DAGANA

Divisional Forest Office Management Plan

(January 2026 – December 2035)

Divisional Forest Office, Dagana

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

WWF

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Foreword

Forests have long been central to the livelihoods of the Bhutanese people and are deeply interwoven with the country's social, cultural, and traditional values. Beyond their contribution to socio-economic development, forests play a critical role in climate regulation and the provision of essential ecosystem services. Recognizing this importance, Bhutan is among the few countries to enshrine environmental conservation in its Constitution. Article 5 of the Constitution mandates that at least 60 percent of the country's land area be maintained under forest cover for all time. Bhutan has further reinforced its global environmental leadership by committing to remain carbon neutral at the 15th Conference of Parties to the UNFCCC in 2009, a pledge reaffirmed through its Intended Nationally Determined Contribution submitted in 2015 under the Paris Agreement.

Currently, forests cover over 69.7 percent of Bhutan's total land area, making them an indispensable national asset. These forests sequester an estimated 8.5 million tonnes of carbon annually, sustain reliable water flows critical for hydropower generation, and provide essential resources such as timber and firewood to citizens. In light of Bhutan's national and international commitments, as well as the social, cultural, economic, and ecological benefits derived from forests, sustainable forest resource management remains imperative, particularly through targeted and effective interventions at the Divisional level.

Accordingly, this Divisional Forest Management Plan has been developed as a comprehensive framework for sustainable forest management within the Divisional Forest Office. The plan takes stock of existing management initiatives and presents the current status of forest area, biodiversity conservation, growing stock, resource allocation, local socio-economic conditions, and human–wildlife conflict. It prescribes strengthened conservation measures, sustainable resource utilization, climate change adaptation and mitigation actions, and human–wildlife conflict management, supported by a phased implementation plan, financing framework, and monitoring system. Developed through broad stakeholder consultation, the plan ensures shared ownership and institutional endorsement. The Divisional Forest Office is commended for this important milestone toward advancing sustainable forest management and biodiversity conservation.

Tashị Delek!

Director

Acknowledgement

The Divisional Forest Office Management Plan is the result of a collective and dedicated effort by the staff of the Divisional Forest Office, Dagana. The Division sincerely acknowledges the commitment, professionalism, and teamwork demonstrated by all officers and staff who contributed their time, experience, and technical inputs toward the successful formulation of this 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 Division would like to extend special appreciation to Mr. Jigme Wangchuk of DFO Dagana, who played a crucial leadership role in guiding and coordinating the formulation of this Management Plan. His 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 in the Division in the years to come.

Abbreviations

AAC..... Annual Allowable Cut
AGB..... Above Ground Biomass
AHL..... Annual Harvesting Limit
BAB ..... Biodiversity Act of Bhutan
BGB ..... Below Ground Biomass
C2C..... Conflict to Co-existence
CF ..... Community Forests
CFMG ..... Community Forest Management Groups
CVCA..... Climate Vulnerability and Capacity Assessment
CWD ..... Coarse Woody Debris
DFO..... Divisional Forest Office
ELCP ..... Elephant Landscape Conservation Project
ESP..... Elementary Service Providers
ESS..... Environmental and Social Safeguards
FIRMS..... Forest Information Reporting and Monitoring System
FMIS..... Forest Monitoring and Information Section
FNCA ..... Forest and Nature Conservation Act of Bhutan
FNCRR..... Forest and Nature Conservation Rules and Regulations of Bhutan
FRPMS..... Forest Resources Planning and Management Section
G2C ..... Government to Citizen Services
GRM..... Grievance Redressal Mechanism
HCVRN ..... HCV Resource Network
HCVs..... High Conservation Value
HWC ..... Human Wildlife Conflicts
IFL ..... Intact-forest landscape
IKI..... Internationale Klimaschutzinitiative / International Climate Initiative
IPCC..... Intergovernmental Panel for Climate Change
IUCN..... International Union for Conservation of Nature
KBA ..... Key Biodiversity Areas
LULC..... Land Use and Land Cover
masl ..... meter above sea level
METT+ ..... Monitoring Effectiveness Tracking Tool
MRV ..... Measurement, Reporting and Verification
NCHM ..... National Center for Hydrology and Meteorology
NCS ..... Nature Conservation Section
NFI ..... National Forest Inventory
NRDCL..... Natural Resources Development Corporation Limited
NWFPs..... Non-wood Forest Products

OD ..... Organizational Development
OECA ..... Other Effective Conservation Area
OFS ..... Online Forestry Services
PA ..... Protected Area
PFs ..... Private Forests
PHCB ..... Population and Housing Census of Bhutan
PMC ..... Professional and Management Category
PWS ..... Phibsoo Wildlife Sanctuary
RAMIS ..... Revenue Administration Management Information System
RBA ..... Rapid Biodiversity Assessment
RBM ..... Riverbed material
RCSC ..... Royal Civil Service Commission
RGoB ..... Royal Government of Bhutan
SDSS ..... Spatial Decision Support System
SES ..... Socio-economic Survey
SFM ..... Sustainable Forest Management
SLM ..... Sustainable Land Management
SMART ..... Spatial Monitoring and Tracking Tool
SOC ..... Soil Organic Carbon
SRFL ..... State Reserve Forest Land
SS and S ..... Supervisory and support category
TAC ..... Technical Advisory Committee
TNA ..... Training Need Assessment
VHF ..... Very High Frequency
WBIs ..... Wood-based Industries
WMD ..... Watershed Management Division
WS ..... Working scheme

Contents

Foreword IV
Acknowledgement V
Abbreviations VI
Executive Summary XIV

Chapter 1: Background 1
1.1 Rationale 1
1.2 History and Significance 1
1.2.1 Importance of Forests 1
1.2.2 Overview of the Sustainable Forest Management 2
1.3 Policies and Legislations 3
1.3.1 National Forest Policy 2011 3
1.3.2 Forest and Nature Conservation Act of Bhutan (1969, 1995, 2023) 3
1.3.3 Forest and Nature Conservation Rules and Regulations 4
1.3.4 Land Lease Rules and Regulations of Bhutan 2018 4
1.3.5 Biodiversity Act of Bhutan 2003 5
1.3.6 Land Act of Bhutan 2007 5
1.3.7 National Environment Protection Act 2007 5
1.3.8 Waste Prevention and Management Act of Bhutan 2009 5
1.3.9 Climate Change Policy of the Kingdom Bhutan, 2020 5
1.3.10 Nationally Determined Contribution, 2021 6
1.3.11 National Adaption Plan of the Kingdom of Bhutan, 2023 6
1.3.12 Water Act of Bhutan, 2011 6
1.3.13 Mines and Mineral Act of Bhutan 1995 and Regulation 7
1.3.14 Economic Development Policy of Bhutan 2016 7
1.3.15 National Biodiversity Strategy and Action Plan of Bhutan, 2025 7
1.4 Purpose and Objectives 8
1.4.1 Vision 8
1.4.2 Mission 8

1.4.3 Purpose 8
1.4.4 Objectives 8

Chapter 2: Current Status 9
2.1 Boundary and Area 9
2.2 Administration 10
2.2.1 Administrative Set-Up 10
2.2.2 Mandates 12
2.2.2.1 Administration Section 13
2.2.2.2 Nature Conservation Section 13
2.2.2.3 Forest Resources Planning and Management Section 14
2.2.2.4 Forest Monitoring and Information Section 15
2.2.3 Human Resources 16
2.2.4 Infrastructure 16
2.2.5 Budget and Revenue 16
2.2.5.1 Budget 16
2.2.5.2 Revenue 18
2.3 Biodiversity Conservation 20
2.3.1 Forest Ecosystems 21
2.3.2 Aquatic Ecosystems 23
2.3.3 Agricultural Ecosystems 24
2.4 Existing Management Regimes 25
2.4.1 Area based Management Regimes 26
2.4.1.1 Local Forest Management Areas 26
2.4.1.2 Community Forests 26
2.4.1.3 Private Forests 27
2.4.2 Cross-Cutting Management Regimes 27
2.5 Forest Resources and Utilization 29
2.5.1 Forest Resources 29
2.5.1.1 Forest Cover by Land Area 29
2.5.1.2 Forest Cover by Forest Types 29
2.5.1.3 Stem Density by Forest Types 30
2.5.1.4 Growing Stock by Forest Types 31
2.5.1.5. Basal Area by Forest Types 31
2.5.1.6 Biomass Stock 32
2.5.1.7 Carbon Stock 33
2.5.1.8 Biomass and Carbon Increment 33
2.5.1.9 Carbon sequestration 35
2.5.1.10 Key Flora and Fauna Species 35

Mammals 36
Flora 38
2.5.2 Function Mapping 38
2.5.2.1 Area under Existing Management Regimes 39
2.5.2.2 Management Circles outside Existing Management Regimes 40
A) Production Circle 41
B) Protection Circle 42
C) Non-Production Circle 42
2.5.3 Forest Resource Utilization 43
2.6 Local People and Livelihood 49
2.6.1 Demography 49
2.6.2 Literacy 50
2.6.3 Landholding 51
2.6.4 Agricultural Management and Challenges 51
2.6.5 Source of Income 52
2.6.6 Livestock Management and Challenges 52
2.6.7 Ethnobotanical Practices 53
2.7 Human Wildlife Conflicts 57
2.7.1 Crop Damages 59
2.7.2 Livestock Depredation 59
2.7.3 Property Damages 59
2.7.4 Human Casualty 59
2.8 Climate Change and Its Impacts 60
2.8.1 Climatic Conditions in the Area 60
2.8.1.1 Temperature 60
2.8.1.2 Precipitation 61
2.8.2 Vulnerability to Climate Change 62
2.8.3 Adaptation and Mitigation Measures 63
2.8.4 Forest Carbon Sequestration and Climate Change Mitigation 64
2.9 High Conservation Value Areas 64
2.9.1 HCV Concept Overview 64
2.9.2 HCVA in Dagana Dzongkhag 65
2.9.3 Significance of HCVA 66
2.9.4 Screening and Identification of the HCVA 67
2.9.5 Threats and Strategic Approach to Mitigate the Threat 69
2.9.6 Management and Monitoring of HCVA 71

Chapter 3: Threats and Challenges 73
3.1 Threats 73
3.1.1 Human Wildlife Conflicts 73
3.1.2 Illegal Activities 73
3.1.3 Drying Up of Water Sources 74
3.1.4 Climate Change 75
3.1.5 Habitat Destruction and Fragmentation 75
3.1.6 Poor Waste Management 76
3.1.7 Loss of Biodiversity 76
3.1.8 Forest Fires 77
3.2 Threat Rating 78
3.3 Challenges 79

Chapter 4: Management Prescription 80
4.1 Management Prescription for DFO 80
4.2 Management of HCVA 83
4.3 Gender Mainstreaming 84
4.4 Environmental and Social Safeguards (ESS) 84
4.5 Grievance Redressal Mechanism (GRM) 85

