geog has a sensitivity index score of 0.22. Additionally, Gakiling geog demonstrates a relatively higher adaptive capacity, with an adaptive capacity index of 0.355, compared to Sangbay geog, which has an adaptive capacity index of 0.303. The vulnerability, exposure, sensitivity, and adaptive capacity index scores for each geog are provided in Table 26 and the vulnerability map is presented in Figure 15.

Geogs with higher negative scores of vulnerability index were more vulnerable. However, a lower negative score of the vulnerability index don't mean that the particular geog is not vulnerable, but is comparatively less vulnerable (JKSNR, 2024).

Table 26: Exposure, Sensitivity, Vulnerability and Adaptive Capacity of Gakiling and Sangbay

Geog Name	Vulnerability	Exposure	Sensitivity	Adaptive capacity
Gakiling	-0.345	0.380	0.319	0.355
Sangbay	-0.382	0.462	0.223	0.303

Based on the vulnerability index of each geog, Sangbay geog is identified as the most vulnerable, with a vulnerability index of -0.382, compared to Gakiling geog, which has an index of -0.345. The higher vulnerability of Sangbay geog is primarily due to its greater combined exposure and sensitivity.

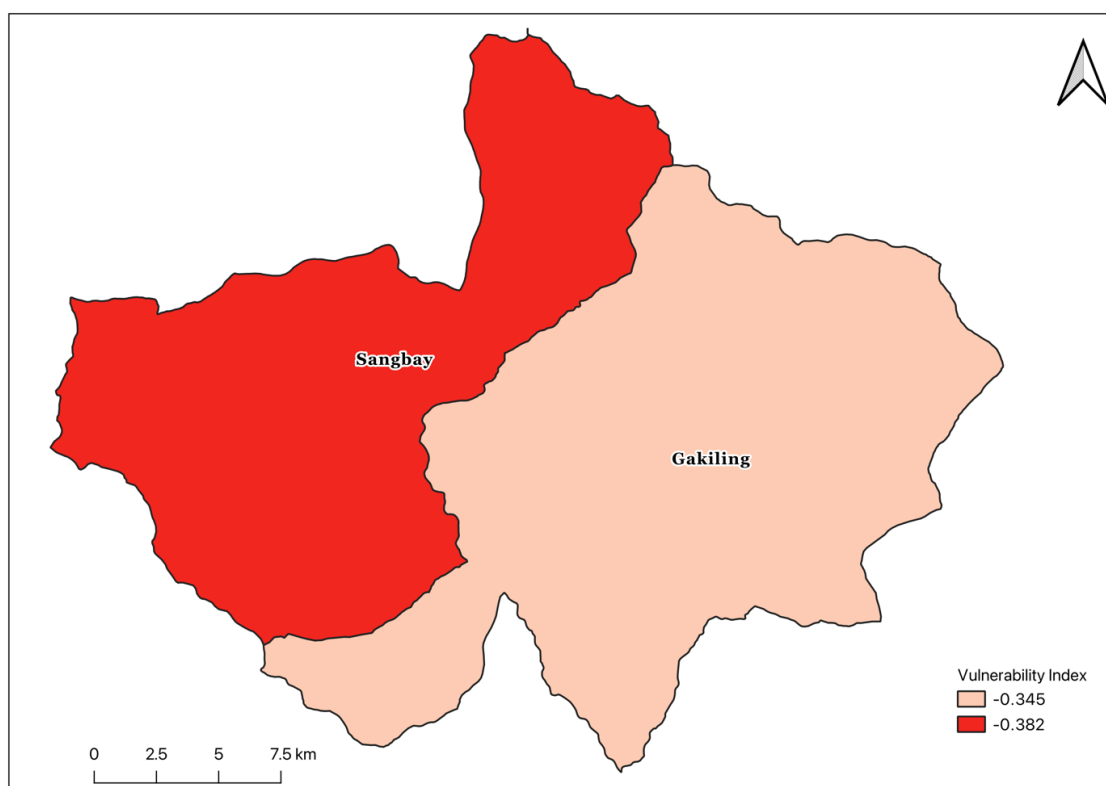


Figure 15: Vulnerability Index map of Gakiling and Sangbay

2.7.5.1. Coping mechanism

The common impacts of extreme temperature reported by the households in the communities are decline or loss of crop yield, drying up of water sources, heat stress, Tree die back and increasing number of pest and diseases. In order to cope with these impacts, commonly practiced coping mechanisms by the communities are crop rotation, change in crop types, irrigation and change in grazing areas.

The common impacts of change in rainfall seasonality are decrease in crop yield, decline in soil quality, increase in number of pest and diseases and decreasing in availability of fresh water. Besides change in crop types and cropping seasons, the communities also practice intercropping to boost the agricultural production in an effort to cope with the impacts of changing rainfall seasonality.

Local government offices are the main institutions that assist people to cope with climate change impacts and disasters. Communities reported the dependence on Non-governmental Organization (NGO), government aids and compensation to deal with the climate change impacts.

2.7.5.2. Forest Carbon Sequestration and climate Change Mitigation

Forests in the IKI landscapes of JKSNR sequester an estimated 153,376.47 tonnes of CO₂ each year, with a sequestration rate of 2.75 tonnes CO₂ ha⁻¹ yr⁻¹ (Table 15). This substantial carbon absorption contributes significantly to climate change mitigation by offsetting greenhouse gas emissions. The resilience and productivity of these forests

are the result of sound management and conservation efforts. Strengthening and maintaining sustainable practices will be essential to boost carbon storage capacity while preserving biodiversity.

2.8. High Conservation Value Areas

High Conservation Values (HCV) refer to biological, ecological, social, or cultural values of outstanding significance or critical importance. These values are identified within natural habitats and need to be managed appropriately to maintain or enhance their identified values (Brown & Senior, 2014).

The High Conservation Value approach was established over 20 years ago as a framework to safeguard significant environmental and social values, initially within Forest Stewardship Council (FSC) certified forests. Since then, it has expanded to encompass other commodities and ecosystems, making HCV maintenance a cornerstone of responsible production and resource management over the past decade. The HCV approach identifies six key values-HCV 1, 2, and 3, which address environmental values of national or global importance, and HCV 4, 5, and 6, which focus on social and resource values determined through engagement with local communities (Watson et al., 2019).

The HCV approach involves three key steps: Identification, through assessments and consultations with stakeholders; Management, by implementing suitable measures; and Monitoring, to evaluate the effectiveness of these management actions.

2.8.1. Tergola Red Panda (*Ailurus fulgens*) conservation area: HCV site for IKI landscapes of JKSNR and its significance

After the screening of HCV, JKSNR management has identified Red panda (*Ailurus fulgens*) habitat at Tergola (27°12'57.22"N; 89°14'20.73"E) with an area of 27.23 SqKm as HCV site. The HCV site falls under HCV category 1 (Species diversity: Concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels). The HCV site falls under both the Geogs (block) with major portion falling under Gakiling (Figure 16).

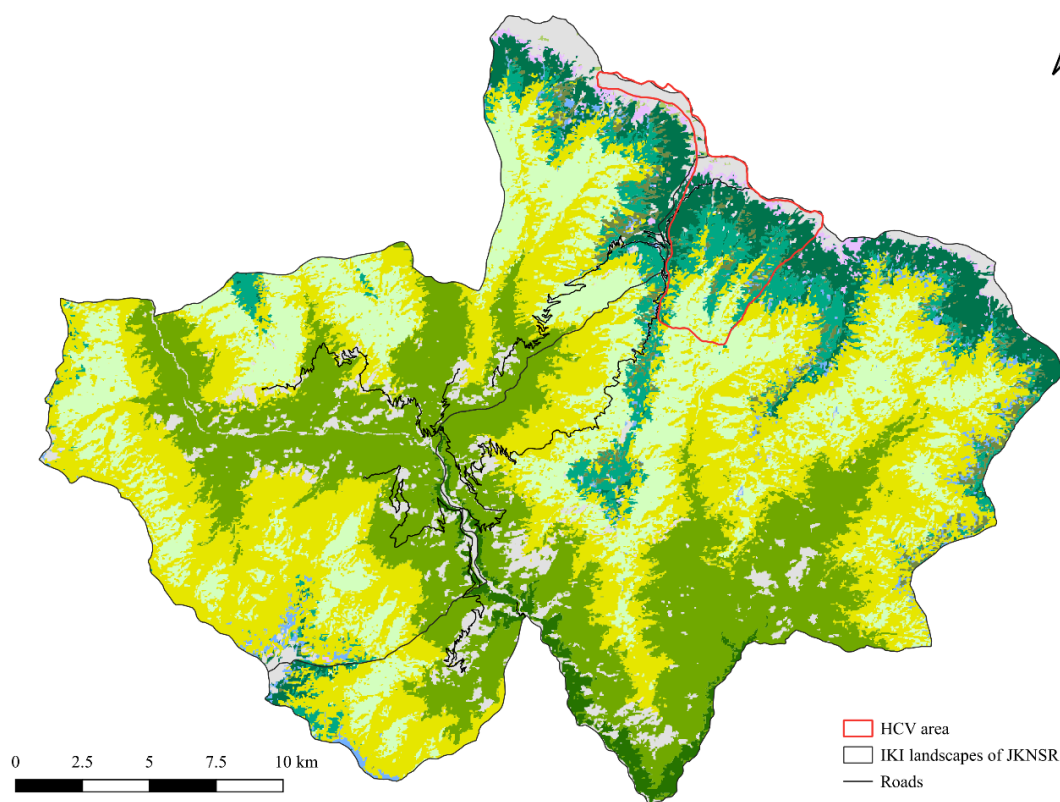


Figure 16: High Conservation Value Area Map of JKSNR

2.8.1.1. Significance of HCV of JKSNR

The High Conservation Value (HCV) site of Jigme Khesar Strict Nature Reserve (JKSNR) holds immense ecological, socio-economic, and cultural significance. Ecologically, the area provides critical habitat for several globally threatened and nationally important species. The endangered Red Panda (*Ailurus fulgens*), a flagship species of temperate forests, finds refuge within this HCV, highlighting its conservation importance. Additionally, the critically endangered medicinal herb *Nardostachys jatamansi* (locally known as Pangpoe), listed in the IUCN Red List and included in CITES Appendix I, occurs naturally in the site. The presence of such rare and sensitive species underscores the global conservation value of the area. Proper management and monitoring of this HCV site will help safeguard these vulnerable species and their habitats, while also supplementing the sustainable harvesting and conservation of Pangpoe, thereby ensuring both ecological protection and socio-economic benefits for local communities.

Beyond the Red Panda and Pangpoe, the site also supports other charismatic and ecologically vital wildlife such as Tiger, Asiatic Black Bear, Sambar, Wild Pig, and a variety of bird species, thereby contributing to biodiversity richness. Botanically, the occurrence of Red Poppy and extensive Rhododendron stands enhances the aesthetic value of the landscape, while seasonally attracting both domestic and international visitors. This ecotourism potential creates opportunities for generating supplementary income for local communities, indirectly supporting conservation efforts through sustainable livelihood promotion.

In essence, the HCV of JKSNR is significant not only for its role in conserving globally threatened flora and fauna but also for its contributions to local livelihoods, cultural values, and Bhutan's image as a biodiversity-rich nation. Its protection is therefore vital for balancing conservation priorities with community well-being and sustainable development.

2.8.2. High Conservation Value Screening Process

An HCV screening was conducted in 2023 to identify priority areas for HCV management and monitoring. This process, developed by the HCV Resource Network (HCVRN), utilized a desktop analysis in conjunction with the National Interpretation and the HCV Screening Open Standards for the Practice of Conservation (Conservation Standards) to guide HCV identification. The Conservation Standards offered a systematic approach for managing HCVAs. A workshop in Thimphu (April 2023) documented strategies for monitoring, threat prevention, and provided recommendations for managing and monitoring priority III and IV areas.

The screening process involved six steps as detailed below;

1. Define Purpose and Scope:

To identify HCVs, spatial analysis for Gakiling and Sangbay defines the geographic scope. Landscape-level screening is categorized into priority I–IV DFOs identified HCV areas in priority I, II or both.

2. Gather Information for Analysis

Before screening, a data gap analysis was conducted. Primary and secondary data were sourced from national surveys (Tiger, Snow Leopard, NFI), jurisdictional studies, wildlife observational SMART data for species diversity and distribution analysis. Threat analysis utilised SMART data and national/DFO level studies to assess landscapes threats.

3. Determine Likelihood of HCV Presence

The probability of HCVs was assessed within the landscape using spatial analysis of critical species. This involved overlaying all species identified by the Department of Forests and Park Services (DoFPS), including both Task Force and DFOs as part of the screening process.

4. Determine Likelihood of Threats to HCVs

High Conservation Values within the landscapes were assessed using spatial analysis of critical species. This involved overlaying of species data identified by DoFPS, including those from Task force and DFOs as a part of the screening process.

5. Identify Priorities in the Landscape

Spatially overlaying species presence and threats mapped the final HCV sites in the landscapes. Post national/landscape screening results were shared with DFOs to identify and prioritise HCVs (priority I or II) and design management interventions, informed by stakeholder consultations to mitigate threats.