Chapter 5: Implementation Plan and Financial Outlays 87
5.1 Implementation Plan and Financial Outlays of FO 88
5.2 Implementation Plan and Financial Outlay for High Conservation Value 97

Chapter 6: Monitoring and Evaluation 98
6.1 Monitoring and Evaluation of DFO 99
6.2 Monitoring and Evaluation of HCV 107

Chapter 7: Stakeholder Consultation and Endorsement 108
7.1 Stakeholder Consultation 108
7.2 Finalization and Endorsement of the DFO Management Plan 108

References 109
Annexure I. Annual Operation Plan 110
Annexure II: Bhutan METT+ form (refined for DFO) 112
Annexure III. Participants of Stakeholder Consultation 153
Annexure IV. Checklist of Biodiversity 155

Figures

Figure 1. Location map of Divisional Forest Office, Dagana 9
Figure 2. LULC map of DFO, Dagana 10
Figure 3. Organogram of DFO, Dagana 11
Figure 4. Jurisdiction map of field offices under DFO, Dagana 12
Figure 5. Revenue generated under various category (2019 – 2023) 19
Figure 6. Actual and projected revenue for DFO, Dagana 20
Figure 7. Forest types map of DFO, Dagana 21
Figure 8. Cluster dendrogram 22
Figure 9. Water sources and lakes under DFO, Dagana 24
Figure 10. Agricultural lands under DFO, Dagana 25
Figure 11. Critically endangered WBH sighted at Homa confluence 37
Figure 12. Thematic representation of existing management regimes 39
Figure 13. Area under existing management regimes 40
Figure 14. Forest function map showing the management circles 41
Figure 15. Gender structure of urban areas and rural areas under DFO, Dagana 49
Figure 16. Age distribution of population under DFO, Dagana 50
Figure 17. Literacy level of people of Dagana 51
Figure 18. Sources of income 52
Figure 19. Numbers of livestock reared by the communities 53
Figure 20. HWC hotspot map for DFO, Dagana based on data collected till 2020 58
Figure 21. Figure showing the different categories of HWC incidences under DFO, Dagana 59
Figure 22. Graph showing the average monthly precipitation and temperature of Division 60
Figure 23. Average Annual Temperature (Left) and average monthly temperature (Right) from 2012 - 2023 61
Figure 24. Average Annual Rainfall (Left) & Monthly Avg Rainfall (Right) from 2012 – 2023 61
Figure 25. Vulnerability map of DFO, Dagana 63
Figure 26. Map showing HCV under Dagana 66
Figure 27. Stages of screening HCVz 68
Figure 28. Priority map 69
Figure 29. Different categories of illegal activities under DFO, Dagana 74
Figure 30. Conceptual model for implementation of strategies 78

Tables

Table 1. Approved budget for the FY 2023-2024....17
Table 2. Revenue generated in five years (2019-2023)....19
Table 3. Details on LFMA under DFO, Dagana....26
Table 4. Details on CFs under DFO, Dagana....26
Table 5. Details on private forest under DFO, Dagana....27
Table 6. Cross-cutting regimes under DFO, Dagana....28
Table 7. Total land area by forest....29
Table 8. Forest cover by forest types....30
Table 9. Tree density by forest types....30
Table 10. Growing stock by forest types....31
Table 11. Basal area by forest types....32
Table 12. Biomass stock by forest types in million tonnes....32
Table 13. Carbon stock by forest types in million tonnes....33
Table 14. Biomass increment by forest types....34
Table 15. Carbon increment by forest types....34
Table 16. Carbon sequestration....35
Table 17. Globally threatened mammals under DFO, Dagana....36
Table 18. Globally threatened birds of DFO, Dagana....37
Table 19. Globally threatened fishes of DFO, Dagana....38
Table 20. Globally threatened flora under DFO, Dagana....38
Table 21. Areas under existing management regimes....39
Table 22. Management circles outside existing management regimes....40
Table 23. Protection circles....42
Table 24. Non-production circle....43
Table 25. Forest resource utilization details for DFO Dagana....43
Table 26. WBIs under the Division....48
Table 27. Potential supply of timber from LFM area of Kana Gewog....48
Table 28. Potential supply of timber from LFM area of Lajab Gewog....49
Table 29. Landholding categories....51
Table 30. List of ethno-medicinal plants used by people of Dagana....53
Table 31. Vulnerability indices of communities to climate change....62
Table 32. Threats within the designated HCV....70
Table 33. Strategic approaches to addressing significant threats on HCV70
Table 34. Response framework for PA produced by HCV Screening....72
Table 35. Threat rating....79
Table 36. Management prescriptions for HCV....83
Table 37. Implementation framework....88
Table 38. implementation framework for High Conservation Value....97
Table 39: Monitoring & Evaluation framework....99
Table 40: Monitoring and evaluation of HCV....107

Executive Summary

The Divisional Forest Office Management Plan for Dagana (2026 – 2035) presents a comprehensive ten-year strategic framework for the sustainable management, conservation, and utilization of forest resources within DFO, Dagana. The Plan is grounded in Bhutan's constitutional mandate to maintain a minimum of sixty percent forest coverage for all time, the country's international commitment to remain carbon neutral, and the guiding principles of Gross National Happiness. It operationalizes national forest, biodiversity, and climate change policies at the divisional level through science-based planning, participatory governance, and adaptive management approaches that balance ecological integrity with socio-economic development.

Dagana DFO, located in south-western Bhutan, encompasses a total area of approximately 1,585.7 square kilometers, of which nearly 88 percent is under forest cover. The Division's altitudinal range, extending from around 90 meters above sea level in the southern foothills to over 4,450 meters in the northern alpine zones, gives rise to a diverse mosaic of forest ecosystems. The forests of Dagana play a vital role in carbon sequestration, watershed protection, climate regulation, and the sustenance of rural livelihoods, making them a nationally significant natural asset.

The Plan highlights the exceptional ecological importance of Dagana's forests, which provide habitat for several globally threatened and nationally protected species such as *Panthera tigris, Elephas maximus, Ailurus fulgens*, and *Moschus leucogaster*, as well as the Critically Endangered *Ardea insignis*. The identification and management of High Conservation Value Areas form a central component of the Plan, which is prioritized for enhanced protection, threat mitigation, and long-term monitoring to maintain ecosystem resilience and landscape connectivity, particularly in the face of increasing climate variability and development pressures.

Forest resource assessment indicates that Dagana's forests possess substantial growing stock, biomass, and carbon reserves, with total forest carbon stock estimated at over 27 million tonnes. This positions the Division as a significant contributor to country's national climate change mitigation efforts and REDD+ commitments. The sustainable utilization of forest resources is therefore emphasized as a critical management principle. The Plan adopts a multi-regime forest management approach that integrates Local Forest Management Areas, Community Forests, Private Forests, and other cross-cutting management regimes.

Climate change adaptation and mitigation constitute a core pillar of the Management Plan. Dagana is increasingly affected by climate-induced challenges such as erratic rainfall patterns, prolonged dry spells, forest fires, landslides, and the widespread drying of water sources. The Plan draws on climate vulnerability and capacity assessments to identify high-risk ecosystems and communities, and prioritizes integrated watershed and springshed management, forest landscape restoration, and climate-smart forestry practices. Particular emphasis is placed on safeguarding water sources, given the high number of springs reported to be drying or already dried up, which poses serious implications for drinking water supply, agriculture, and ecosystem health. By maintaining forest cover and improving land-use practices in catchment areas, the Plan aims to enhance long-term water security and ecosystem service provision.

Human–wildlife conflict is identified as one of the most pressing management challenges within the Division, where crop depredation by elephants and livestock losses are prevalent. The Plan adopts a conflict-to-coexistence approach that emphasizes preventive, community-based, and landscape-level interventions such as habitat management, physical barriers, rapid response mechanisms, awareness programs, and coordination with relevant stakeholders.

The Plan also provides a detailed assessment of the institutional, administrative, and human resource capacities of the Division. While the Division has established functional sections responsible for forest planning, monitoring, biodiversity conservation, and administration, it continues to face challenges related to staffing shortages, infrastructure constraints, and increasing service delivery demands. To address these limitations, the Plan emphasizes targeted capacity building, improved deployment of digital tools such as online forestry services and SMART patrolling, and strengthened inter-agency and stakeholder collaboration.

Implementation of the Management Plan is structured through a phased ten-year framework with clearly defined objectives, strategies, actions, timelines, and responsible agencies. In total, the Plan outlines four strategic objectives supported by ten strategies and fifty-three targeted actions aimed at strengthening public service delivery, conserving biodiversity, enhancing sustainable forest utilization, building climate resilience, and promoting community engagement. The estimated financial requirement for implementation over the Plan period is Nu. 115.658 million, comprising allocations for core divisional forest management activities and dedicated investments for the management of High Conservation Value Areas. Funding is expected to be mobilized through government budgets, donor support, and partnerships with national and international conservation and climate initiatives. Monitoring, evaluation, and adaptive management are integral to the Plan's design.

Overall, the Divisional Forest Office Management Plan for Dagana (2026–2035) serves as a strategic and operational roadmap for sustaining forest ecosystems while enhancing climate resilience and community well-being. By balancing conservation priorities with sustainable use and inclusive development, the Plan reinforces Bhutan's national and global environmental commitments and ensures that the forests of Dagana continue to provide ecological, cultural, and economic benefits for present and future generations.

Key Facts of DFO Dagana

Sl. No.	Forest statistics		
1	Total Forest Area	ha	140179.8
2	Forest Cover Percent	%	88.51
3	Broadleaved forest	ha	121965.9
		%	87.01
4	Conifer forest	ha	18213.89
		%	12.99
5	Basal area per hectare	m2/ha	31.03
6	Growing Stock per hectare	m3/ha	283.22
7	Biomass Stock per hectare (AGB, BGB, DoM)	m t/ha	38.34
Protected Area			
1	Forest Carbon Stock	Million tonnes	27.32
2	Key Biodiversity Areas	No.	1
		ha	916.58
3	High Conservation Value Areas	No.	1
		ha	43.94
Sustainable Forest Management Regimes			
1	Total Area of Community Forest	ha	3479.39
2	Total Community Forest	No.	35
3	Local Forest Management Area	ha	27813.67
		No.	2
4	NWFP Groups	No.	3
Wood -based industries			
1	Wood-based Industries	No.	11
Field Division and field offices			
1	Divisional Forest Office	No.	1
2	Range Offices	No.	4
3	Beat Offices	No.	2

Chapter 1: Background

1.1 Rationale

Bhutan, though a small country, is widely recognized across the world for its environmental conservation initiatives and as a carbon-negative country in the 21st century. The intact natural resources that we have today testify to the farsighted conservation visions of our successive monarchs and the sound environmental conservation policies of the country. However, over the years, forest management policies have undergone significant changes from being more conservation-focused to sustainable utilization of forest resources.