6. Present Results

The outcome of the screening process and engaging with stakeholders necessitates effective communication with decision-makers and relevant organizations. The DFO should utilize these results to guide land-use planning, conservation strategies, and management actions.

2.8.3. Selecting HCV Management Areas (HCVMA)

High Conservation Value Management Areas were selected within a wider landscape based on the number of considerations using the HCV screening summary map as a guide focusing on priority I areas. The HCV of JKSNR, as per the screening, falls under priority I, with priority II and III being negligible, i.e., areas with a high likelihood of HCV presence and significant threats, requiring the highest level of management to sustain HCVs (Figure 17).

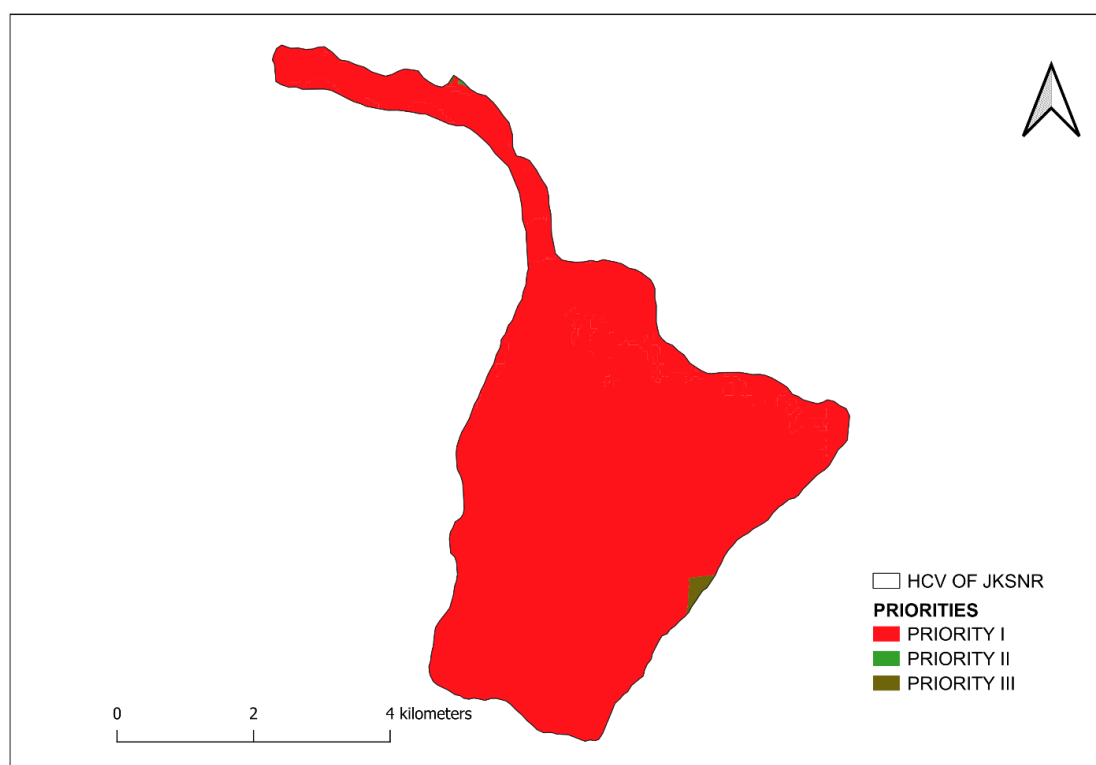


Figure 17: HCV priority maps

2.8.4. Threats identification and HCV affected by threats

For selected HCVMA, threats and HCVs at risk, predicted using summary screening map, have been identified by overlaying the boundaries of the HCVMA with threat-based priority maps and HCV probability maps.

Following threat parameters were used for the identification of threats during screening process;

1. Illegal Logging
2. Poaching

3. Wildfire
4. Road Development
5. Overharvesting of NWFP
6. Pests and Diseases

Spatial analysis of the threat data reveals that HCV area faces significant threats from forest fire, illegal logging, overharvesting of NWFPs and poaching (Figure 18), while threats from pest and diseases are less severe. The analysis revealed that HCV has no risk from road development. However, the road kill of Red panda has been reported in the previous years and road is assumed as one of the threats to the HCV in addition to waste (illegal dumping of waste).

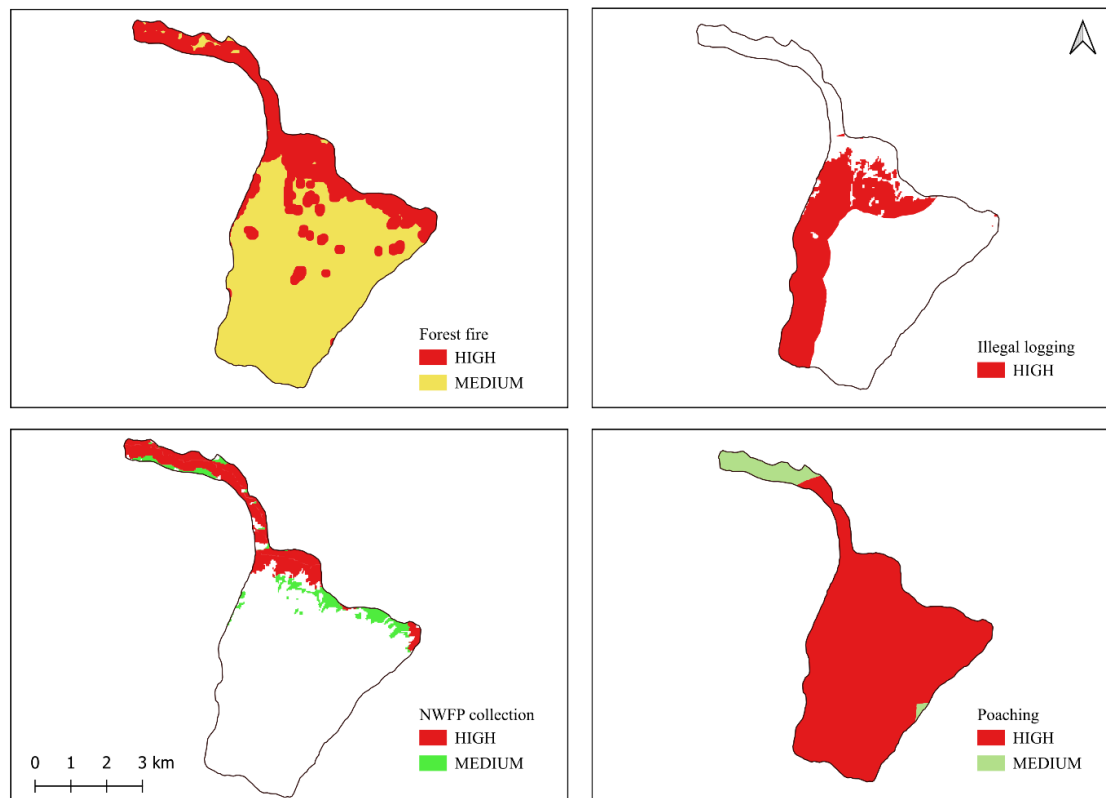


Figure 18: Threat based HCV priority maps for illegal logging, poaching, forest fire and overharvesting of NWFP

Table 27: Presence of threats in HCVMA, its magnitude and response mechanism

HCV priority	Threats in HCVMA	Threat magnitude (H,M,L)*	Response mechanism
1	Poaching	H	Anti-poaching patrol
1	Illegal logging	H	Community-based Forest monitoring
2	Pest and diseases	M	Surveillance
1	Forest fire	M	Monitoring and mobilization of firefighting teams
1	Unsustainable harvesting of NWFP	H	SMART patrolling and inspection

2.8.5. Threats and Strategic Approach to Mitigate the Threat

This section outlines the significant threats faced by the HCV of IKI landscapes of JK-SNR and strategic approaches (not limited to) to address these challenges effectively.

2.8.5.1. Illegal Logging

Threat: The unauthorized harvesting of timber undermines forest sustainability, depletes resources, and disrupts ecosystems.

Strategic Approach:

- Promote sustainable livelihoods to reduce dependence on illegal activities.
- Enhance surveillance and monitoring systems to detect and deter illegal activities.
- Strengthen institutional and human resource capacity for effective law enforcement.
- Implement awareness and education programs to inform communities about the impacts of illegal logging.

2.8.5.2. Poaching

Threat: The illegal hunting of wildlife threatens biodiversity and disrupts ecological balance.

Strategic Approach:

- Provide sustainable livelihood options to reduce community dependence on poaching.
- Increase surveillance and monitoring to protect wildlife populations.
- Build institutional and HR capacity to enforce wildlife protection laws.
- Conduct awareness and education campaigns on the importance of wildlife conservation.

2.8.5.3. Forest Fire

Threat: Forest fire causes extensive damage to forest ecosystems, biodiversity, and carbon storage.

Strategic Approach:

- Strengthen surveillance and monitoring mechanisms to detect and respond to fires promptly.
- Enhance institutional and HR capacity for fire prevention and management.
- Raise awareness and educate communities on fire prevention practices and safety measures.

2.8.5.4. Road Impact

Threat: The construction and maintenance of roads contribute to habitat fragmentation, soil erosion, biodiversity loss, and increased wildlife roadkill, posing significant threats to forest ecosystems and species conservation.

Strategic Approach:

- Implement improved spatial planning and governance to ensure environmentally sensitive road construction and maintenance practices.

2.8.5.5. Unsustainable Harvesting of NWFPs

Threat: Overharvesting of NWFP depletes resources, affects biodiversity, and undermines livelihoods.

Strategic Approach:

- Develop sustainable livelihoods to support communities while reducing overexploitation.
- Strengthen surveillance and monitoring to regulate NWFP harvesting practices.
- Build institutional and HR capacity to enforce sustainable management practices.
- Promote awareness and education on the benefits of sustainable NWFP harvesting.

2.8.5.6. Pest and Diseases

Threat: Infestations and diseases harm forest health and productivity, reducing ecological resilience.

Strategic Approach:

- Enhance surveillance and monitoring to identify and manage pest outbreaks early.
- Strengthen institutional and HR capacity for pest and disease management.
- Conduct awareness and education programs to promote preventive and control measures.

2.8.5.7. Illegal Dumping of Waste

Threat: Improper waste disposal pollutes the environment, degrades forest ecosystems, and poses health risks.

Strategic Approach:

- Increase surveillance and monitoring to detect and prevent illegal dumping.
- Build institutional and HR capacity to enforce waste management regulations effectively.
- Conduct awareness and education initiatives to encourage proper waste disposal practices and community participation in waste management.

These strategic approaches are designed to mitigate threats and ensure sustainable management of HCVAs, balancing conservation efforts with the needs of local communities.

Chapter Three:

Threat and challenges

3.1 Threats

The threat analysis forms an integral part of conservation action planning and management of the landscape. Once threats are identified, threat ranking is essential to effectively prioritize and implement strategic intervention actions. The threats to the Gakiling and Sangbay geogs are many, which serves as a major deterrent to their conservation and protection of nature and wildlife, and impact the livelihoods of local communities. Using the Miradi threat analysis tool 4.5.0, ten threats to the Gakiling and Sangbay were identified and evaluated. These threats pose significant challenges to the sustainable management and conservation of the areas. The analysis categorized and ranked the threats based on a score of three critical dimensions; scope (the spatial extent of the threat), severity (the degree of impact), and irreversibility (the difficulty of recovery if the threat is realized) using a 4 points absolute scale of Low, Medium, High, and Very High. This approach provided an overall threat rating, with the assessment for Gakiling-Sangbay was ranked as Medium (Table 28).

Table 28: Miradi table of threats for each target ranked based on scope, severity and irreversibility

Threats/Targets	Objective 1: Strengthen institutional capacity and governance for effective and efficient service delivery to nature & public	Objective 2: Ensure sustainable Forest Resource Management through improved planning, monitoring, and enforcement mechanisms	Objective 3: Restore and protect degraded habitats for species persistence	Objective 4: Minimize human-wildlife conflict to promote harmonious coexistence	Objective 5: Build resilience and adaptive measures to climate change impacts	Summary Threat Rating	
Habitat degradation and fragmentation			High			Medium	
Species population decline			Medium			Low	
Human-wildlife Conflict	Medium			High		Medium	
Pest and Disease outbreak	Medium		Medium			Medium	
Drying of water source	Medium				Medium	Medium	
Climate change			Low		Low	Low	
Pollution			Medium		Low	Low	
Illegal harvesting of timber & NWFPs	Low	Low				Low	
Wildlife poaching		Low		Low		Low	
Illegal fishing		Low				Medium	
Summary Target Ratings:	Medium	Low	Medium	Medium	Low	Overall	Medium

The threat which was classified as HWC, habitat degradation and fragmentation, drying of water source, pest and diseases outbreak and illegal fishing was ranked as Medium, because mostly the threat was extensive in Scope and High in Severity. The medium threats are characterized by their extensive geographic impact and significant severity, directly affecting ecosystems and communities which required immediate strategic interventions. And the rest, species population decline, impact of climate change, pollution, illegal harvesting of timber and NWFPs and wildlife poaching and trade were ranked as Low. In contrast, low threats have a narrower scope and less severe consequences within the management area.