Although scientific management of our forest resources based on the principles of sustainability has long been practiced, it has become even more imperative in light of the changing climate and its impacts. Today, climate change and its effects have widely affected many countries. Bhutan, by virtue of being located in a fragile mountainous ecosystem, is even more vulnerable 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 a commitment to ensure that, in order to conserve the country's natural resources and prevent the degradation of the ecosystem, a minimum of sixty percent of Bhutan's total land shall be maintained under forest cover for all time.

The Divisional Forest Office, Dagana as the custodian of our forest resources in the Dzongkhags, plays an integral role in conserving and protecting our natural forest resources while catering to forestry services for 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 time to come.

Though the 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 having long-term divisional goals and objectives. It is also equally important to review and evaluate such goals and objectives periodically. Therefore, 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 for scientifically managing the forest resources within the jurisdiction of the Divisional Forest Office, Dagana.

1.2 History and Significance

1.2.1 Importance of Forests

Dagana Dzongkhag is a distinct administrative district in the southern part of Bhutan, celebrated for its abundant natural beauty, deep cultural roots, and historical significance. According to the official Dagana Dzongkhag Administration website, more than 80 % of the dzongkhag's land is covered by forests, creating a verdant landscape that stretches

from the foothills of Thimphu and Wangdue Phodrang to Bhutan's southern border. The district's name traces back to the historic Daga Trashiyangtse Dzong, a fortress established in 1651 by Zhabdrung Ngawang Namgyel, which continues to serve as the administrative centre and a symbol of Dagana's heritage (Dagana Dzongkhag Administration, n.d). The population of Dagana is primarily composed of Ngalops and Lhotshampas, whose cultural practices are reflected in the festivals and traditions celebrated throughout the region, further enriched by recent internal migrations that add to its cultural diversity.

Beyond its natural and cultural features, Dagana's landscape is dotted with spiritually significant sites and intriguing landmarks that attract visitors and scholars alike. Among these are three legendary megaliths — the Sky Pillar Rock, the Rock of Ancient Steps, and the Frontier Sky Fortress — each enveloped in local folklore connected to the construction of the Daga Trashiyangtse Dzong (Dagana Dzongkhag Administration, n.d). The district also contains several Buddhist temples and monasteries, such as Shathong Lhakhang and Nyindukha Lhakhang, which testify to the region's enduring spiritual heritage (Dagana Dzongkhag Administration, n.d). Economically, Dagana remains largely agrarian with staples such as mandarins and paddy forming the backbone of local livelihoods, while its varied terrain and rich forest resources underscore the community's close relationship with the environment — a characteristic shared by many districts in Bhutan's administrative framework. For an instance, 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 enshrined 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 the only carbon neutral country in the world; absorbing carbon more than it emits. The RGoB has made an international commitment to remain carbon neutral for all times to come.

1.2.2 Overview of the Sustainable Forest Management

Bhutan places a high priority on sustainable forest management (SFM) as part of its commitment to environmental conservation and socio-economic development. The country's forest policy is grounded in principles that promote conservation, sustainable utilization, and equitable distribution of forest resources. Key national acts and policies supporting SFM include the Forest and Nature Conservation Act (FNCA, 2023), Forest and Nature Conservation Rules and Regulations (FNCRR, 2023), the Biodiversity Act of Bhutan (BAB, 2022), and the National Forest Policy (2011). These frameworks ensure that forest management practices maintain ecological balance, protect biodiversity, and contribute to the livelihoods of local communities.

Divisional Forest Office, Dagana, was established on 8th November 2016 as per the organizational development exercise conducted by Royal Civil Service Commission of Bhutan and plays a crucial role in conserving biodiversity and managing forest resources within its jurisdiction. The division spans 1585.7 km^2 across 13 gewogs under Dagana Dzongkhag, ranging from sub-tropical to alpine forests with elevations from 90 *m.a.s.l*

to 4450 *m.a.s.l.* The diverse habitats support various critically endangered species, such as *Ardea insignis, Paphiopedilum fairrieanum,* and *Manis pentadactyla*. The division also hosts endangered species such as *Panthera tigris, Elephas maximus, Ailurus fulgens, Moschus leucogaster,* and *Tor putitora*.

The forest management strategies for DFO, Dagana align with national policies to ensure sustainable harvesting, conservation of key species, and prevention of forest degradation. The Division's efforts in biodiversity conservation are supported by provisions in the FNCRR and the establishment of community forests and Non-wood Forest Products (NWFPs) management groups.

Since its establishment, the Division has evolved both administratively and technically. The division has implemented various initiatives to strengthen forest governance, enhance community participation, and improve forest resource management. Key sections within the division include the Forest Resources Planning and Management Section (FRPMS), Forest Monitoring and Information Section (FMIS), and the Nature Conservation Section (NCS), each responsible for specific aspects of forest management and conservation.

1.3 Policies and Legislations

1.3.1 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 Forest Land (SRFL). Since 1957, Forest governance has transitioned from providing "free access" to "almost no access" to "managed access".

The National 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 includes 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.

1.3.2 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 Forest and Nature

Conservation Act 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 FNCA of Bhutan 1995 was revised in the year 2023 to cope with emerging conservation issues without compromising the development needs of the Country and its people. Besides, harmonizing obsolete sections and subsections of the previous Act, the FNCA of Bhutan 2023 formulated a mechanism for payment for ecosystem services.

1.3.3 Forest and Nature Conservation Rules and Regulations (2000, 2003, 2006, 2017, 2020, 2023, 2024)

The Forest and Nature Conservation Rules (FNCR) 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 Community Forests (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 Area (PA), Forest Management Units (FMU), CF, NWFP (Non-Wood Forest Produce Management Area), Soil & Water Conservation. Various amendments to the FNCR 2006 have been done over the years 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 rules for the rural timber allotment as part of the implementation of the Government to Citizen Services (G2C) 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 2017 was revised in 2023 to accommodate all the requirements vested in FNCA of Bhutan 2023. Major changes in the FNCRR 2023 includes the deletion of Chapter on Surface Collection of Sand and Stone as the mandate is transferred to the Department of Geology and Mines. In addition to fine tuning the provisions of the FNCRR 2017 the FNCRR 2023 underscores expediting public service 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.

1.3.4 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.

1.3.5 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 Generis 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.

1.3.6 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.

1.3.7 National Environment Protection Act 2007

The National Environment Protection Act 2007 provides for the establishment of an effective system to conserve and protect the environment through the National Environment Commission 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.

1.3.8 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 3 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.

1.3.9 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 well-being 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.

1.3.10 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 enhanced our actions by elaborating priority mitigation actions in the form of LEDS, roadmaps and strategies.

1.3.11 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).

1.3.12 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.

1.3.13 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.

1.3.14 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.

1.3.15 National Biodiversity Strategy and Action Plan of Bhutan, 2025

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.

1.4 Purpose and Objectives

1.4.1 Vision

Contribute to sustaining Bhutan's forest resources & biodiversity for the happiness of present and future generations.

1.4.2 Mission

Contribute to conserve and manage Bhutan's forest resources & 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.

1.4.3 Purpose

The purpose of the Divisional Forest Office, Dagana is to oversee and manage the sustainable utilization and conservation of forest resources within its jurisdiction. The DFO, Dagana plays a crucial role in implementing national policies, fostering community engagement, and ensuring the long-term health and productivity of forests under its jurisdiction.

1.4.4 Objectives

The following are the objectives of the DFO Management Plan:

1. To deliver efficient public services through sustainable forest management, promoting economic growth and environmental stewardship.
2. To safeguard biodiversity and ecosystem services through strategic habitat conservation and climate resilience.
3. To effectively manage forest resources through continuous monitoring, assessment and enforcement mechanisms.
4. To enhance local communities' engagement in forest conservation and management to promote sustainable livelihoods

Chapter 2: Current Status

2.1 Boundary and Area

The Divisional Forest Office, Dagana is situated in the South-western part of Bhutan, lying between the geographical coordinates of 26.7000° N to 27.3000° N, and 89.8000° E to 90.5000° E. The Division covers a total area of 1585.7 km2 with an elevation ranging from 90 till 4450 meters above sea level. It shares boundary with Wangdue and Thimphu Dzongkhag in the north, Chukha Dzongkhag in the west, Tsirang Dzongkhag and Phibsoo Wildlife Sanctuary (PWS) in the east, and Indian State of West Bengal and Assam in the south.

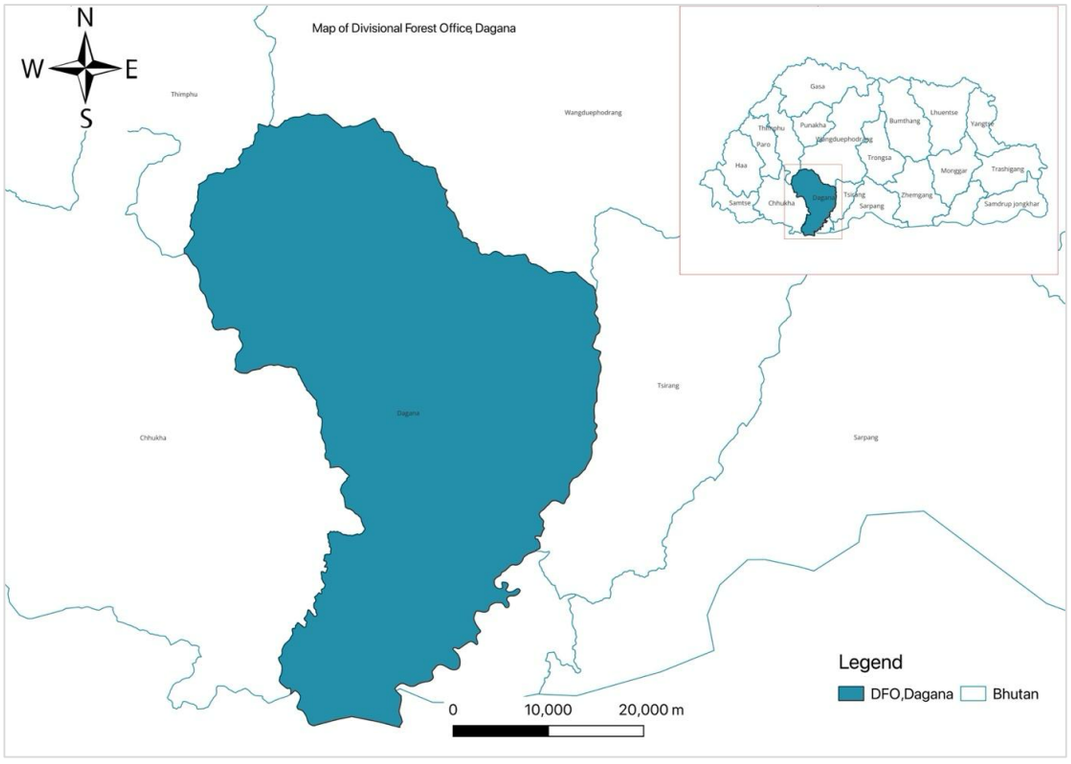


Figure 1. Location map of Divisional Forest Office, Dagana

As per the Land Use and Land Cover (LULC) classification of Bhutan (2020) shown in figure 2, a majority of the landscape is covered by forests (87.80 %), indicating a region's richness in its natural resources, supporting a diverse range of flora and fauna. The significant forest coverage plays a major role in regulating the local climate, providing clean water sources, and contributing to carbon sequestration, which ultimately is linked to the success of Gross National Happiness (GNH). In contrast, agriculture (4.65%) covers a smaller proportion of the total area, signifying the extent of anthropogenic interventions and food production within the jurisdiction. Other categories of land use include shrubs (3.74 %), which indicate ecotones between forests and open land. The presence of sandy banks (0.42 %) suggests the presence of river banks is potentially impacted by erosion or sedimentation.

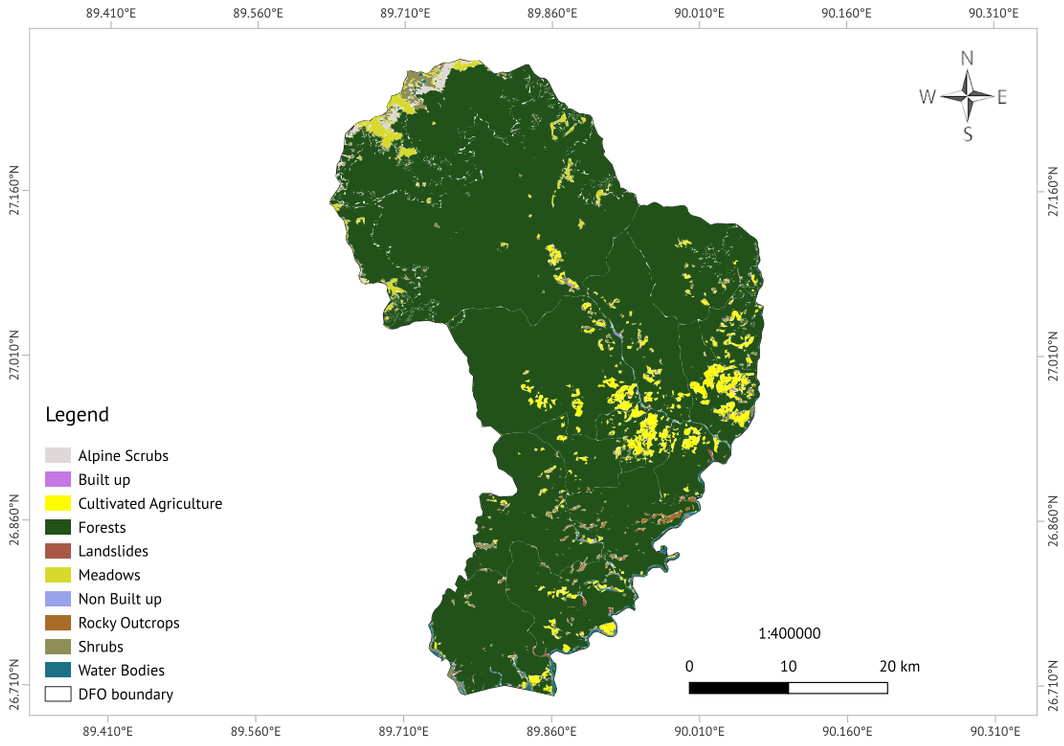


Figure 2. LULC map of DFO, Dagana

2.2 Administration

2.2.1 Administrative Set-Up

The Division has an administrative jurisdiction over Dagana Dzongkhag, covering 13 gewogs out of 14, which includes Dorona, Drujeygang, Gesarling, Goshi, Kana, Karmaling, Lajab, Tashiding, Tsendagang, Lhamoizingkha, Khebisa, Tseza, and Tsangkha. However, Nichula gewog, which is a part of Dagana dzongkhag, is excluded from the jurisdiction of the Division as it falls under Nichula Range, Phibsoo Wildlife Sanctuary.

The division is structured with several institutional setups to effectively manage and oversee forest resources. The key components of the structure are as follows:

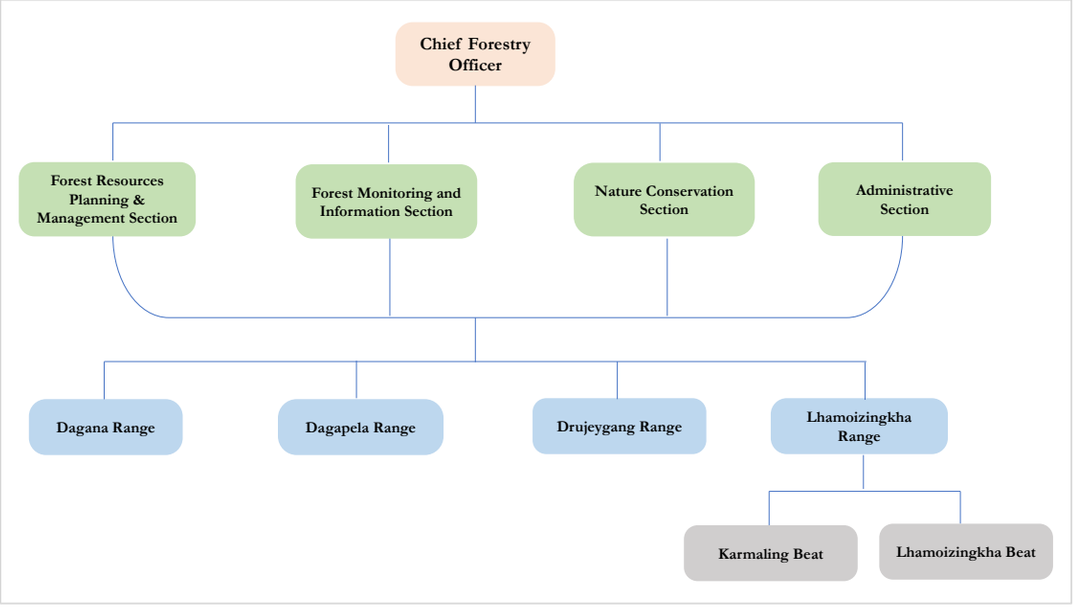


Figure 3. Organogram of DFO, Dagana

The Division operates under the leadership of the Chief Forestry Officer (CFO) stationed at its head office at Dagapela, Dagana. The division is structured into several key sections, each with its specific mandate:

1. Forest Resources Planning and Management Section (FRPMS)
2. Forest Management Information System (FMIS)
3. Nature Conservation Section (NCS)
4. Administration Section

The Division also have four Range Offices, located at Dagana, Dagapela, Drujeygang, and Lhamoizingkha as shown in figure 4. Additionally, two Beat Offices are approved at Karmaling and Lhamoizingkha gewogs, to be managed by the Lhamoizingkha Range, to address workloads and strategic needs at the border areas. However, due to lack of staff strength and infrastructure, the activities are carried out by Lhamoizingkha Range.

The Division oversees forestry-related services in 13 Gewogs in Dagana, each serviced by its respective Range Office and gewog focals. The services and activities are currently carried out by a team of 48 officials (including eight females), consisting of 40 technical staff and eight supporting staff. According to the Organizational Development (OD) exercise conducted by the Royal Civil Service Commission (RCSC), the Division has an approved strength of 48 technical staff, leaving it eight short of the required numbers of technical staff.

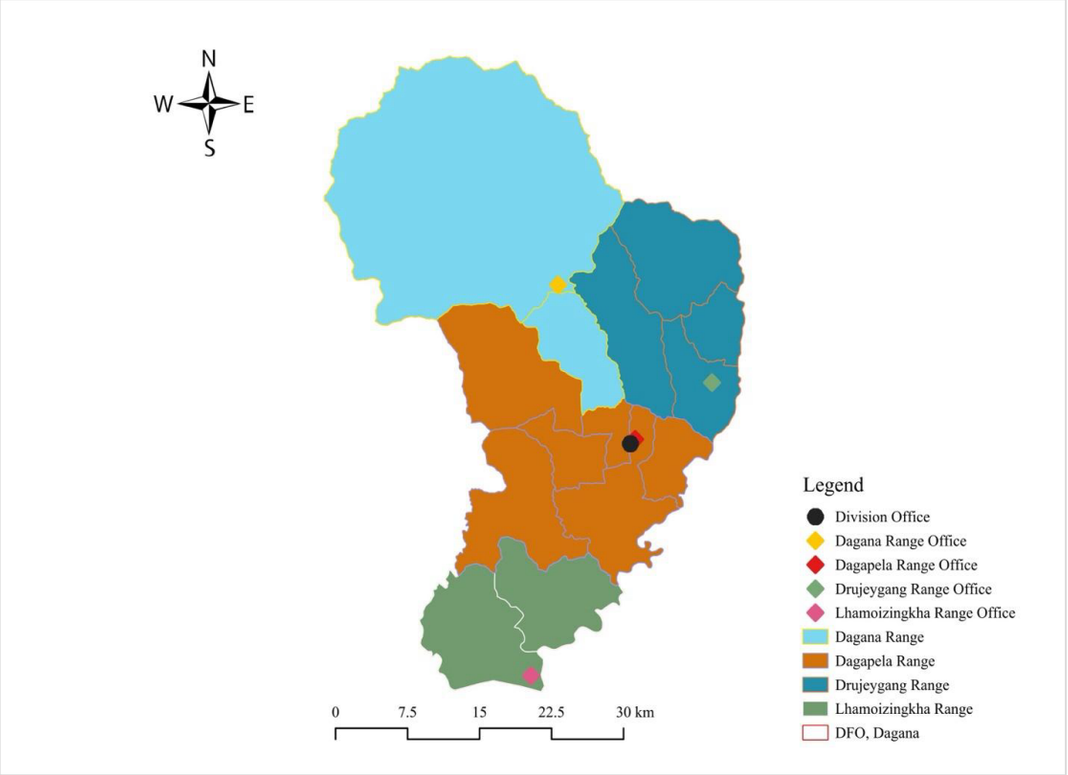


Figure 4. Jurisdiction map of field offices under DFO, Dagana

2.2.2 Mandates

The Division is dedicated to providing a wide range of services and fulfilling various conservation mandates to benefit the general public and protect the environment. The division also facilitates the issuance of permits for timber and non-timber forest products, conducts afforestation and reforestation programs, and manages community forests and conservation areas. Additionally, it implements sustainable forest management practices, enforces forest laws and regulations, and provides technical assistance and capacity-building to local communities. In terms of conservation mandates, the Division is committed to protecting flora and faunal species through the establishment and maintenance of conservation areas, conducting wildlife conservation programs, implementing climate change mitigation and adaptation measures, and promoting the sustainable use of forest resources.