3.1.1 Human-wildlife Conflict

Agriculture farming and livestock rearing are the main source of livelihood of the local communities of two gewogs. The livestock depredation by predators and crop radiation by ungulates were major challenges to our local communities under these two gewogs as data authenticate the presence of mega-fauna living in close proximity to communities/herding areas. Sharing the same landscape and shrinkage of natural habitats has resulted in people and animal conflicts over living space and food. Based on the survey, it is ascertained that there are livestock depredation by different predators like wild dog, tiger, leopard and bear which killed almost 34 cattle over past three years (2021-2023). The predation has happened exclusively due to negligent herding, inadequate guarding practices, open grazing in the forest area, lax herding practices and let-loose in forest. However, past studies in Bhutan (Thinley et al., 2011; Sangay & Vernes, 2008; Wang & Macdonald, 2006) also reported that livestock predation is mainly caused by lax herding in deep forests. A study by Wangchuk, 2018 in buffer areas of JKSNR revealed that most depredation case was recorded in the forest without supervision, lax herding practice which also overlaps with the habitat of the predators such as Wild dog, Tiger, Snow leopard, Leopard and Asiatic black bear which indicates negligence of the livestock owner. Two cases of human injuries and casualties were reported in Shaba-Shebji village under Sangbay gewog which was caused by Himalayan Gaur at herding sites. Similarly, three incidents of property damage were also reported at Dorithasa village under Gakiling, Nakha and Bebjhi village under Sangbay, attributed to Asiatic black bear. Grey langur vs communities; agricultural crop raiding by rodents, birds, ungulates, monkey, bear. However, considerable tolerance of the yak-herders is evident wherein there are no official reports of retaliatory killing cases in JKSNR, although few incidences of retaliatory killing cannot be completely ruled out. Nevertheless, the management should not be complacent as retaliatory killing can happen at any time once the tolerance level of the communities crosses the optimum threshold, and if those affected farmers are not compensated on the loss of livestock and agriculture crops through an innovative compensation mechanism at the earliest possible.

3.1.2 Habitat degradation and fragmentation

Wildlife habitat conservation has become difficult in the face of human population increase and resulting developmental pressure. The assessment of the Drivers of Deforestation and Forest Degradation in Bhutan (MoAF, 2017) establishes that deforestation is driven chiefly by allotment of SRF land for various purposes like, roads, mining &

quarries, hydropower projects, agriculture and powerlines. The construction of 18 MW Sochhu hydropower project in Sangbay and the transmission lines from the project sites and the transmission line from Samtse have deforested significant areas and disturbed the habitat of wildlife. The management has leased forest to six mining sites at Fentena, Sektena, Chego, Somchu and Merisham which will also disturb the habitats. The 271 and 254 households under Gakiling and Sangbay dependence on forests for timber, fuelwood, and other forest products degrades wildlife habitat. MoAF, 2017 has ranked timber harvesting and firewood extraction as also drivers of forest degradation. National Forest Inventory Report, 2016 and (MoAF, 2017) show that the construction of roads opens up forest areas for resource extraction. The roads constructed all over the villages, chewogs and deep inside forest for mining has created habitat loss and fragmentation which wild animals will be pushed to agriculture fields for food. Livestock grazing and rampant collection of non-wood forest products degrade wildlife habitat through the depletion of food resources in the wild. In addition to natural and anthropogenic factors causing habitat degradation, climate change is expected to accelerate habitat degradation processes in the future.

3.1.3 Drying of water source

Erratic snow and rainfall, changing weather patterns, natural disasters such as earthquakes and landslides, anthropogenic/developmental activities, the drying of spring water, and the impacts of climate change have contributed significantly to the depletion of water sources which leads to reduction of water volume in the areas. The communities of Thangdhokha village under Gakiling have faced acute water shortages due to drying of their water source. To address this, the JKSNR management, in collaboration with the gewog, identified 3 potential water source and initiated water source management program with fund support from BFL. This growing challenge has made it increasingly difficult to meet the rising demand for water, essential for drinking, irrigation and hydropower generation. For farmers in Gakiling and Sangbay, reduced water availability for domestic use and irrigation has emerged as a threat. With limited water, agricultural fields are left underutilized, which indirectly impacts food security and livelihoods in the area.

3.1.4 Pest and diseases outbreak

Forest pest outbreaks pose a significant threat and challenges to the health and sustainability of forest. Among the recorded, pest like Dwarf Mistletoe, Spruce Bark Beetle, and Adelgid in conifer forest are the pest which are potential to severely impact forest ecosystem. However, the extent of their presence and impact within the forest remains poorly understood. The primary challenge lies in the lack of technical expertise to conduct comprehensive studies as study have not been undertaken to determine the spread and severity of these outbreak. Pests can damage native flora, leading to habitat degradation, reduced food sources for wildlife, and an altered balance in forest ecosystems. Factors such as climate change, habitat loss, and weakened vegetation health exacerbate these outbreaks. This knowledge gap hampers efforts to manage and control these pests effectively, leaving the forest vulnerable to further degradation.

Diseases certainly pose a significant threat to wildlife, as they are susceptible to various diseases, including viral, bacterial, and parasitic infections. Some common diseases include Foot and Mouth Disease (FMD) which can spread from domestic animals to wild ungulates, and rabies and canine distemper, which can transmit to wildlife by stray dogs. Additionally, disease like 'Black Quarter' which is caused by the bacterium (*Clostridium chauvoei*), can spread from yaks and horses to wild ungulates. Of late, viral infection outbreak have become a critical concern for the management. An outbreak of Capripox under Gakiling and Sangbay, resulted in the mass mortality of species such as Goral, Serow and Wild pigs, highlighting this as an emerging threat which is concern to the management. Disease outbreaks can significantly impact wildlife population, particularly if the disease is highly contagious pathogens with high mortality rates. Beyond direct impacts, outbreaks can also indirectly affect wildlife populations, such as by reducing food availability or altering social dynamics and destabilizing ecosystem. Conservation efforts should include monitoring and managing disease outbreaks in the wild. This can include measures such as vaccination programs while carrying out rescue and rehabilitation operations, monitoring of disease prevalence and transmission, and measures to reduce human-wildlife interactions that can increase the risk of disease transmission.

3.1.5 Illegal fishing

The presence of 13 fish species including valuable fish species, such as chocolate mahseer and trout, in the Amochu river and other nearby streams has heightened the risk of illegal fishing activities. The range office has documented several cases, confiscating fishing gears such as fishing nets, handmade fishing rods, bamboo traps, and other tools. Illegal fishing in the river systems of the two gewogs is primarily driven by increased human access and economic incentives. Developmental activities such as road construction, bridge construction, and mining have opened up previously remote river systems, making it easier for people to exploit aquatic resources. The growing population in these areas, fueled by such development, has further intensified pressure on natural resources, including fish populations. Economic incentives play a significant role in illegal fishing. Local fish species like chocolate mahseer and trout fetch high prices in the market, motivating individuals to engage in unauthorized fishing despite the risk of penalties. Additionally, the limited alternative livelihood opportunities in rural areas compels many to turn to fishing as a source of income or food security and subsistence needs.

The issue is further exacerbated by insufficient enforcement and monitoring of fishing activities, which allows illegal practices to persist. These factors collectively contribute to the rising prevalence of illegal fishing, posing a serious threat to aquatic biodiversity and ecosystem stability in the gewogs. Addressing these challenges requires a combination of enforcement, regular monitoring, community awareness, and sustainable livelihood initiatives. Initiative like, promote regulated high-end capture fisher as an ecotourism activity, offering alternative income opportunities for communities while conserving fish populations. Such measures will help curb illegal fishing, protect aquatic biodiversity, and promote sustainable use of fishery resources in the region.

3.1.6 Species population decline

The decline in wildlife populations is primarily driven by a combination of HWC, poach-

ing, and habitat alteration. Retaliatory killings will become a significant issue as rising cases of HWC push communities beyond their tolerance threshold, though not much has been recorded. When wildlife damages crops, livestock, or property, affected individuals often lose faith in conservation efforts, leading to intentional killings of animals as a form of retaliation. This not only reduces species numbers but also undermines coexistence between humans and wildlife. Poaching and the illegal wildlife trade further exacerbate the decline in populations. Driven by demand for animal products, poaching depletes species numbers and disrupts social structures within populations, making it harder for them to recover. Habitat alteration due to deforestation, infrastructure development, and other land-use changes adds another layer of pressure. These changes reduce available habitats, forcing species to disperse into human-dominated landscapes, where their survival is further threatened by conflict and lack of resources. Additionally, habitat fragmentation disrupts natural prey-predator dynamics, leading to ecological imbalances. When these relationships are disturbed, it can trigger trophic cascades, where the effects of population changes at one level of the food chain ripple through the ecosystem. This instability impacts the health and functionality of the entire forest ecosystem. Preserving species populations is crucial for maintaining ecological balance. Wildlife plays a vital role in regulating prey populations, dispersing seeds, and maintaining biodiversity. To sustain forest ecosystems and their benefits, conservation efforts must prioritize mitigating human-wildlife conflict, combat poaching, and protecting and restoring habitats. Failure to address these issues could lead to irreversible damage to ecosystems and the loss of vital ecological services, however it requires further investigation or in-depth research to understand the wildlife population in the landscape.

3.1.7 Impact of climate change

Due to climate change, it is estimated that by the end of the 21st century, approximately 20% - 30% of plants and animal species are at risk of extinction. The mountains of Asia are likely to be subject to more extreme and more variable weather as a result of a changing climate according to the assessment by the IPCC (IPCC, 2007). Biodiversity and ecosystems of Gakiling and Sangbay are also vulnerable to climate change impacts. The survey report on the subject revealed that 72% of the respondents reported that, it is changing yearly and changes are experienced in the form of unusual storm, erratic rainfall, snowfall and pest and diseases. However, there is lack of scientific information on the effect of climate change to the natural environment and the local communities. But studies in other country have recorded that, climate change is a major detrimental factor in habitat alteration and fragmentation of large mammal habitats and populations. The study carried out by Honda & Kozakai, (2020) explained how the change in temperature leads to a reduction of food sources and leads to human-wildlife conflict. Therefore, it is necessary to build resilience against these changes through proactive measures and appropriate adaptation strategies, and conservation actions to safeguard the vulnerable communities of the Gakiling and Sangbay.

3.1.8 Pollution

Pollution is emerging as a significant threat in the Gakiling and Sangbay, driven by increasing developmental activities and population growth. The construction of infrastruc-

ture such as the Sochhu mini hydropower project, roads everywhere, transmission line and mining operations has introduced multiple forms of pollution into the environment.

Air pollution, particularly dust pollution, is prevalent around mining areas and road construction sites. The use of explosives in mining activities also contributes to noise pollution, which affects both wildlife and local communities. Additionally, the improper disposal of non-degradable waste along roadsides, campsites, forest areas, and streams has led to increased land and water pollution, degrading ecosystems and threatening biodiversity. Without intervention, pollution will continue to degrade natural habitats, disrupt wildlife, and reduce the quality of life for local communities. Education and awareness to communities and workers, and enforcement of rules and regulations to ensure compliance with pollution control measures, and along with other innovative measures like eco-friendly practices, and regular monitoring to ensure strict implementation of measures.

3.1.9 Illegal collection of forest resources

In addition to the previously identified threats, several drivers contribute significantly to habitat degradation in the landscape. The area is predominantly covered by broadleaved forests, which provide habitat for valuable tree species and edible NWFPs. However, illegal activities have become a growing concern, including the unauthorized harvesting of species such as Walnut (*Juglans regia*), *Morus laevigata*, and wood burrs. Rampant collection of NWFPs, including *Nardostachys jatamansi*, *Juniperus recurva*, and various rhododendron species, is particularly prevalent in the Tergola area. Other forest resources such as cane shoots, bamboo, ferns, mushrooms, Banana, *Thysanolaena*, *Oroxylum indica*, Mullberry, Piper (*pani*), *Pipla*, *Elastrotema*, wild tubers (wild potato), *Persea fructifera* and orchids are also being harvested unsustainably. The lure of easy income has driven many individuals to overexploit these resources, jeopardizing the ecological balance of the forest and threatening its long-term sustainability.

Addressing these issues requires a combination of community engagement, sustainable harvesting practices, and regular monitoring and enforcement of regulations to ensure the protection of these valuable natural resources and their habitats.

3.1.10 Wildlife poaching and illegal trade

Poaching and illegal trade pose significant threats to the survival of wildlife species in the landscape. The abundance of wildlife and increased access to technology among local communities have exacerbated this issue and poaching became one of the threats. Poaching of wildlife species is evident from the traps, snares and poacher caves encountered during survey and patrolling. The management has dealt with several cases of illegal wildlife trade, such as the trafficking of bear bile and paws (3 cases), barking deer (2 cases), python skin (1 case). Additionally, there are likely unreported cases of poaching involving bears, wild pigs, sambar, and porcupines in the area. In high-altitude regions, patrols have uncovered poacher camps, traps, and snares-many of which are suspected to be set for musk deer, a species frequently targeted for its highly valued medicinal properties. Bears and Musk deer are the primary targets due to the lucrative prices their body parts fetch in illegal markets. Although no direct evidence of bird poaching has been found, the musk deer traps collected from the area indicate that larger pheasants

such as the Himalayan monal, Satyr tragopan, Kalij pheasant, Blood pheasant, and Partridge may also be at risk as unintended victims of these traps.