The functions of the Division include protecting State Reserved Forest (SRF) land from illegal activities such as timber harvesting, wildlife poaching, and the exploitation of Non-Wood Forest Products (NWFPs) through regular patrolling and enforcement approaches. It ensures the sustainable management of natural resources to meet the demands of the nation, prevents and suppresses forest fires and the outbreak of diseases in forests, and delivers prompt services, especially in the allocation of forest products. The Division also conducts land inspections and issues forestry clearances for developmental activities and private land exchanges. It enforces the FNCA and related rules, monitors and evaluates the five-year plans and programs of the Division, and sets clear outcomes and objectives for individual work planning. By integrating these diverse functions and

mandates, the Division ensures the protection, conservation, and sustainable management of forest resources while providing essential services and support to local communities.

The Division is also mandated to carry out protection, conservation, resource allocation, and ensure sustainable management of forest resources. Additionally, the Division is also mandated to carry out forestry extension services, particularly in the mobilization of communities in forest resource management and protection work. The specific mandates of each section are outlined below:

2.2.2.1 Administration Section

The Administration Section is responsible for managing the general administrative functions of the Division to ensure efficient and effective operations. The section plays a vital role in supporting the strategic objectives through meticulous management of personnel, properties, and logistical support.

Following are the terms of references for administration section:

- Deals with matters pertaining to the administration of the division, and provides timely reminders for Individual Work Plan (Planning, Review & Evaluation) alongside APA focal of the Division and Asset Declaration.
- Maintains proper service files and service books for all staff under the division, process and record leave, annual increments, leave encashment, LTC, training, tours, workshops, seminars, promotions, and transfers.
- Maintains the properties of the division, including equipment, furniture, buildings, and vehicles, verifies bills and maintains an inventory of the stock, transport and maintain store materials, and carry out the issuance of office-related equipment and furniture.
- Obtains permit books, hammers, and uniforms for distribution to field offices and ensures effective and acceptable methods to float tenders, quotations, spot quotations, and select suppliers. The section also coordinates with suppliers and user agencies to ensure the timely delivery and proper use of supplies.
- Coordinates various activities as and when required.
- Financial focal for the Division

The Administration Section is critical to the Division's success, providing the backbone for operational excellence and strategic alignment.

2.2.2.2 Nature Conservation Section

The Nature Conservation Section is dedicated to the strategic and technical management of other areas under effective measures such as Key Biodiversity Areas (KBAs), High Conservation Value Areas (HCVs), and other external conservation areas. The section is tasked with protecting and conserving biodiversity, watersheds, and wetlands while mitigating human-wildlife conflicts and promoting sustainable livelihoods through ecotourism and nature-based recreation.

The terms of references for NCS are as follows:

- Provides strategic and technical guidance for preparation and implementation of OECA plans including KBAs, HCV.
- Protect and conserve watersheds and wetlands as natural habitats for fauna and flora, coordinate and provide technical guidance for all activities related to the protection and conservation of wild flora and fauna, and support the implementation of conservation programs for flagship species identified by the department.
- Plan and compile data on biodiversity surveys for important species to inform decision-making and policy development.
- Develop strategies for mitigating human-wildlife conflict and managing wildlife species that come into conflict, liaise with relevant stakeholders to identify and implement human-wildlife conflict mitigation measures, conduct awareness and sensitization programs on human-wildlife conflict, and coordinate and provide rapid response to human-wildlife conflict incidents.
- Promote sustainable livelihoods through ecotourism and nature-based recreation programs, and promote and coordinate activities related to conservation projects.

The NCS is important in preserving the Division's biodiversity, mitigating human-wildlife conflicts, and promoting sustainable development through conservation and nature-based initiatives.

2.2.2.3 Forest Resources Planning and Management Section

The Forest Resources Planning and Management Section is responsible for the scientific and sustainable management of forest resources within the division. This includes the development, utilization, and conservation of forest resources through community involvement, planning, and technical support. The section ensures the efficient and effective use of timber and non-wood forest products, forest restoration, and the management of forest fires, pests, and diseases.

The terms of references of FRPMS are as follows:

- Implement scientific forest management through appropriate planning and extraction of forest resources from local forest management areas, working schemes, and other forest management regimes, and facilitate and collaborate for the effective and efficient utilization of forest resources.
- Facilitate community-based forest resource development, management, and utilization, assist in the formation of community forest and non-wood forest products management and marketing groups, assist in the preparation of community forestry and non-wood forest product management and marketing plans, support the development of forestry-based rural enterprises and business plans, and establish community-based forest enterprises through planning and monitoring operations.
- Oversees timber resource allocation and utilization, including facilitation activities with wood-based industries, natural resource pricing, timber disposal, and utilization, and also, manages non-wood forest product allocation and utilization.

- Restore forest landscapes through afforestation and reforestation plantations, and manage trees outside forests in agricultural land through agroforestry programs.
- Manage forest fires and provide technical support, assist in planning and implementing forest fire management plans at the Dzongkhag and Gewog levels, coordinate the implementation of Gewog and Dzongkhag Forest fire management plans, and coordinate prescribed burn implementation inside community forests and private registered land.
- Manage and control the outbreak and spread of forest pests and diseases.
- The FRPMS plays a crucial role in maintaining the health and sustainability of forest resources, supporting community-based forest management initiatives, and ensuring the efficient use and conservation of both timber and non-wood forest products.

2.2.2.4 Forest Monitoring and Information Section

The Forest Monitoring and Information Section plays a critical role in collecting, analyzing, and disseminating information related to forest resources and management. The section conducts inventories, monitors forest management regimes, manages forest information systems, and provides online forestry services. Additionally, the section oversees the management of arms and ammunition used for forest protection purposes.

Following are the terms of references for FMIS:

- Periodic inventories of forests (NFI, CF Inventory, NWFP Inventory and LFMP Inventories), analysis of inventory data, and technical backstopping for inventory related activities.
- Monitoring of Forest Management Regimes (LFMAs, WS, CFs), cross-cutting regimes (Plantation and NWFP Groups) and WBIs, METT+ (Monitoring Effectiveness Tracking Tool).
- Manage the Forest Information Resource Management System (FIRMS), Spatial Digital Support System (SDSS), spatial data (Forest Cover Mapping, MRV, SDSS, Remote Sensing) and use the Monitoring Effectiveness Tracking Tool (METT+) for monitoring.
- APA and Policy Works (Strategies, FYP, Progress reporting, etc.), Online Forestry Services (OFS), Government to Citizen Services (G2C).
- Serve as the focal point for any SMART (Spatial Monitoring and Reporting Tool)-related activities, participate in refining the SMART data model, provide technical support for loading SMART onto individual phones, coordinate SMART patrolling, process, analyze, and submit SMART reports, and ensure the use of regular updates related to SMART.
- Maintain proper records of arms and ammunition, ensure timely renewal of arm licenses and repeater licenses, maintain firing reports received from field offices, ensure timely maintenance of very high frequency (VHF) repeater stations and maintain a register of radio handsets for the division.

The FMIS is crucial for maintaining a comprehensive understanding of forest resources and management practices, facilitating informed decision-making, and ensuring the effective monitoring and evaluation of forest management regimes and activities.

2.2.3 Human Resources

The Professional and Management Category (PMC) in the Division currently comprises six members, including the Chief Forestry Officer, head of Division. The PMC officials are engaged in managing sections or projects within the division. They are supported by ten "SS" level and 24 "S" level staff across division, range, and beat offices. Three range offices are headed by SS level staff, with one led by a PMC level officer. Administrative tasks for the Chief Forestry Officer are supported by an Administrative Assistant. The division also has two staff members at the "O" level and six ESPs contributing to the functioning of the Division. There are five female technical staff and three female non-technical staff. This staffing arrangement is designed to ensure adequate coverage of the division's jurisdiction to fulfill its mandates.

Despite the committed workforce, the division faces challenges such as insufficient staffing in remote areas, limited training opportunities, and inadequate resources for field operations. However, there are opportunities for improvement, including staff capacity building through training, leveraging technology for better forest management, and enhancing community participation in conservation efforts.

2.2.4 Infrastructure

Currently, the DFO has five buildings in the DFO and range offices used to provide services to the public. Additionally, there are 10 single–storey residential structures located in Dagana, Dagapela, and Lhamoizingkha. Most of these residential buildings were constructed in the 1970s and were originally used as a forestry school. These residential buildings are now in need of maintenance. Currently, 10 staff members occupy these government quarters. The Division has two Toyota Hilux vehicles and four motorbikes for staff mobility to provide public services. One Hilux is stationed at the Division for attending emergencies or emergencies at the Division and Range offices of Dagana, Dagapela, and Drujeygang. The other Hilux is stationed at Lhamoizingkha due to the risks associated with border areas and to address the human-elephant conflicts, a prominent threat in southern Bhutan. In addition to these pool vehicles and motorcycles, almost every staff member owns a motorbike for ease of service delivery. All these mobility options aid in achieving the mandates of the Division.

These infrastructures enable the Division to effectively deliver services, allocate resources, conserve floral and faunal species, and adopt climate change mitigation, and adaptation measures. However, there are areas that require improvement, such as upgrading outdated equipment and enhancing communication facilities in remote areas.

2.2.5 Budget and Revenue

2.2.5.1 Budget

A budget is a fundamental tool for government organizations, enabling effective financial management, accountability, strategic planning, and operational efficiency. It ensures that public funds are used responsibly and transparently to achieve the objectives of the Organization and serve the public interest. As shown in table 2, the Division received a total approved budget of Nu. 165.377 M from RGoB and donor agencies for the last five financial years (2019-2024), with the current budget of Nu. 136.419 M and a capital budget of 28.958 M.

Table 1. Approved budget for the FY 2023-2024

Types of Budgets	Activities	Sub-activities	Approved Budget (Nu. in Millions)				
			2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
Current	**General Management and Direction Services**						
	Personal emoluments	Pay and Allowances	15.945	17.614	17.072	17.402	21.434
		Other Personnel Emoluments	1.012	1.016	0.934	0.683	1.511
		Travel - (LTC/Leave Travel Concession)	0	0.778	0.814	0.74	0
		Contributions - Provident Fund	1.976	2.166	2.087	1.779	1.715
		Travel - Incountry	1.18	0	0	0	0
		Utilities -Telephones and Internet	0.353	0.245	0.212	0.026	0.031
		Utilities - Postage	0.001	0	0	0	0
		Utilities - Electricity, Water, Sewerage, Waste	0.024	0.041	0.088	0.088	0.089
		Utilities - Fuelwood	0	0	0	0.006	0
		Rental of Properties - Buildings	0.132	0.11	0	0	0
		Office Supplies, Printing, Publications	0.2	0.08	0.06	0.063	0.135
		Animal Feeds	0.044	0	0		0
		Uniforms, Extension Kits, Linens	0.05	0.057	0.057	0.053	0.053
		Maintenance of Property - Buildings	0.2	0	0	0	0.085
		Maintenance of Property - Vehicles	0.285	0.401	0.442	0.472	0.808
		Maintenance of Property - Equipment	0.04	0	0	0	0.009
		Maintenance of Property - Computers	0.039	0	0	0	0
		Hospitality & Entertainment	0.03	0.025	0.043	0	0
		In-country Meetings and Celebrations	0	0	0	0.139	0.023
		Retirement Benefits	0.975	0.091	0.102	2.917	0.612
		Taxes, Duties, Royalties, Fees, Handling Charges, Bank Charges	0	0.01	0.009	0.009	0.021
		Furniture	0.028	0	0	0	0
		Exp. on Structure - Others	0	0	0	0.1	0.001
		Exp. on Structure - Plantations	0	0	0	0	0.032
		Office Equipment	0.033	0	0	0	0
		Computers & Peripherals	0.08	0	0	0	0
	Rural Development and climate change response	Disaster: Relief and Response	0	0	0.825	0	0
	TADA for civil servants during COVID 19 Duty	Travel-In-country	0.405	0	0	0	0
	Monitoring and mobility of staff	Travel – In-country	4.97	3.141	3.695	3.71	1.456
Capital	**Waste management program**	In-country Meetings and Celebrations	0.03	0	0	0	0
	Watershed and wetland management	Training - Others	0	0.158	0	0.265	0
		Assessment of catchment area	0	0.105	0	0	0
		water revival	0	0.15	0	0	0

		Development of watershed Write shop	0	0.27	0	0	0
		Assessment of water user	0	0.05	0	0	0
		Plantations	0	0.45	0.55	0.6	0
		Drinking water supply	0	0.553	0	0	0
		construction of Irrigational channel	0	0.88	0	0	0
	Plantation in barren and degraded forest area	Maintenance of Property - Plantations	0.13	0	0	0	0
		Watershed plantation	0	0	0	0	0
	Asian elephant protection	QRT formation-training-others	0	0	0	0	0.3
		Habitat improvement-Training - others	0	0	0	0	0.2
		Structures-barrier construction-Crop Protection	0	0	0	0	1.2
	Social forestry day celebration	Op. Exp. – In-country Meetings and Celebrations	0.02	0	0	0	0
	Nursery development	S & M - Seeds, Seedlings	0.12	0	0	0	0
	Redd+ plus implementation framework component-2	Development of LFMP/Training - Others	0.3	0	0	0	0
	Infrastructure Development	Construction of Division Office					
		Exp. on Structure - Buildings	6.731	3.41	0	0	0
		Structure - Roads	0	1.6	0	0	0
		Plant & Equipt. - Power Trans. & Dist.	0	0.65	0	0	0
		Range Offices maintenance	0	0	0	0	4
	Community forest development	Training - Others	0	0	0.202	0	0
		plantation	0	0.45	0	0.45	0
	National forest inventory	Professional Services	0	0	2.21	0	0
	Awareness on forestry act rules & policies	Training - Others	0	0	0	0.179	0
	Feasibility study on PES	Training - Others	0	0	0	0.15	
	Procurement of chadri items	Structure - others	0	0	0	0	0.142
	Tiger conservation	Structure - others	0	0	0	0	2.453
		Grand Total	**35.333**	**34.501**	**29.402**	**29.831**	**36.31**

2.2.5.2 Revenue

The Division has made a total revenue of Nu. 20.75 M in the last five years (2019 – 2023), which were deposited into the RGoB account through Revenue Administration Management Information System (RAMIS). This revenue is generated through the royalty charged for timbers (Log form, sawn form, poles, firewood, etc.), royalty from NWFPs (including the sands and boulders), fishing licenses fees, coupon permit costs, fines and penalties, compensation on forest offences, and other fees and service charges.

Among these, the highest revenue was generated from NWFPs in the last five years, accounting for 53 % (Nu. 10.95 M) of the generated revenue, followed by the timber (16 %, Nu. 3.17 M), and fines and penalties (1 %, 3.67M). With 0.01 %, other fees and service charges contributed the least in the revenue generation for the Division as shown in figure 5.

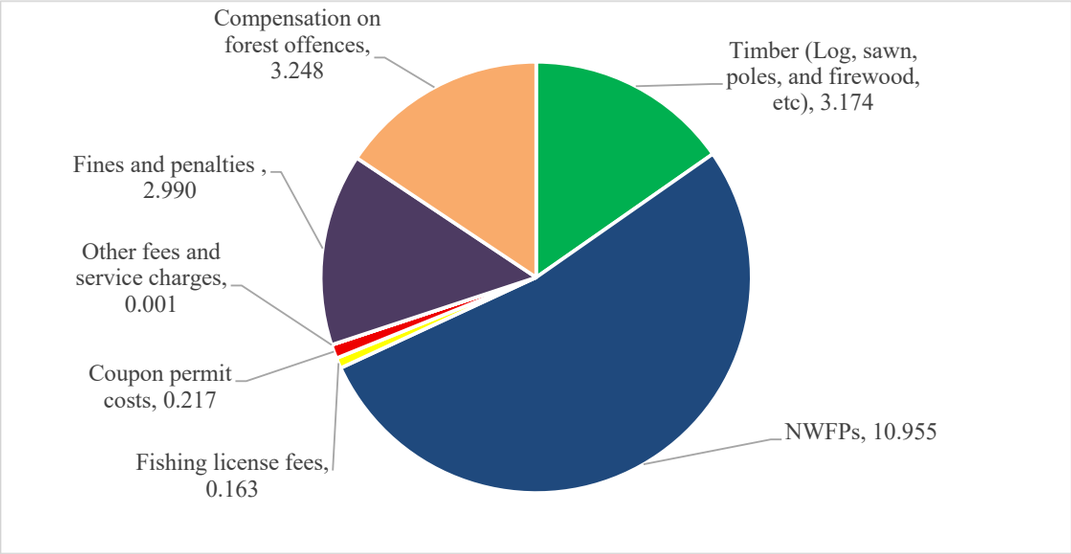


Figure 5. Revenue generated under various category (2019 – 2023)

The highest revenue generation was made in the year 2023 with Nu. 11.311 M, which is 54.51 % of the overall revenue generated in five years, while the year 2022 has the lowest generation of revenue as shown in table 4. The drastic increase in the revenue generation in 2023 could be due to the allocation of riverbed material (RBM) dredging sites, carried out as a result of Open Auction.

Table 2. Revenue generated in five years (2019-2023)

Year	Revenue (Nu. in millions)
2019	2.777
2020	2.115
2021	2.459
2022	2.086
2023	11.311

The linear regression model in python was used to project the revenue for next five years (2024-2028), which basically calculates two parameters: the slope (m) and the intercept (b). The relationship between the year and the revenue can be expressed with the equation:

$$\textbf{Revenue} = \textbf{m X Year} + \textbf{b}$$

The linear regression model indicates a steady increase in revenue for the Division over the next five years as shown in figure 6. The significant increase in 2023 influences the projected trend, suggesting an optimistic growth trajectory. It is important to consider potential external factors that may impact future revenues, which are not accounted for in this model.

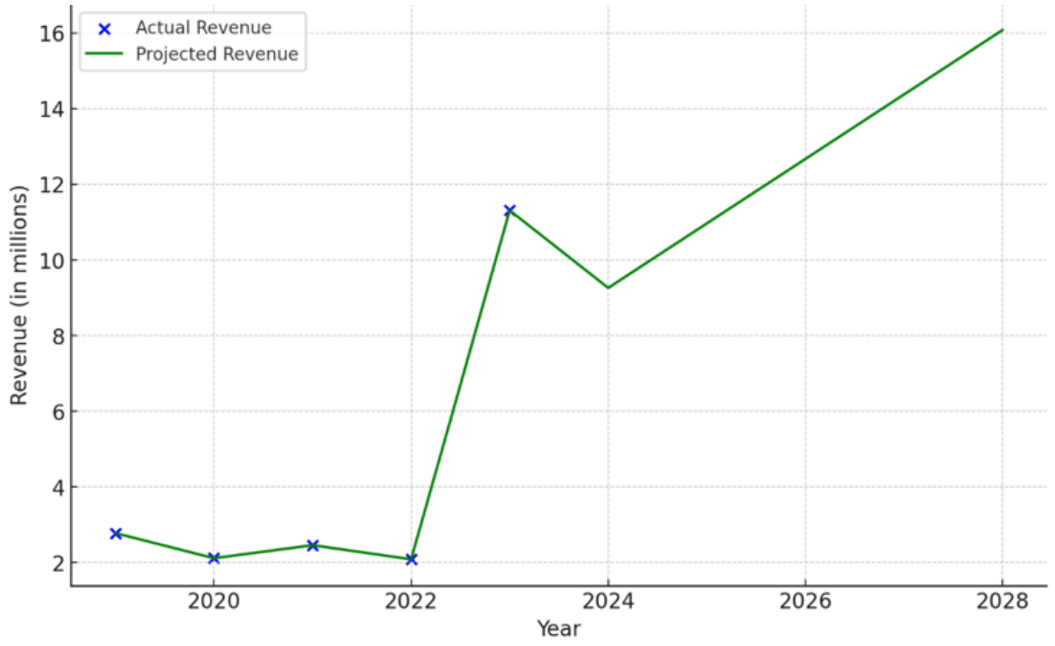


Figure 6. Actual and projected revenue for DFO, Dagana

2.3 Biodiversity Conservation

Biodiversity conservation is a cornerstone of sustainable development, ensuring the resilience and vitality of ecosystems that support both natural and human communities. The preservation of biodiversity is not merely a moral imperative but a strategic necessity to safeguard essential ecosystem services such as fresh and pristine air, water, and fertile soils. It is essential to explore the critical interdependencies between biodiversity conservation and three key ecosystem types: forests, agricultural landscapes, and wetlands/ riverine ecosystems. Each ecosystem type plays a distinct yet interconnected role in maintaining global biodiversity, emphasizing the need for integrated conservation strategies that reconcile environmental stewardship with socio-economic imperatives. These interlinkages should be well examined to underscore the urgency and complexity of biodiversity conservation efforts in shaping a sustainable future for all life on Earth.