To combat poaching and illegal trade, proactive measures are essential. Building an effective intelligence network involving local communities, herders, and security forces can provide valuable information to track and prevent poaching activities. Additionally, leveraging advanced technologies to gather and analyze data can help create a predictive system for monitoring poaching threats. These measures, combined with continuous surveillance and strict enforcement, are critical for protecting wildlife populations and preserving biodiversity.

3.2 Challenges

3.2.1 Inadequate knowledge and research gap

The lack of inadequate and reliable field data on target species has hindered science-based conservation and resource management efforts in the landscape. Understanding species dispersal and persistence is crucial in the landscape; without this knowledge, successful conservation programs will be significantly challenged in the future. The management needs to focus on filling the data gaps, regarding the populations of other key species such as musk deer, wild dog, leopard, Asiatic black bear, and prey species like ungulates, as well as their habitats. Additionally, insufficient data on climate variables has obstructed research on climate change and its effects on vegetation, species dispersal, and community livelihoods. Addressing these information gaps is essential for the effective implementation of conservation programs to safeguard habitats and reduce community vulnerability to climate impacts at a broader landscape level.

3.2.2 Limited resources and technical capacity

One of the pertinent challenges in Bhutanese conservation is the limited financial and human resource capacity, which impedes the effective implementation of conservation efforts and service delivery. The two lower-range offices face human resource constraints, often becoming overwhelmed with public service duties, leaving little to no time for essential conservation activities such as anti-poaching patrols and research. Conservation in Bhutan is mostly driven by donor funding, and no separate conservation funds are allotted within our country, which limits research on the ecology and distribution of species, which is critical information for developing effective conservation management plans. Moreover, the lack of sufficient conservation funds restricts the purchase of quality patrolling and first aid equipment for field teams. Capacity-building opportunities for field staff, coupled with the low literacy rates in local communities, continue to be significant challenges for effective field management. The limited funding for conservation efforts has been further exacerbated by the post-pandemic economic impact of COVID-19. The government annual budget for conservation programs has been drastically reduced, hindering the implementation of critical conservation activities. This financial strain has also impacted staff capacity development, limiting opportunities for training and professional growth. As a result, both the effectiveness of ongoing programs and the ability to address emerging challenges in conservation management have been significantly compromised. The reduced budget has also restricted the procurement of necessary resources and equipment, further impeding the progress of conservation goals.

With the advancement of information technology, many government-to-citizen (G2C) services have been moved online to improve the speed and efficiency of public service delivery. The Department of Forests and Park Services has launched online platforms such as Government to Citizen (G2C) for the allocation of rural timber and Online Forest Services (OFS) to issue forestry clearances and permits for accessing forest resources. These initiatives have significantly accelerated service delivery to the public. However, many communities in Gakiling and Sangbay face challenges in accessing these services due to high illiteracy rates, making it difficult for them to fully benefit from the online services.

3.2.3 Livelihood practices and traditional rights

Free-range grazing in the forest is a vital source of fodder for cattle in Bhutan (Roder et al., 2002). While livestock contributes significantly to the livelihoods and economy of rural areas, the large livestock population ‘Thanor’ and their extensive grazing within forest areas pose a challenge to biodiversity conservation. Managing such free-grazing livestock inside a forest overlapping wildlife habitat increases the risk of depredation by predators. Additionally, waste dumping in the forest, which is likely to be fed by the bears, can lead to food habituation, making bears more reliant on easy food sources. This increased reliance on human-provided food may escalate bear-human conflicts. Furthermore, most of the agricultural fields are located near wildlife habitats or forests are often raided by wild animals, which quickly become habituated to crops as an easy food source.

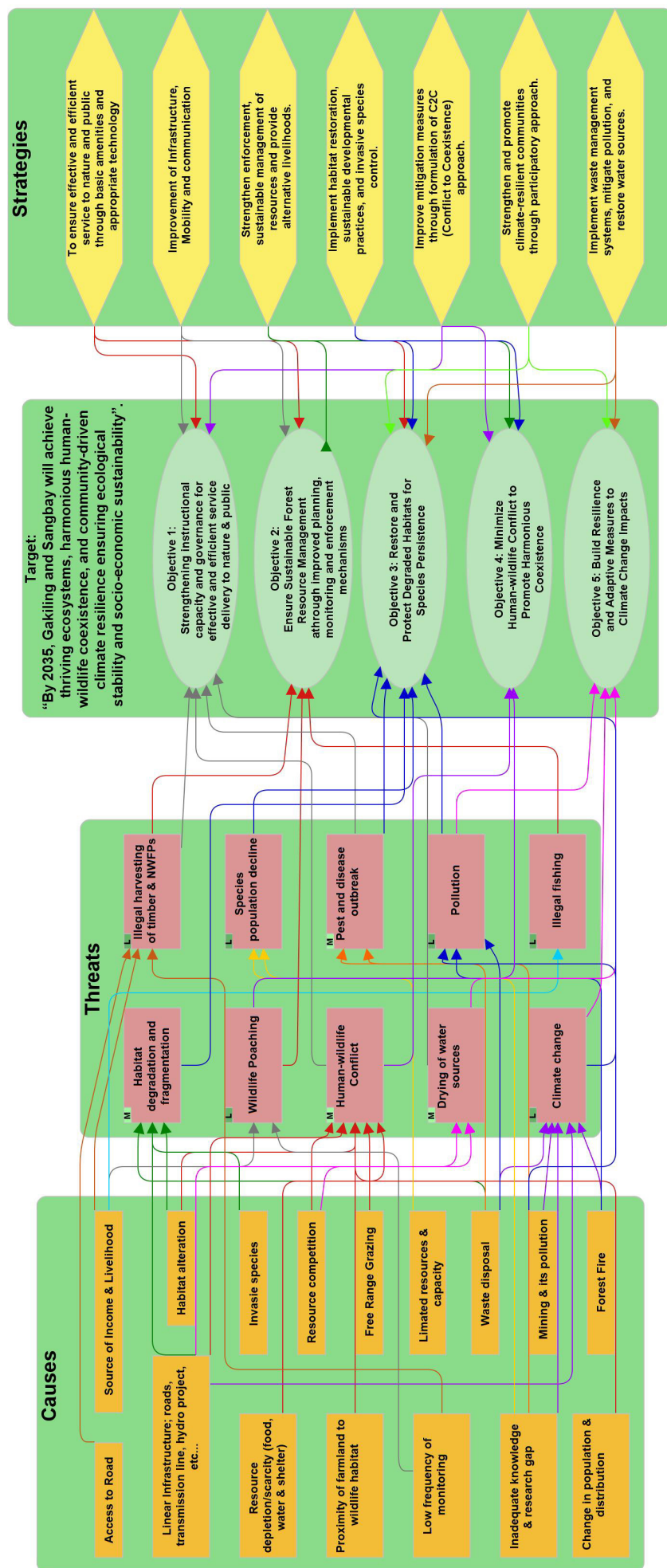


Figure 19: Conceptual model for Gakiling-Sangbay management plan to achieve Targets

Chapter Four:

Management prescription

4.1 Management prescription for IKI landscapes of Gakiling-Sangbay

The strategies and actions (management prescriptions) are developed based on the overarching management goals of the plan, aiming to provide efficient and effective service to both nature and the public, protect and conserve species, preserve habitats, and improve social livelihoods. These strategic actions are designed to address key issues, threats, challenges, and barriers that hinder the achievement of management objectives and, ultimately, conservation goals, ensuring sustainable development within the landscape. This section outlines the strategic prescriptions to tackle the threats and challenges discussed in CHAPTER THREE: THREAT AND CHALLENGES, contributing to the achievement of the Gakiling–Sangbay landscape’s overall goals. These objectives will be pursued through five main objectives, seven strategies, and 47 detailed actions, as outlined in the logical framework.

Objective 1: Strengthen institutional capacity and governance for effective and efficient service delivery to nature & public

Strategy 1.1: To ensure effective and efficient service to nature and public through basic amenities and appropriate technology

- **Action 1.1.1:** Provide online forestry services (G2C and OFS) system within the given schedule.
- **Action 1.1.2:** Awareness program to the public on Online Forestry Services, Acts and Rules by ensuring equal representation of women and men.
- **Action 1.1.3:** Enhance professional capacity development to staff on different forestry theme based for effective service delivery by ensuring equal opportunity for women and men.
- **Action 1.1.4:** Conduct basic first aid, arms handling, uniform discipline and field safety training to the frontline staff.
- **Action 1.1.5:** Provide operational/directional support for effective and smooth functioning of office.
- **Action 1.1.6:** Payment of staff salary and allowances for effective and efficient services delivery.

Strategy 1.2: Improvement of Infrastructure, Mobility and communication

- **Action 1.2.1:** Procure and equip field staff with all necessary communication, office and field equipment and field gears. Provide field gear and



equipment designed to accommodate the needs of both male and female staff.

- **Action 1.2.2:** Maintenance of offices, computer, equipment, tools and field gears.
- **Action 1.2.3:** Purchase pool bike for effective and timely service delivery.

Objective 2: Ensure sustainable Forest Resource Management through improved planning, monitoring, and enforcement mechanisms

Strategy 2.1: Strengthen enforcement, sustainable management of resources and provide alternative livelihoods.

- **Actions 2.1.1:** Revision of management plans (CF, LFMA)
- **Action 2.1.2:** Sustainable resource allocation from different management regimes.
- **Action 2.1.3:** SMART patrolling: Deploy Forest patrols in illegal harvesting hotspots.
- **Action 2.1.4:** Organize awareness campaigns about the environmental and legal implications of illegal harvesting. Ensure equal participation of women and men.
- **Action 2.1.5:** Facilitate alternative livelihood programs, such as eco-tourism, forest-based enterprise and sustainable NWFP group by encouraging women-led forest users' group.
- **Action 2.1.6:** Monitoring and evaluation of different management regimes with the use of Bhutan METT plus tools.
- **Action 2.1.7:** Enhance the capacity of the forestry staff on advance technology.
- **Action 2.1.8:** Capacity development of community and other user groups by ensuring that equal opportunities are provided to both women and men.
- **Action 2.1.9:** Conduct regular anti-poaching or ad hoc patrolling to curb illegal poaching.
- **Action 2.1.10:** Develop community-based monitoring and intelligence networking system through partnership and local stewardship.
- **Action 2.1.11:** Support Rangtse, Dorjiphamo and Sektena Nye.
- **Action 2.1.12:** Conduct study on the Economic Valuation and visitor carrying capacity of the Nyes.
- **Action 2.1.13:** Conduct Forest Inventory Data Collection and Analysis under IKI landscape



Objective 3: Restore and Protect Degraded Habitats for species persistence

Strategy 3.1: Implement habitat restoration, sustainable developmental practices, and invasive species control.

- **Action 3.1.1:** Conduct baseline habitat surveys to identify priority areas for restoration.
- **Action 3.1.2:** Conduct biodiversity assessment in the identified grids.
- **Action 3.1.3:** Carry out camera trap for species monitoring.
- **Action 3.1.4:** Establish community nursery and implement a reforestation program, targeting native species, high value tree plantation. Use native plant species that enhance biodiversity while considering social and ecological impacts.
- **Action 3.1.5:** Collaborate with relevant stakeholders and local communities for conservation program initiative through coordination meeting, training and workshop. Ensure equal representation of men and women.
- **Action 3.1.6:** Control and manage invasive species through proper preventive measures.
- **Action 3.1.7:** Implement and monitor KBA and HCV as per plan.
- **Action 3.1.8:** Strengthen QRT and citizen scientist group by encouraging the participation of women.
- **Action 3.1.9:** Implement habitat management practices that prioritize environmental sustainability and incorporate social safeguards to minimize impacts on local communities and biodiversity.
- **Action 3.1.10:** Coordinate and collaborate closely, and regularly with livestock sector to monitor the prevalence of diseases and control.

Objective 4: Minimize Human-wildlife Conflict to promote harmonious coexistence

Strategy 4.1: Improve mitigation measures through formulation of C2C (Conflict to Coexistence) approach.

- **Action 4.1.1:** Identify HWC hotspots areas to formulate C2C strategy.
- **Action 4.1.2:** Initiate C2C intervention as per the Strategy plan.
- **Action 4.1.3:** Coordination meeting with relevant stakeholders by equally involving women and men.
- **Action 4.1.4:** Develop and disseminate an HWC reporting and compensation mechanism for affected communities.
- **Action 4.1.5:** Facilitate stakeholder meetings to include voices from women and other vulnerable groups in developing HWC strategies.



Objective 5: Build resilience and adaptive measures to climate change impacts

Strategy 5.1: Strengthen and promote climate-resilient communities through participatory approach.