As a part of the conservation of flora and fauna, the Division carries several surveys – Forest Inventory, Tiger Survey, Red Panda Survey, Biodiversity monitoring, rapid biodiversity survey, fish survey, etc. Apart from the survey, the division has carried out major activities such as restoration of waterholes, development of wildlife corridors, enforcement and monitoring of the status of biodiversity, HWC intervention measures, community engagement in conservation, and regular awareness to the communities on the significance of conservation.

2.3.1 Forest Ecosystems

The Division encompasses a range of elevations from 90 meters above sea level (m.a.s.l) in the south to 4450 m.a.s.l in the north, resulting in a highly diverse forest species composition. The forest types in Dagana are classified using the Forest Management Code of Best Management Practice, Vol. I, derived from Grierson and Long (1983), and are categorized into ten forest types, excluding dry alpine scrub as shown in Figure 7.

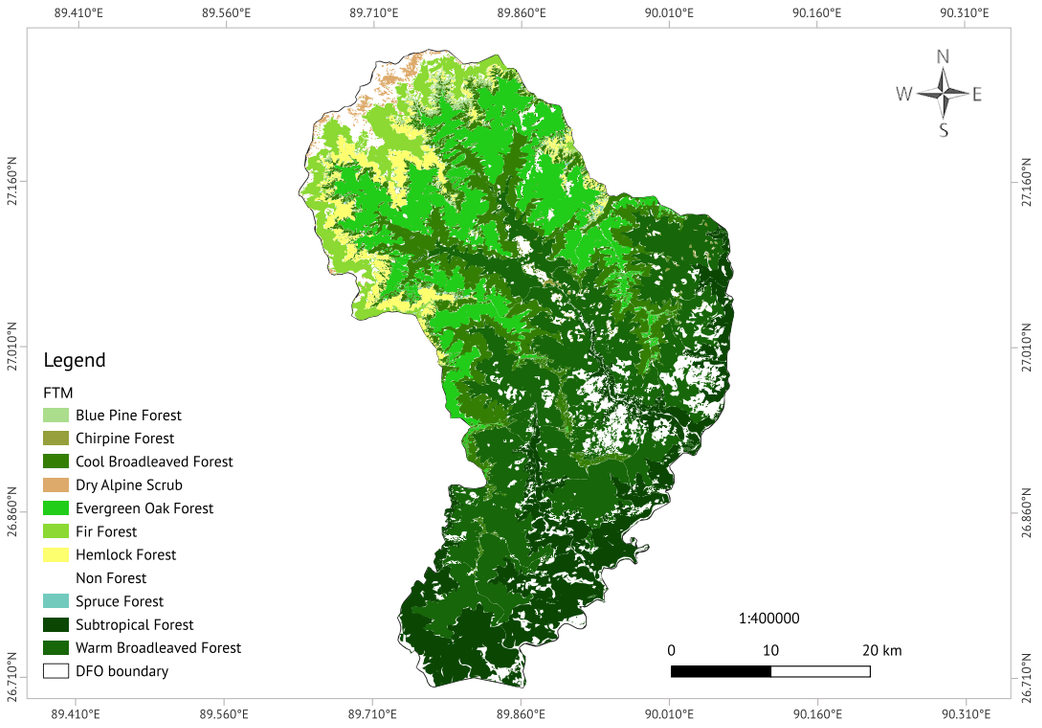


Figure 7. Forest types map of DFO, Dagana

The rapid biodiversity assessment (RBA) in the above forest types carried out in 2022 recorded a total of 531 species of flora belonging to 127 families with 15 major life form groups, which are Evergreen trees, Deciduous trees, Deciduous shrubs, Evergreen shrubs, Perennial herbs, Annual herbs, shrub, climbers, climbing shrub, climbing herb, orchids, Shrub, Herb and all the spore bearing plants including trees ground vegetation and epiphytes.

The cluster analysis of the vegetation types performed through PC-ORD (ver. 5) resulted in six different clusters or vegetation types, when placed at the similarity index of 25 %. The forest is classified based on the Relative Basal Area of trees and shrubs of each plot. The cluster analysis grouped homogenous plant communities and site factors. The MONTE CARLO test of significance was performed to determine indicator species in each cluster. The top indicator species with the lowest significant P value were added to the cluster dendrogram.

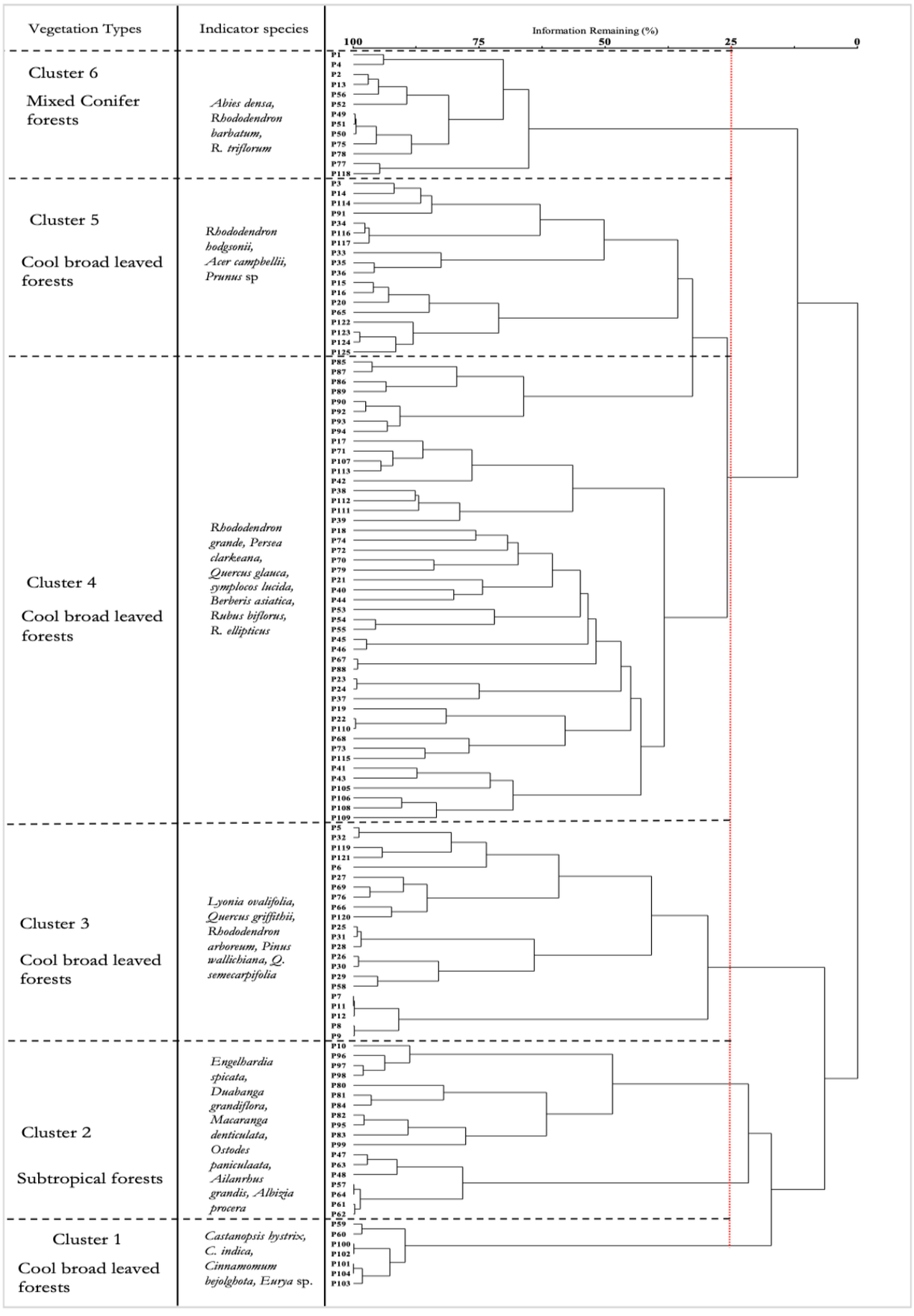


Figure 8. Cluster dendrogram

The classification of RBA plots into six clusters or vegetation types indicated the presence of three distinct forest types – Subtropical forests, cool broadleaved forests, and mixed conifer forests.

As shown in figure 8, the Cluster 1 is dominated by *Castanopsis hystrix, C. indica,* and *Cinnamomum bejolghota,* while Cluster 2 is generalized by the presence of sub-tropical vegetation such as *Engelhedra spicata*, *Duabanga grandiflora, Macaranga denticulata, Ostodes paniculata, Ailanthus grandis*, and *Albizia procera*. Cluster 3, 4, 5 are pre-dominated by cool broad-leaved species such as *Lyonia ovalifolia, Quercus griffithii, Rhododendron arboreum, Pinus wallichiana, Quercus semicarpifolia, Rhododendron grande, Persea clarkeana, Quercus glauca, Symplocos lucida, Berberis asiatica, Rubus biflorus, R. ellipticus, Rhododendron hodgsonii, Acer campbellii*, and *Prunus sp*, while the Cluster 6 is dominated by *Abies densa, Rhododendron barbatum*, and *R. triflorum*.

2.3.2 Aquatic Ecosystems

According to data collected by the Division with financial support from the erstwhile Watershed Management Division (WMD) in 2020, the Dagana currently taps 719 water sources. The highest number of these sources is in Tsangkha Gewog (105), followed by Kana Gewog (99) and Drujeygang Gewog (81). Of these water sources, 271 are reported to be drying up, while 12 have already dried up, making Dagana the highest in the country for drying water sources (Phuntsho et al., 2023).

Within the jurisdiction of the division, a total of 695 water sources is tapped by the communities to support their livelihoods. Among these, 244 water sources are observed to be drying, 16 have already dried up, and 435 have shown no changes in their discharge. This represents the critical need for effective water resource management and conservation strategies to ensure the sustainability of water supplies for the local communities.

The major water sources in Dagana district consist of springs, streams, and rivers as shown in Figure 10. Additionally, there are several smaller lakes, ponds, and marshes that contribute to the water resources within the Division. These lentic ecosystems, such as the artificial pond in Norbuzingkha, the lakes at Sertsho and Gaytsholing, Hari Pokhri, Khurul lake, and Jour Pokhri, provide diverse habitats for aquatic and terrestrial life dependent on these ecosystems.

One of the notable lentic ecosystems in the region is located in Lhamoizingkha, known as Khurul Lake or *Pelden Lhamoi-latsho*, named after its protector deity Mahakali. This lake is home to freshwater mussels, often mistaken for oysters, hence its colloquial name, Oyster Lake. The lake supports a variety of fish and frog species, while wild rice grows in small pockets along its periphery. The lake is believed to be a feeding ground for the White-bellied Heron, though there is no proper evidence of its observation. The species such as the Tawny Fish Owl and various kingfisher species are commonly found around the lake, indicating the importance of this ecosystem for local biodiversity. Just above the lake, there is a presence of natural Sal forests.