- **Action 5.1.1:** Conduct annual fire safety training programs with equal participation of women and men, and establish inclusive community-based fire response teams that ensure gender representation and equitable roles.
- **Action 5.1.2:** Initiate Forest fire management programs to reduce fire incidences.
- **Action 5.1.3:** Provide support to plant climate-resilient crop species in vulnerable areas.
- **Action 5.1.5:** Develop and implement a climate adaptation action plan with specific measures for species and ecosystems at risk.
- **Action 5.1.6:** Red panda tourism development

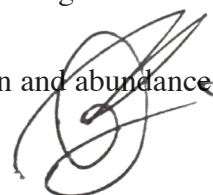
Strategy 5.2: Implement waste management systems, mitigate pollution, and restore water sources.

- **Action 5.2.1:** Assessment of spring shed, critical watershed and water source areas for management intervention.
- **Action 5.2.2:** Launch community-led programs to conserve and restore drying water sources through different technology and interventions.
- **Action 5.2.3:** Enforce dust suppression measures (e.g., water spraying) in mining zones.
- **Action 5.2.4:** Conduct environmental awareness campaigns to reduce illegal dumping and noise pollution.
- **Action 5.2.5:** Installation of signages and information boards at strategic locations.
- **Action 5.2.6:** Organize gender-inclusive waste management awareness and cleaning campaigns.

Objective: 6. To revalidate and monitor the population status of priority wildlife species through structured national surveys and to generate baseline biodiversity data using advanced scientific tools.

Strategy 6.1: Conduct scientifically robust and regular national surveys through a coordinated framework that targets priority habitats and fosters active collaboration among field offices and stakeholders

- **Action 6.1.1:** Undertake population revalidation surveys for tigers at five-year intervals to monitor status and trends.
- **Action 6.1.2:** Implement a survey to assess the distribution and abundance of musk deer in confirmed habitats.



- **Action 6.1.3:** Conduct an environmental DNA survey across IKI Land scape of JKSNR to establish baseline biodiversity information.

4.2 Management prescription for High Conservation Value Area

The management of HCVA is essential to ensure the protection of biodiversity and ecological integrity. The process involves identifying and addressing various threats that could impact the conservation values of these areas. As part of the HCVA screening process, threats such as forest fires, poaching, illegal logging, unsustainable harvesting of NWFP, dumping of waste, and the impact of existing roads were identified. To manage these threats, strategies and activities are tailored to mitigate their effects as detailed in Table 29.

Table 29: High Conservation Value Areas Management

Strategy	Outcomes	Outputs	Activity
1. Sustainable Livelihoods enhanced	Sustainable and Legal Harvesting of Timber	Alternative livelihoods identified (incl. Ecotourism, NWFP)	Identify alternative livelihood option—Chain link fencing at Dorithasa-5.0
	Sustainable Harvesting of NWFP	NWFP Groups formed and trained	Formation of NWFP management groups and partner with local communities for joint sustainable NWFP management and training
			Awareness and training on the sustainable harvesting technique of NWFP
	Reduced Poaching	Diversified income	Facilitate alternatives (Homestays, Ecotourism service, Trekking trail, Hot-stone bath)
			Promotion of alternative products (cane and bamboo products etc.)

2. Institutional & HR Capacity enhanced	Sustainable and Legal Harvesting of Timber	Improved forest management practices	Train forestry officers/Rangers in sustainable forestry techniques— training on SMART, GIS, HWC management, and innovative tools (drones, camera traps & eDNA service)
			Implement workshops on monitoring and reporting forest health.
		Strengthened regulatory frameworks and enforcement	Conduct regular inspections to ensure compliance with regulations
		Enhanced collaboration with local communities	Establish partnerships for community participation in forest management
			Conduct awareness campaigns on the importance of legal harvesting practices
	Sustainable Harvesting of NWFP	Strengthened guidelines and harvesting protocols	Develop clear guidelines for the sustainable collection of NWFP
			Implement monitoring programs to ensure adherence to protocols
			Conduct awareness sessions on sustainable use and benefits of legal practices
	Reduced poaching	Improved patrolling and monitoring capabilities	Deploy new technology (e.g., drones and camera traps) for surveillance
		Increased reporting and intelligence sharing	Set up a centralized reporting system for poaching incidents
		Strengthened law enforcement coordination	Facilitate collaboration between forest departments and local law enforcement
			Organize joint training programs with law enforcement agencies on wildlife protection
	Pest and diseases reduced	Improved pest and disease monitoring systems	Establish regular forest health surveys and data collection procedures
		Strengthened pest and disease management protocols	Develop and update standard operating procedures for pest control
			Implement workshops on integrated pest management (IPM) techniques
		Enhanced technical skills of forestry personnel	Conduct training programs on identifying and managing invasive species
		Increased community engagement in forest health management	Organize awareness campaigns on the importance of preventing pest and disease spread

3. Strengthened Waste Management Systems and Community Engagement	Improved Waste Management and Reduced Illegal Dumping	Improved waste disposal infrastructure and systems	Install waste collection points and bins in strategic locations
		Enhanced community awareness and participation	Set up community-based waste management committees
			Conduct educational initiatives to promote responsible waste disposal habits
4. Sustainable Road Management and Habitat Conservation	Minimized Road Impact on Red panda Habitat	Enhanced road safety measures for wildlife	Enforce speed limits and wildlife-friendly driving regulations in red panda habitats
			Implement road signs and warning systems to alert drivers in wildlife-sensitive areas
		Improved habitat restoration and connectivity	Restore vegetation and create buffer zones along roadsides to reduce habitat fragmentation
			Reconnect fragmented areas by planting native flora and constructing green corridors/passage
		Strengthened monitoring and research initiatives	Conduct research on the ecological effects of roads on the local wildlife and habitat
		Increased awareness among the passer-by	Organize educational campaigns and roadside events to highlight the importance of Red panda habitat protection and encourage responsible road use
5. Enhanced Forest Fire Prevention and Response	Reduced Impact of Forest Fires	Strengthened fire response and control capabilities	Equip forest rangers and community members with firefighting tools and protective gear
			Establish rapid response teams for immediate action during fire outbreaks
		Increased community engagement in fire prevention	Set up volunteer Firewatch groups to patrol high-risk areas during dry seasons
		Enhanced forest management practices to reduce fire risk	Implement controlled burning and clearing of dry underbrush in strategic areas

4.3 Gender Mainstreaming

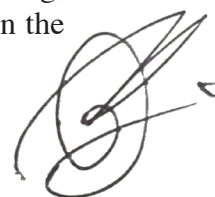
Gender mainstreaming involves examining the roles and relationships between genders in various aspects of conservation, including policy-making, research, resource management, access to resources, division of labour, socio-cultural gender perception, and community engagement. All DFOs understand that this approach recognizes that gender dynamics influence how individuals interact with their environment, access resources, and participate in decision-making processes. As such, integrating gender considerations into conservation efforts is a fundamental step toward achieving equitable and sustainable outcomes of the DFO management plan.

The “Gender Analysis, Gender Mainstreaming Strategy and Gender Action Plan” 2019 has indicated that in order to mainstream gender into the DFO management plans, adequate budget allocation is needed (indicative budget in relation to gender mainstreaming is provided in the Gender Action Plan). The report recommends the need to involve women’s organization both at national and local level to enhance gender mainstreaming, building capacity of project team, enhancing skill development at local level for nature-based product diversification, identification of alternative livelihood and incentives for participation and support to Community Forest Management Group (CFMG). Integrating the above recommendations within the overall structure of the DFO management plan is supposed to ensure gender aspects are addressed.

In addition, the following are some important outcomes that are generally accepted if gender integration, specifically women are considered:

1. **Diverse Knowledge and Perspectives:** Women and men often possess distinct knowledge about local ecosystems, resources, and species. Incorporating this diverse knowledge can lead to more comprehensive and accurate conservation strategies. Therefore, women participation would be considered of outmost significance when planning and implementing biodiversity action plans.
2. **Resource Management:** Women frequently play key roles in natural resource management, including agriculture, water collection, and fuelwood collection. As a result, women involvement in the management of forest resources in the CF and SRF would be encouraged.
3. **Empowerment:** The Division shall empower women by providing them with opportunities to actively engage in decision-making processes related to conservation and land management.
4. **Equitable Benefits:** Ensure gender equity in conservation initiatives and promotes fair distribution of benefits and resources, preventing potential gender-based disparities.

The DFO management plan has effectively incorporated Gender Mainstreaming by embedding relevant components throughout its strategies and activities wherever possible. This ensures that gender considerations are an integral part of decision-making, planning, and implementation processes, promoting equality and inclusivity within the organization’s operations.



4.4 Environmental and Social Safeguards (ESS)

Environmental and Social Safeguards (ESS) are vital to balance development with ecological integrity and community well-being. They help prevent deforestation, habitat loss, and community displacement while protecting biodiversity, cultural values, and livelihoods. By addressing risks early, ESS strengthens sustainable forest management and aligns with Bhutan's environmental policies and global commitments such as the SDGs.

To operationalize ESS in the DFO Management Plan, occupational safety measures are integrated across activities to protect staff, rangers, and community participants.

- Habitat Restoration: Use PPE, safe equipment handling, and wildlife emergency protocols.
- Biodiversity Monitoring: Team-based fieldwork, GPS/communication tools, and safety briefings.
- Fencing & Infrastructure: Helmets, gloves, safe lifting training, and first-aid readiness.
- HWC Mitigation: Non-lethal deterrents, patrols in groups, and clear SOPs for incidents.
- Fire Management: Firefighting PPE, hydration/rest schedules, and trained rapid response teams.
- Water Source Restoration: Protective clothing, safe tool use, and health checks for waterborne risks.



Chapter Five:

Implementation plan and financial outlay

The current plan represents the first-ever DFO management plan and aligns closely with sustainable development, service delivery, livelihood improvement, and conservation initiatives, similar to those in PA conservation plans. To implement the outlined programs over the next decade and achieve the stated goals and objectives, a secure and sustainable funding mechanism is crucial. While significant funding support is anticipated from the WWF-IKI Project (8 years), the Bhutan for Life (BFL) initiative (14 years) and United Nation Environment Program (UNEP) for 5 years, a funding gap remains beyond the contributions from WWF-IKI, BFL, and the Royal Government of Bhutan (RGoB). Thus, it is essential for the management to proactively explore additional funding from other conservation donors, like WWF-Bhutan Program, Bhutan Trust Fund for Environmental Conservation (BTF-EC), Asian Forest Cooperation Organization (AFOCO), Reducing Emissions from Deforestation and Forest Degradation (REDD+), UNDP-Global Environment Facility (UNDP-GEF), Helvetas-Bhutan, Bhutan Foundation, and the Royal Society for the Protection of Nature (RSPN). These resources will help finance programs that are either excluded from or insufficiently covered by the IKI and BFL projects. Furthermore, strengthening collaboration and fostering partnerships with both national and international donor organizations is critical to ensure the successful implementation of the plan.

The 10-year management plan (2026–2035) for Gakiling–Sangbay carries a total projected budget of Nu. 116.68 million, of which Nu. 110.94 million is earmarked for IKI Landscape initiatives in Gakiling and Sangbaykha geogs, and Nu. 5.74 million is allocated to HCVA programs. The bulk of this funding is expected from partners such as the WWF-IKI Project, Bhutan for Life, UNEP, and the Royal Government of Bhutan (RGoB). To address potential shortfalls, additional resources will be sought from the Bhutan Trust Fund for Environmental Conservation (BTFEC), Asian Forest Cooperation Organization (AFOCO), Bhutan Foundation, UNDP-GEF, and the Royal Society for Protection of Nature (RSPN).

Recurrent costs including salaries, allowances, and management services will be financed through RGoB, subject to staff strength approved by the RCSC and annual allocations endorsed by the Government, with a 10% inflation adjustment considered. Furthermore, an annual operational plan, aligned with the 10-year strategy and supported by a Monitoring and Evaluation Framework, will be developed to ensure effective implementation of the programs.



5.1 Implementation Framework

The management prescription of the plan is detailed out in this chapter of the plan in the implementation framework (Table 30) for a period of 10 years (2026-2035). The plan was prepared with a realistic year-wise budget indicated against each activity based on the management prescription for the entire plan period. With the emergence of new issues and threats; and mitigation and/or addressal of the existing or perceived issues and threats, the program activities should be re aligned accordingly. Based on the implementation framework, an Annual Operational Plan (Annexure I: Annual Operational Plan) which covers all the activities to be carried out in a year will be linked with Annual Performance Appraisal (APA) and Monitoring Framework to help achieve this dynamism and evaluate at the end of every financial year.



Table 30: Implementation Framework

Objectives	Strategies	Actions	Year (2026-2035) along with budget outlay (Nu. in million)										Total	Remarks
			I	II	III	IV	V	VI	VII	VIII	IX	X		
1: Strengthen institutional capacity and governance for effective and efficient delivery service to nature & public	1.1: To ensure effective and efficient service to nature and public through basic amenities and appropriate technology	1.1.1: Provide Online Forestry Services via G2C and OFS system within the given schedule	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	2.50	RGoB
		1.1.2: Awareness program to the public on Online Forestry Services, Acts and Rules by ensuring equal representation of women and men.	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	1.40	RGoB/ Comment: Breakdown budget alternatively
		1.1.3: Enhance professional capacity development to staff on different forestry theme based for effective service delivery by ensuring equal opportunity for women and men.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	BFL
		1.1.4: Conduct basic first aid, arms handling, uniform discipline and field safety training to the frontline staff.	0.10	0.00	0.00	0.10	0.00	0.00	0.10	0.00	0.00	0.10	0.40	BFL
		1.1.5: Provide operational/ directional support for effective and smooth functioning of office.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	RGoB
		1.1.6: Payment of staff salary and allowances for effective and efficient services delivery.	3.55	3.55	3.55	3.55	3.55	4.00	4.00	4.00	4.00	4.00	37.75	RGoB

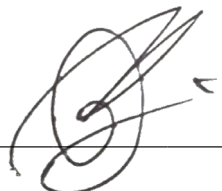
	1.2: Improvement of Infrastructure, Mobility and communication	1.2.1: Procure and equip field staff with all necessary communication, office and field equipment and field gears.	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	IKI
		1.2.2: Maintenance of offices equipment, computer, tools & field gears	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	BFL
		1.2.3: Purchase pool bike for effective and timely service delivery	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	
	2: Ensure sustainable Forest Resource Management through improved planning, monitoring, and enforcement mechanisms.	2.1: Strengthen enforcement, sustainable management of resources and provide alternative livelihoods	2.1.1: Revision of management plans (CF, LFMA)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	BFL
			2.1.2: Sustainable resource allocation from different management regimes	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00
		2.1.3: SMART patrolling: Deploy Forest patrols in illegal harvesting hotspots.	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	4.00	BFL
		2.1.4: Conduct awareness programs highlighting the environmental and legal consequences of illegal harvesting, ensuring the active and equal participation of both women and men	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	BFL
		2.1.5: Promote alternative livelihood initiatives—such as wildlife and nature-based ecotourism, forest-based enterprises, and sustainable NWWFP groups—by supporting and encouraging women-led forest user groups	0.80	0.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	BFL

	2.1.6: Monitoring and evaluation of different management regimes by using Bhutan METTPlus	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00	BFL
	2.1.7: Enhance the capacity of the forestry staff on advance technology	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	
	2.1.8: Capacity development of community and other user groups by ensuring that equal opportunities are provided to both women and men.	0.30	0.00	0.20	0.00	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	1.70	BFL
	2.1.9: Conduct regular anti-poaching or ad hoc patrolling to curb illegal poaching.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	RGoB
	2.1.10: Develop community-based monitoring and intelligence networking system through partnership and local stewardship.	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	1.50	BFL
	2.1.11: Support Rangtse, Dorjiphamo and Sektena Nye for conservation	0.50	0.30	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	1.80	Explore fund
	2.1.12: Conduct study on the Economic Valuation and visitor carrying capacity of the Nyes	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.60	Explore fund
	2.1.13: Conduct Forest Inventory Data Collection and Analysis under IKI landscape															2.35	FMID/NFI

3: Restore and Protect Degraded Habitats for species persistence	3.1: Implement habitat restoration, sustainable development practices, and invasive species control.	3.1.1: Conduct baseline habitat surveys to identify priority areas for restoration.	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30	UNEP
		3.1.2: Conduct biodiversity (BMG) assessment in the identified grids	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.600	BFL
		3.1.3: Carry out camera trap for species monitoring	0.00	0.25	0.00	0.20	0.00	0.00	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.20	1.05	BFL
		3.1.4: Establish community nursery and implement a reforestation program, targeting native species, high value tree plantation. Use native plant species that enhance biodiversity while considering social and ecological impacts.	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	UNEP
		3.1.5: Collaborate with relevant stakeholders and local communities for conservation program initiative through coordination meeting, training and workshop. Ensure equal representation of men and women. (Cross-geog exchange programs on best practices, Village-level campaigns on environmental laws, biodiversity importance, and penalties for illegal activities etc)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	BFL
		3.1.6: Control and manage invasive species through proper preventive measures	0.00	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.40	BFL

4: Minimize Human-wild-life Conflict to promote harmonious coexistence	4.1: Improve mitigation measures through formulation of C2C (Conflict to Coexistence) approach.	3.1.7: Implement and monitor KBA and HCV as per plan	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	IKI
			0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	BFL
			0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
			0.15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.05	RGoB
			0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	IKI
			3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	13.05	IKI/Agri/Tarayana-
			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.50	IKI

		4.1.4: Establish a community-led HWC reporting and compensation mechanism under the ICDP framework with shared costs and responsibilities	0.00	2.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	2.20	IKI
5: Build resilience and adaptive measures to climate change impacts	5.1: Strengthen and promote climate-resilient communities through participatory approach.	5.1.1: Conduct annual fire safety training with equal gender participation and form inclusive community fire response teams with equitable roles.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	IKI
		5.1.2: Initiate Forest fire management programs to reduce fire incidences.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	IKI
		5.1.3: Provide support to plant climate-resilient crop species in vulnerable areas.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	2.50	Explore fund/Agri
		5.1.5: Develop and implement a climate adaptation action plan with specific measures for species and ecosystems at risk, including conducting vulnerability assessments for climate-sensitive species such as Musk deer, establishing ex-situ conservation programs for threatened orchids, and monitoring migration patterns of Red panda to track climate-driven range shifts.	1.10	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	2.1	IKI



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6: To reval- idate and monitor the population sta- tus of priority wildlife spe- cies through structured na- tional surveys and to generate baseline biodi- versity data us- ing advanced scientific tools.	6.1: Conduct scientifically robust and regular national sur- veys through a coordinated framework that targets priority habitats and fosters active collaboration among field offices and stakeholders.	6.1.1: Undertake population revalidation surveys for ti- gers at five-year intervals to monitor status and trends. deer in confirmed habitats.								1.25									2.70	NCD	
		6.1.2: Implement a survey to assess the distribution and abundance of musk deer in confirmed habitats.	0.365																	0.365	NCD
		6.1.3: Conduct an environ- mental DNA survey across IKI Land scape of JKSNR to establish baseline biodi- versity information.	0.225																	0.225	NCD
Total Nu. in million			14.9	16.8	13.2	13.0	8.5	9.5	8.8	8.1	8.4	10.8							110.94		

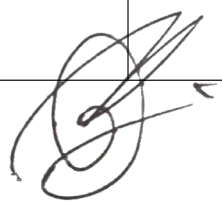


5.2 Implementation Plan and Financial Outlay for HCVA

Table 31: Implementation framework for HCVA

Strategy	Outcomes	Outputs	Activity	Location	Time-frame	Budget (million Nu.)
Sustainable Livelihoods enhanced	Sustainable and Legal Harvesting of Timber	Alternative livelihoods identified (incl. Ecotourism, NWFP)	Identify alternative livelihood option—Chain-link fencing at Dorithasa	Sang-bay&Ga-kiling	2025-2026	0.20
	Sustainable Harvesting of NWFP	NWFP Groups formed and trained	Formation of NWFP management groups and partner with local communities for joint sustainable NWFP management and training	Sang-bay&Ga-kiling	2026-2027	0.100
			Awareness and training on the sustainable harvesting technique of NWFP	Sang-bay&Ga-kiling	2026-2027	0.070
	Reduced Poaching	Diversified income	Facilitate alternatives (Homestays, Ecotourism service, Trekking trail, Hot-stone bath)	Sang-bay&Ga-kiling	2026-2027	0.500
			Promotion of alternative products (cane and bamboo products etc.)	Sang-bay&Ga-kiling	2027-2028	0.150
Institutional & HR Capacity enhanced	Sustainable and Legal Harvesting of Timber	Improved forest management practices	Train forestry officers/Rangers in sustainable forestry techniques—training on SMART, GIS, HWC management, and innovative tools (drones, camera traps & eDNA service)	Sang-bay&Ga-kiling	2026-2027	0.100
			Implement workshops on monitoring and reporting forest health.	Sang-bay&Ga-kiling	2025-2027	0.100
		Strengthened regulatory frameworks and enforcement	Conduct regular inspections to ensure compliance with regulations	Sang-bay&Ga-kiling	2025-2028	0.150

		Enhanced collaboration with local communities	Establish partnerships for community participation in forest management	Sang-bay&Ga-kiling	2025-2026	0.150
			Conduct awareness campaigns on the importance of legal harvesting practices	Sang-bay&Ga-kiling	2026-2027	0.100
	Sustainable Harvesting of NWFP	Strengthened guidelines and harvesting protocols	Develop clear guidelines for the sustainable collection of NWFP	Sang-bay&Ga-kiling	2026-2027	0.070
			Implement monitoring programs to ensure adherence to protocols	Sang-bay&Ga-kiling	2025-2028	0.100
			Conduct awareness sessions on sustainable use and benefits of legal practices	Sang-bay&Ga-kiling	2026-2027	0.100
	Reduced poaching	Improved patrolling and monitoring capabilities	Deploy new technology (e.g., drones and camera traps) for surveillance	Sang-bay&Ga-kiling	2029-2031	0.300
			Set up a centralized reporting system for poaching incidents	Sang-bay&Ga-kiling	2030-2032	0.050
		Strengthened law enforcement coordination	Facilitate collaboration between forest departments and local law enforcement	Sang-bay&Ga-kiling	2031-2032	0.100
			Organize joint training programs with law enforcement agencies on wildlife protection	Sang-bay&Ga-kiling	2032-2033	0.100
	Pest and diseases reduced	Improved pest and disease monitoring systems	Establish regular forest health surveys and data collection procedures	Sang-bay&Ga-kiling	2028-2029	0.150
		Strengthened pest and disease management protocols	Develop and update standard operating procedures for pest control	Sang-bay&Ga-kiling	2028-2029	0.050



			Implement workshops on integrated pest management (IPM) techniques	Sang-bay&Ga-kiling	2029-2030	0.100
		Enhanced technical skills of forestry personnel	Conduct training programs on identifying and managing invasive species	Sang-bay&Ga-kiling	2026-2028	0.100
		Increased community engagement in forest health management	Organize awareness campaigns on the importance of preventing pest and disease spread	Sang-bay&Ga-kiling	2030-2034	0.150
Strengthened Waste Management Systems and Community Engagement	Improved Waste Management and Reduced Illegal Dumping	Improved waste disposal infrastructure and systems	Install waste collection points and bins in strategic locations	Sang-bay&Ga-kiling	2025-2030	0.300
		Enhanced community awareness and participation	Set up community-based waste management committees	Sang-bay&Ga-kiling	2026-2027	0.050
			Conduct educational initiatives to promote responsible waste disposal habits	Sang-bay&Ga-kiling	2025-2027	0.200
Sustainable Road Management and Habitat Conservation	Minimized Road Impact on Red panda Habitat	Enhanced road safety measures for wildlife	Enforce speed limits and wildlife-friendly driving regulations in red panda habitats	Sang-bay&Ga-kiling	2027-2028	0.250
			Implement road signs and warning systems to alert drivers in wildlife-sensitive areas	Sang-bay&Ga-kiling	2027-2028	0.100
		Improved habitat restoration and connectivity	Restore vegetation and create buffer zones along roadsides to reduce habitat fragmentation	Sang-bay&Ga-kiling	2030-2034	0.300
			Reconnect fragmented areas by planting native flora and constructing green corridors/passage	Sang-bay&Ga-kiling	2030-2034	0.500
		Strengthened monitoring and research initiatives	Conduct research on the ecological effects of roads on the local wildlife and habitat	Sang-bay&Ga-kiling	2027-2034	0.250

Jigme Khesar Strict Nature Reserve

		Increased awareness among the passer-by	Organize educational campaigns and roadside events to highlight the importance of Red panda habitat protection and encourage responsible road use	Sang-bay&Gakiling	2027-2029	0.100
Enhanced Forest Fire Prevention and Response	Reduced Impact of Forest Fires	Strengthened fire response and control capabilities	Equip forest rangers and community members with firefighting tools and protective gear	Sang-bay&Gakiling	2028-2030	0.250
			Establish rapid response teams for immediate action during fire outbreaks	Sang-bay&Gakiling	2026-2028	0.100
		Increased community engagement in fire prevention	Set up volunteer Firewatch groups to patrol high-risk areas during dry seasons	Sang-bay&Gakiling	2026-2028	0.200
		Enhanced forest management practices to reduce fire risk	Implement controlled burning and clearing of dry underbrush in strategic areas	Sang-bay&Gakiling	2029-2034	0.150
Total Budget (Nu in million)						5.74



Chapter Six:

Monitoring and evaluation

Additionally, timely monitoring and evaluation of planned programs is essential to ensure proper delivery of outputs. This chapter outlines how the implementation of the plan will be monitored and evaluated. The M&E plan (Table 32) will be prepared to ensure synergy with the Implementation Framework and has also included the indicators against which the performance of the Division will be measured. The output indicator will basically describe the achievement of the actions identified under **CHAPTER FOUR: MANAGEMENT PRESCRIPTION**.

6.1 Monitoring

Monitoring involves a continuous assessment process designed to provide stakeholders with timely and detailed updates on the progress or delays of ongoing activities, offering a clear view of their implementation status. For the 10-year management plan, monitoring will be conducted annually by the JKSNR management team. This will be aligned with the annual operational plan to ensure systematic oversight and accountability throughout the implementation phase.

6.2 Evaluation

Evaluation of the plan will be done twice during the entire plan period. A midterm review (in last quarter of the 4th year) and final review (last quarter of the 9th year) will be carried out. Evaluation will be done by both internal (JKSNR) and external committee members from the functional divisions, DoFPS.

Further, evaluation shall be carried out using the “Bhutan METT+ (Management Effectiveness Tracking Tool)” (Dudley et al., 2016) which has been tweaked to meet the requirement of the Division Forest Office. The objectives to use Bhutan METT+ is to evaluate the management effectiveness of Division Forest Office. Similar to the Protected Areas, Bhutan METT+ evaluation shall be carried out once every five years for the DFOs.

The Bhutan METT+ should be conducted at two levels, Internal Assessment and External Assessment. The Internal Assessment is a self-assessment which should be carried out prior to the External Assessment by the respective field offices comprising the following members from their jurisdiction; CFO, Section Heads and at least two officers from Range Offices.

The External Assessment should be coordinated by FMID and carried out in collaboration with relevant offices to ensure that the results from the internal assessment are



unbiased. The team members for the external assessment shall include one Specialist, One representative from each functional division and, one representative each from the adjoining Division Forest Office. The first baseline METT+ score for Gakiling–Sang-bay DFO management plan was 44.72%. This score was determined only to provide the baseline data for the IKI project and management cannot assure 20% increase in the METT+ score by June 2028 as indicated in the project document.

A handwritten signature in black ink, consisting of several overlapping loops and a final horizontal stroke.

Table 32: Monitoring and Evaluation Framework

Objectives	Actions	Output indicator	Baseline	Unit	Yearly Target									
					Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
 1: Strengthening institutional capacity and governance for effective and efficient service delivery to nature & public	1.1.1: Provide Online Forestry Services via G2C and OFS system within the given schedule	Online forestry service requests processed within TAT and report quarterly	4	Report	4	4	4	4	4	4	4	4	4	4
	1.1.2: Awareness program to the public on Online Forestry Services, Acts and Rules by ensuring equal representation of women and men.	Number of awareness conducted and submit report	250	Numbers	100	100	100	100	100	100	100	100	100	100
	1.1.3: Enhance professional capacity development to staff on different forestry theme based for effective service delivery by ensuring equal opportunity for women and men.	Number of staff trained to build capacity and submit report	18	Numbers	25	25	25	25	25	25	25	25	25	25
	1.1.4: Conduct basic first aid, arms handling, uniform discipline and field safety training to the frontline staff.	Number of frontline staff trained and submit report	18	Numbers	25	0	0	25	0	0	25	0	0	25
	1.1.5: Provide operational/ directional support for effective and smooth functioning of office.	Timely released and utilized the operation and direction services fund and technical backstopping.	8	Staff	8	10	10	10	10	10	10	10	10	10
	1.1.6: Payment of staff salary and allowances for effective and efficient services delivery.	Timely released and disbursement of fund.	8	Staff	8	10	10	10	10	10	10	10	10	10

	1.2.1: Procure and equip field staff with all necessary communication, office and field equipment and field gears. Provide field gear and equipment designed to accommodate the needs of both male and female staff.	Number of equipment items procured and issued	6	Items	3	0	0	0	0	3	0	0	0	0	3	0
	1.2.2: Maintenance of offices equipment and tools	Number of maintenance activities performed on office equipment annually	0	Numbers	3	0	0	0	3	0	0	3	0	0	0	5
	1.2.3: Purchase pool bike for effective and timely service delivery	Staff satisfied with issue of pool bike	2	Nos.	0	2	0	0	0	0	0	0	0	0	0	0
	2.1.1: Revision of management plans (CF, LFMA)	Number of management plans revised and approved	10	Plan	0	0	0	4	0	0	3	0	0	0	1	1
2: Ensure sustainable Forest Resource Management through improved planning, monitoring, and enforcement mechanisms.	2.1.2: Sustainable resource allocation from different management regimes	Number of households benefited and submit report quarterly	4	Report	4	4	4	4	4	4	4	4	4	4	4	4
	2.1.3: SMART patrolling: Deploy Forest patrols in illegal harvesting hotspots.	Number of SMART patrols conducted monthly and produced report quarterly	4	Report	4	4	4	4	4	4	4	4	4	4	4	4
	2.1.4: Organize awareness campaigns about the environmental and legal implications of illegal harvesting. Ensure equal participation of women and men.	Number of awareness campaigns conducted and produced report	12	Reports	24	0	24	0	0	24	0	0	24	0	24	0

2.1.5: Facilitate alternative livelihood programs, such as eco-tourism, forest-based enterprise and sustainable NWFP group by encouraging women-led forest users' group.	Number of alternative livelihood programs initiated & submit report	3	No. of programs	5	5	5	0	0	0	0	0	0	3	0	0	3
2.1.6: Monitoring and evaluation of different management regimes with the use of Bhutan METT plus tools.	Number of management regimes monitored & evaluated and submit report	10	Reports	4	4	4	4	4	4	4	4	4	4	4	4	4
2.1.7: Enhance the capacity of the forestry staff on advance technology	Number of staff trained in advance forestry technology and submit report	4	Report	1	1	1	1	1	1	1	1	1	1	1	1	1
2.1.8: Capacity development of community and other user groups by ensuring that equal opportunities are provided to both women and men.	Number of community/user group trained & submit report	9	Report	1	1	1	1	1	1	1	1	1	1	1	1	1
2.1.9: Conduct regular anti-poaching or ad hoc patrolling to curb illegal poaching.	Frequency of patrolling conducted & submit field patrol report	12	Report	12	12	12	12	12	12	12	12	12	12	12	12	12
2.1.10: Develop community-based monitoring and intelligence networking system through partnership and local stewardship.	Number of community-based monitoring network established & maintained record	2	Events	1	1	1	1	1	1	1	1	1	1	1	1	1
2.1.11: Support Rangtse, Dorjiphamo and Sektena Nye for conservation	Proposal developed and program initiated	0	Program	4	3	0	0	0	0	0	0	0	4	0	0	4

3: Restore and Protect Degraded Habitats for species persistence	2.1.12: Conduct study on the Economic Valuation and visitor carrying capacity of the Nyes	Survey conducted & report produced	0	Report	0	1	0	0	0	0	0	0	0	0	0	0	1
	2.1.13: Conduct Forest Inventory Data Collection and Analysis under IKI landscape	Number of forest plots inventoried	47	Report	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.1.1: Conduct baseline habitat surveys to identify priority areas for restoration.	Priority areas/location identified for restoration & submit report	11	Report	1.00	1	0	0	0	0	0	0	0	0	0	0	0
	3.1.2: Conduct biodiversity assessment in the identified grids	Assessment on taxa conducted & submit report	6	Report	1	1	1	1	1	1	1	1	1	1	1	1	1
	3.1.3: Carry out camera trap for species monitoring	Number of species monitored through camera traps & produced report	1	Report	0	1	0	1	1	0	1	0	1	0	1	0	1
	3.1.4: Establish community nursery and implement a reforestation program, targeting native species, high value tree plantation. Use native plant species that enhance biodiversity while considering social and ecological impacts.	Community nursery established and area reforested with native, high-value and fruit trees and maintain plantation journal	5	Ha.	4	4	4	4	4	4	0	0	0	0	0	0	0
	3.1.5: Collaborate with relevant stakeholders and local communities for conservation program initiative through coordination meeting, training and workshop. Ensure equal representation of men and women.	Number of stakeholders and communities engaged in conservation initiative	250	Report	1	1	1	1	1	1	1	1	1	1	1	1	1

 4: Minimize Human-wildlife Conflict to promote harmonious coexistence	3.1.6: Control and manage invasive species through proper preventive measures	Area managed for invasive species prevention	0	Ac.	0	1	1	0	0	1	0	0	0	1
	3.1.7: Implement and monitor KBA and HCV as per plan	Monitored KBA & HCV and report accordingly	2	Reports	2	2	2	2	2	2	2	2	2	2
	3.1.8: Strengthen QRT and citizen scientist group by encouraging the participation of women.	Number of QRT & Citizen Scientist group strengthened	3	Reports	2	2	2	2	2	2	2	2	2	2
	3.1.9: Implement habitat management practices that prioritize environmental sustainability and incorporate social safeguards to minimize impacts on local communities and biodiversity.	Area brought under habitat management in different location and submit report	5	Ha	1	0	1	0	1	0	0	1	0	1
	3.1.10: Coordinate and collaborate closely, and regularly with livestock sector to monitor the prevalence of diseases and control	Number of joint activities initiated & submit report	2	Report	2	2	2	2	2	2	2	2	2	2
	4.1.1: Identify HWC hotspots areas to formulate C2C strategy	HWC hotspots identified and prepare report	1	Report	1	0	0	0	0	0	0	0	1	0
	4.1.2: Initiate C2C intervention as per the Strategy plan & Review	% of C2C strategies implemented and prepared progress report	0	Report	2	2	2	2	2	2	2	2	2	2
	4.1.3: Coordination meeting with relevant stakeholders by equally involving women and men.	Number of coordination meeting held and maintained minutes/report	3	Minutes	2	2	2	2	2	2	2	2	2	2

5: Build resilience and adaptive measures to climate change impacts	4.1.4: Develop and disseminate an HWC reporting and compensation mechanism for affected communities.	Guidelines developed for HWC reporting mechanism	0	Guideline	0	1	0	0	0	0	0	0	1	0	0	0
	5.1.1: Conduct annual fire safety training programs with equal participation of women and men, and establish inclusive community-based fire response teams that ensure gender representation and equitable roles.	Fire safety training conducted & submit report	1	Report	1	1	1	1	1	1	1	1	1	1	1	1
	5.1.2: Initiate Forest fire management programs to reduce fire incidences.	Immediate response as reported	1	Report	1	1	1	1	1	1	1	1	1	1	1	1
	5.1.3: Provide support to plant climate-resilient crop species in vulnerable areas.	Households initiated with crop variety and maintained record	0	Report	2	2	2	2	2	2	2	2	2	2	2	2
	5.1.5: Develop and implement a climate adaptation action plan with specific measures for species and ecosystems at risk.	Climate adaptation action plan developed and implemented and reviewed	0	Plan	0	1	0	0	0	0	0	0	0	0	0	1
	5.1.6: Red panda tourism development	Number of red panda tracking trails identified, mapped, and maintained.	0	Report	1											
	5.2.1: Assessment of spring shed, critical watershed and water source areas for management intervention	Number of spring sheds, watersheds, and water sources assessed for interventions.	1	Report	2	0	0	0	0	0	0	0	0	0	0	1

	5.2.2: Launch community-led programs to conserve and restore drying water sources through different technology and interventions	Number of critical water source re-stored and prepare report	1	Report	0	1	0	0	0	0	0	1	0	0	0
	5.2.3: Enforce dust suppression measures (e.g., water spraying) in mining zones.	Number of dusts suppression measures implemented in mining zones and maintain record	0	Report	1	1	1	1	1	1	1	1	1	1	1
	5.2.4: Conduct environmental awareness campaigns to reduce illegal dumping and noise pollution.	Number of environmental awareness conducted and submit report	4	Report	2	0	2	0	2	0	2	0	2	0	0
	5.2.5: Installation of signages and information boards at strategic locations	Number of signages and information boards installed and maintained record	10	Report	0	1	0	0	0	1	0	0	0	0	1
	5.2.6: Organize gender-inclusive waste management awareness and cleaning campaigns.	Number of waste management campaigns conducted and submit report	12	Times	12	12	12	12	12	12	12	12	12	12	12
	6.1.1: Undertake population revalidation surveys for tigers at five-year intervals to monitor status and trends.	population estimate of tigers	1	Report			1						1		
6: To revalidate and monitor the population status of priority wildlife species through structured national surveys and to generate baseline biodiversity data using advanced scientific tools.	6.1.2: Implement a survey to assess the distribution and abundance of musk deer in confirmed habitats.	Baseline population density/abundance of musk deer established	0	Report		1									
	6.1.3: Conduct an environmental DNA survey across IKI Land scape of JKSNR to establish baseline biodiversity information.	Number of rare, threatened, or endemic species detected by eDNA survey.	0	Report		1									

6.3 Monitoring and Evaluation of High Conservation Value Area

The primary objective of monitoring is to evaluate the implementation of HCV management strategies and assess the extent to which management objectives are being achieved. Monitoring results provide managers with current information about the HCVs under their stewardship, serving as a foundation for informed management interventions or adjustments to management plans. A key ongoing goal of monitoring is the progressive accumulation of knowledge about the site and its HCVs, enabling managers to refine and enhance their strategies over time based on prior experiences. Effective monitoring does not always necessitate extensive biodiversity or social surveys but should employ suitable indicators to evaluate whether HCVs are being preserved and whether management actions are achieving their intended outcomes (Brown & Senior, 2014).

Brown and Senior (2014) identified three types of HCV monitoring: operational monitoring, which focuses on the implementation of management plans; strategic/effectiveness monitoring, which evaluates whether current management plans are successfully maintaining HCVs; and threat monitoring, which assesses potential threats to HCVs.



Table 33: Monitoring and evaluation framework for HCV

Strategy	Outcomes	Outputs	Activity	Location	Timeframe	Budget (million Nu.)	Monitoring Indicator	Target
Sustainable Livelihoods enhanced	Sustainable and Legal Harvesting of Timber,	Alternative livelihoods identified (incl. Ecotourism, NWFP)	Identify alternative livelihood option	Sang-bay&Gak-iling	2025-2026	0.20	Livelihood options identified	2
			Develop Incentives & Opportunities	Sang-bay&Gak-iling	2025-2026	1.50	Incentive & opportunities created	
	Sustainable Harvesting of NWFP	NWFP Groups formed and trained	Formation of NWFP management groups	Sang-bay&Gak-iling	2026-2027	0.100	NWFP groups formed	2
			Awareness and training on the sustainable harvesting technique	Sang-bay&Gak-iling	2026-2027	0.070	Awareness & training conducted	1
	Reduced Poaching	Diversified income	Facilitate alternatives (Homestays, Payment for Environmental Services, Ecotourism service, Hot-stone bath)	Sang-bay&Gak-iling	2026-2027	0.500	Homestays, PES & hot-stone bath created	5 homestays, 1 PES & 1 hot-stone bath
			Promotion of alternative products (cane and bamboo products etc.)	Sang-bay&Gak-iling	2027-2028	0.150		

	Institutional & HR Capacity enhanced	Sustainable and Legal Harvesting of Timber	Subsistence Farming Improved & More Economic Farming	Facilitation and coordination with other sectors (Agri and Livestock)	Sang-bay&Gak-iling	2027-2028	0.200	Coordination meeting with Agri & live-stock conducted	1
			Improved forest management practices	Farm Management training including choice of crop species	Sang-bay&Gak-iling	2027-2028	0.150	Public trained on farm management	1
				Train forestry officers/Rangers in sustainable forestry techniques	Sang-bay&Gak-iling	2026-2027	0.100	Forestry officials trained on sustainable forestry techniques	1
				Implement workshops on monitoring and reporting forest health.	Sang-bay&Gak-iling	2025-2027	0.100	Workshop on monitoring and reporting forest health conducted	1
			Strengthened regulatory frameworks and enforcement	Conduct regular inspections to ensure compliance with regulations	Sang-bay&Gak-iling	2025-2028	0.150	Inspections carried out	3
			Enhanced collaboration with local communities	Establish partnerships for community participation in forest management	Sang-bay&Gak-iling	2025-2026	0.150	Community participated in forest management enhanced	100 men & 150 women

Sustainable Harvesting of NWFP	Conduct awareness campaigns on the importance of legal harvesting practices	Sang-bay&Gak-iling	2026-2027	0.100	Awareness campaign conducted	1
	Strengthened guidelines and harvesting protocols	Sang-bay&Gak-iling	2026-2027	0.070	Guidelines developed	1
	Increased community involvement and co-management	Sang-bay&Gak-iling	2025-2028	0.100	Programs monitored	3
		Sang-bay&Gak-iling	2025-2027	0.150	NWFP management training conducted	1
	Improved knowledge of sustainable NWFP practices	Sang-bay&Gak-iling	2026-2027	0.100	Awareness conducted	1
		Sang-bay&Gak-iling	2028-2030	0.100	Training on sustainable harvesting technique of NWFP conducted	1



	Reduced poaching	Improved patrolling and monitoring capabilities	Deploy new technology (e.g., drones and camera traps) for surveillance	Sang-bay&Gak-iling	2029-2031	0.300	New technology deployed	
		Increased reporting and intelligence sharing	Set up a centralized reporting system for poaching incidents	Sang-bay&Gak-iling	2030-2032	0.050	Centralized reporting system for poaching created	1
		Strengthened law enforcement coordination	Facilitate collaboration between forest departments and local law enforcement	Sang-bay&Gak-iling	2031-2032	0.100	Collaboration facilitated	
	Pest and diseases reduced		Organize joint training programs with law enforcement agencies on wildlife protection	Sang-bay&Gak-iling	2032-2033	0.100	Joint training program conducted	1
		Improved pest and disease monitoring systems	Establish regular forest health surveys and data collection procedures	Sang-bay&Gak-iling	2028-2029	0.150	Procedures developed	1
		Strengthened pest and disease management protocols	Develop and update standard operating procedures for pest control	Sang-bay&Gak-iling	2028-2029	0.050	SOP for pest control developed	1

			Implement workshops on integrated pest management (IPM) techniques	Sang-bay&Gak-iling	2029-2030	0.100	IPM workshop conducted	1
		Enhanced technical skills of forestry personnel	Conduct training programs on identifying and managing invasive species	Sang-bay&Gak-iling	2026-2028	0.100	Training on invasive plants management and identification conducted	1
		Increased community engagement in forest health management	Organize awareness campaigns on the importance of preventing pest and disease spread	Sang-bay&Gak-iling	2030-2034	0.150	Awareness campaign conducted	1
Strengthened Waste Management Systems and Community Engagement	Improved Waste Management and Reduced Illegal Dumping	Improved waste disposal infrastructure and systems	Install waste collection points and bins in strategic locations	Sang-bay&Gak-iling	2025-2030	0.300	Waste collection points and bins installed	5
		Enhanced community awareness and participation	Set up community-based waste management committees	Sang-bay&Gak-iling	2026-2027	0.050	Waste management committees set up	2
			Conduct educational initiatives to promote responsible waste disposal habits	Sang-bay&Gak-iling	2025-2027	0.200	Educational/awareness program conducted	1

Sustainable Road Management and Habitat Conservation	Minimized Road Impact on Red panda Habitat	Enhanced road safety measures for wildlife	Enforce speed limits and wildlife-friendly driving regulations in red panda habitats	Sang-bay&Gak-iling	2027-2028	0.250	Regulations developed and speed limits enforced	
			Implement road signs and warning systems to alert drivers in wildlife-sensitive areas	Sang-bay&Gak-iling	2027-2028	0.100	Road signages installed	
		Improved habitat restoration and connectivity	Restore vegetation and create buffer zones along roadsides to reduce habitat fragmentation	Sang-bay&Gak-iling	2030-2034	0.300	Buffer zones created and vegetation restored	20 km (road)
			Reconnect fragmented areas by planting native flora and constructing green corridors	Sang-bay&Gak-iling	2030-2034	0.500	Plantation carried out and green corridors constructed	20 km (road)
		Strengthened monitoring and research initiatives	Conduct research on the ecological effects of roads on the local wildlife and habitat	Sang-bay&Gak-iling	2027-2034	0.250	Research conducted	1

Enhanced Forest Fire Prevention and Response	Reduced Impact of Forest Fires	Increased awareness among the passer-by	Organize educational campaigns and roadside events to highlight the importance of Red panda habitat protection and encourage responsible road use	Sang-bay&Gak-iling	2027-2029	0.100	Educational campaign organized	2
		Strengthened fire response and control capabilities	Equip forest rangers and community members with firefighting tools and protective gear	Sang-bay&Gak-iling	2028-2030	0.250	Firefighting tools procured and issued	
			Establish rapid response teams for immediate action during fire outbreaks	Sang-bay&Gak-iling	2026-2028	0.100	Rapid response teams established	2
		Increased community engagement in fire prevention	Set up volunteer firewatch groups to patrol high-risk areas during dry seasons	Sang-bay&Gak-iling	2026-2028	0.200	Firewatch group set up	2
		Enhanced forest management practices to reduce fire risk	Implement controlled burning and clearing of dry underbrush in strategic areas	Sang-bay&Gak-iling	2029-2034	0.150	Controlled burning implemented	2



Chapter Seven:

Stakeholder consultation and endorsement

7.1 Stakeholder Consultation

The preparation of the Management Plan for the Division was carried out through a participatory and consultative process to ensure inclusiveness, ownership, and practical applicability. In line with this, a stakeholder consultation meeting was conducted with relevant agencies, officials of Jigme Khesar Strict Nature Reserve (JKSNR), local government representatives, and other key partners who are directly or indirectly associated with the management and conservation of the area.

During the consultation, the planning team presented the objectives, strategies, and proposed management prescriptions outlined in the draft plan. The stakeholders provided valuable feedback, which helped refine the activities, align them with the current priorities, and ensure harmony with national laws, policies, and programs. Specific attention was given to integrating the perspectives of JKSNR officials, as their practical experience and field-level knowledge are critical in shaping realistic interventions for biodiversity conservation, sustainable resource management, and addressing threats such as forest fires, human-wildlife conflict, and illegal resource extraction.

SL#	NAME	GENDER	CID #	DESIGNATION	OFFICE
1	Dawa Penjore	Male	10505000089	Tshogpa	Sangbay Geog Office
2	Thuji	Male	11908001608	RBP	Sangbay Drungkhag
3	Kelzang Wangchuk	Male	12007003335	Livestock	Gakiling
4	Loyang Singye	Male	10706003685	LPS	Sangbay
5	Deki Pelden	Female	11106003860	Environment Officer	DAH
6	Tshewang Lhamo	Female	10716003142	Planning Officer	DAH
7	Tashi Chozom	Female	11104001859	EDMO	DAH
8	Dawa Dorji	Male	11913000583	DLO	DAH
9	Tashi Wangchuk	Male	11603003908	Sr. AEO	Gakiling GC
10	Kuenzang Dema	Female	11514001411	Agri extension	Sangbay
11	Pemo	Female	11908001070	Agri extension	Sangbay
12	Passang Dorji	Male	10505001074	Tshogpa	Dorithasa

13	Sukman Rai	Male	11209002547	Tshogpa	Sangbay Geog Office
14	Wang Tshering	male	11210000992	Gup	Gakiling geog office
15	Ugyen Dorji	Male	11210002115	Tshopa	Gakiling geog office
16	Nima Lhaki Sherpa	Female	10506000627	ADM	Gakiling geog office
17	Tobgay	Male	10505000666	Gup	Sangbay Geog Office
18	Tempa Rinchen	Male	10504000536	Mangmi	Gakiling geog office
19	Nima Gyeltshen	Male	10505000159	Mangmi	Sangbay Geog Office
20	Rinzin Gyeltshen	Male	10505000709	Tsgopa	Sangbay Geog Office
21	Migma Dawa Drukpa	Male	11210001146	Tshogpa	Gakiling geog office
22	Mindu	Male	10404000575	ADM	Sangbay Geog Office
23	Dawa Drukpa	Male	11210001149	Tshogpa	Sangbay Geog Office
24	Chimi Wangchuk	Male		DAO	DAH

7.2 Finalization and Endorsement of the DFO Management Plan

Following an extensive process of data analysis, stakeholder consultations, and multiple rounds of technical review, the draft Divisional Forest Office (DFO) Management Plan was finalized by the Division Team in close coordination with the IKI Task Force. The draft plan was subsequently presented at the 75th Technical Advisory Committee (TAC) Meeting held in Phuentsholing from 15-18 December 2025.

Based on the deliberations of the Committee, all comments and recommendations were duly incorporated, and the final version of the plan was submitted to the 78th Technical Advisory Committee on 30 January 2026 for consideration and endorsement. The first-ever ten-year DFO Management Plan was recommended by the Hon'ble Director, Department of Forests and Park Services (DoFPS) and was formally approved by the Dasho Secretary, Ministry of Energy and Natural Resources (MoENR) and the plan will expire on December 2035.

Annexure I: Annual Operational Plan

Framework for Annual Operational Plan for Division Forest Office						
"The Annual Operational plan for the Division Forest Office shall be prepared and submitted to latest by 31st July."						
Name of the office:						
Prepared by and date:						(Seal and sign)
Verified by and date:						
Recommended by and date:						
Approved by and date:						
I. REVIEW OF THE PREVIOUS YEARS PLAN						
I.a. SUMMARY OF THE PLAN						
No. of Planned activities	Status of the activities (in Nos.)					
	Achieved	On-going	Not Implemented			
I.b. DETAILED REVIEW OF THE PLANNED ACTIVITIES						
Activities	Target with unit	Budget utilization status	Brief report on the progress of the activities	Remarks (Justification/reasoning if not completed or not implemented)		
II. ANNUAL OPERATIONAL PLAN SCHEDULE (For the new FY)						
II.a. DETAILS OF THE PLANNED ACTIVITIES						
Output Indicator as per the management plan/APA	Activities	Target with Unit	Timeline	Budget (in Nu.)	Fund Source	Specify location, if relevant
Program I: Nature Conservation¹						
Program II: Forest Resources Management²						
Program III: Social Forestry and Extension³						
Program IV: Forest Protection and Enforcement⁴						
Program IV: Administration and Direction⁵						

¹ Program I shall include but not limited to; Surveys, research, BWC management, habitat management, watershed/wildland protection, ecotourism & nature recreation, waste

² Program II shall include but not limited to; LFMA plan preparation, timber allocation and monitoring.

³ Program III shall include but not limited to; CF management, NWFP management, plantation, livelihood improvement initiatives.

⁴ Program IV shall include but not limited to; patrolling, forest office compounding, prosecution, forestry clearances, pest & diseases surveillance, forest fire management.

⁵ Program V shall include but not limited to; Park management plan preparation, work planning, coordination meetings, administrative and accounting activities, monitoring

*Note: Activities such as Awareness, capacity building, etc to be logged with respective program activities

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