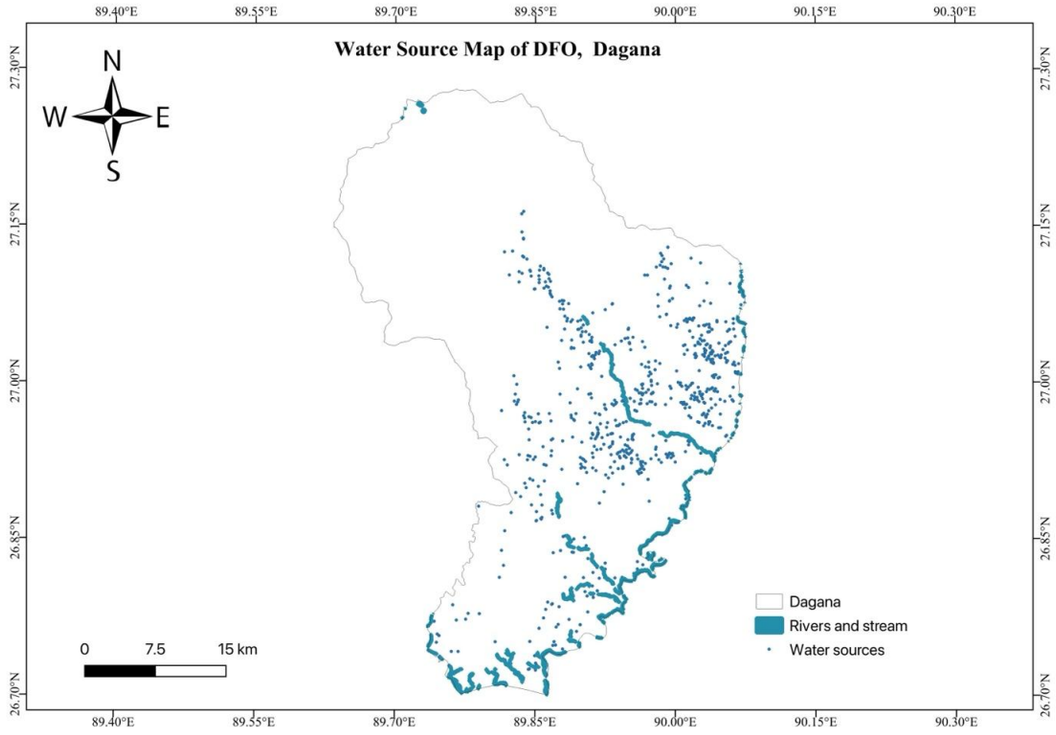


Figure 9. Water sources and lakes under DFO, Dagana

In addition to springs, streams, rivers, lakes, ponds, and marshes, waterholes also play a vital role in supporting wildlife in Dagana. These waterholes serve as crucial sources of water for various wild species, particularly during dry seasons when water availability is limited. Under initiatives such as the Elephant Landscape Project Conservation (ELCP) for elephant conservation, and programs supported by the International Union for Conservation of Nature (IUCN) for tiger conservation efforts have been made to restore and maintain waterholes in several parts of the Division. These conservation efforts aim to ensure that wildlife, including elephants and tigers, have access to reliable water sources, which is essential for their survival and well-being.

2.3.3 Agricultural Ecosystems

The majority of the communities' practices livestock farming, and this serves as an essential source of foods ensuring household food security and economic stability. Poultry farming and cattle rearing are more prevalent than other livestock such as pigs, goats, sheep, etc. While poultry farming is mostly carried out, cattle are either tethered/stall feeding or allow open grazing in fallow land and SRF land. The livestock herding practices employed by households show tethering or stall feeding as the most prevalent method, the improved pasture is the second most common practice, while pastoral herding is notably absent in the Division. However, in the alpine scrub of Dagana, nomads from Chukha and Thimphu carry out the pastoral herding. Although a small portion of the total household inhibiting under Dagana practices open grazing, it is essential for maintaining the biodiversity and to encourage natural regenerations.

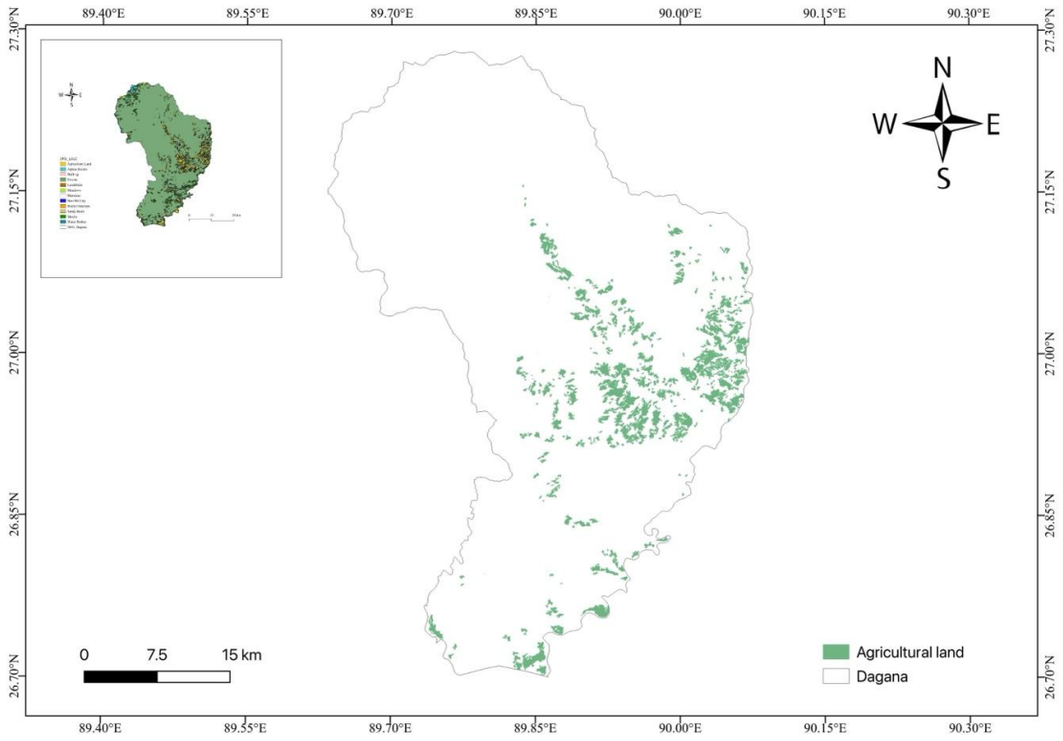


Figure 10. Agricultural lands under DFO, Dagana

In addition to raising livestock, cultivation of cereal crops, fruits and nuts productions are common under the Division. Maize is widely grown followed by millets, pulse, dhal, and paddy. Mandarin oranges, mangoes and areca nuts are the most common fruit trees grown in the area. The most significant challenges to grow agriculture and horticulture crops are pest and diseases (Chili blight, cabbage moth, gray leaf spot) shortage of irrigation channel and crops raiding by wild animals while some of the minor problems include erratic rainfall, drought, poor accessibility to market, soil erosion and water scarcity. The agricultural field acts as a habitat for wide arrays of insects including the aphids and coccinellids.

2.4 Existing Management Regimes

The Division manages a diverse spectrum of forest resources through 37 area–based management regimes and 7 cross–cutting measures, which are either included in the area-based management regimes or out of those regimes. These regimes include local forest management areas (LFMAs), community forest management groups (CFMGs), and private forests (PFs), while the cross-cutting measures include key biodiversity area (KBA), high conservation value (HCV) area, plantation, ecotourism, and non-wood forest product (NWFP) management groups.

2.4.1 Area based Management Regimes

2.4.1.1 Local Forest Management Areas

LFMAs are established in Lajab and Kana Gewog in line with the section 48 of FNCA 2023 and to address the resource needs of its residents. The Division office will assess the remaining 11 gewogs for creation of LFMAs, where the resources are allocated without specific management plans. To promote community ownership and empowerment, 34 community forest management groups have been formed, with the rights over the forests and its management including the allocation of resources based on scientifically developed management plans.

Table 3. Details on LFMA under DFO, Dagana

LFMA name	Dzongkhag	Gewog	Year of establishment	Total Gewog Area (ha)	Area covered by plan (ha)	Annual Allowable Cut (AAC) - m3	Plan Period	Plan Cycle
Lajab	Dagana	Lajab	2021	9097.66	5597	10311	January 01, 2021- December 31, 2030	10 years
Kana	Dagana	Kana	2020	18716.01	9312.74	23428	January 01, 2020, to December 31, 2029	10 years

2.4.1.2 Community Forests

The relationships between the local people and an environment are inherited within the culture since time immemorial. In order to manage the existing forests in a sustainable way and to provide continuous forest produce supply to the citizens, the concept of social forestry was started in 1979 under a Royal Decree. Local communities are seen as important partners in the protection and management of natural resources. The policy implementation was initiated with the establishment of the first Community Forest Management Group (CFMG) in 1997 at Dozam, Mongar. Since inception of first CF under Dagana in 2009, i.e., Thuenlam CF, the Division has a total of 35 approved Community Forest Management Plans, empowering the communities in decision making and management of forests, and one community forest that is under proposal for initiation/ establishment.

Table 4. Details on CFs under DFO, Dagana

Name of community forests	Year of establishment	Dzongkhag	Gewog	Members		Total Area (Ha)	Area under Forest Cover (Ha)	Annual Allowable Cut (AAC) - m3	Plan Period	Plan Cycle
				Male	Female					
Thuenlam	2009	Dagana	Tsangkha	19	3	88	77	138.11	2020-2030	10 Yrs
Thuenpa Puenzhi	2009	Dagana	Drujeygang	31	38	139.67	121.71	211.46	2020-2030	10 Yrs
Tshothang	2010	Dagana	Khebisa	5	31	185	184.85	1116.61	2021-2031	10 Yrs
Tashi Thoenkey	2010	Dagana	Tseza	21	13	72	72	94.102	2021-2031	10 Yrs
Saertsho	2010	Dagana	Gesarling	8	6	74	20	6.5	2020-2030	10 Yrs
Namchag	2010	Dagana	Tashiding	14	1	41	4.18	51.25	Plan in halt due to revision	10 Yrs
Lhaling Phuensum	2011	Dagana	Kana	12	9	99.28	93.44	193.29	2020-2030	10 Yrs
Tashithang	2011	Dagana	Gesarling	36	7	156	52	36.4	2022-2032	10 Yrs
Tashi Phentap	2011	Dagana	Tseza	27	3	98	98	325.26	2021-2031	10 Yrs
Norbuling	2012	Dagana	Tashiding	29	1	48.44	48.44	49.98	2023-2033	10 Yrs
Thangna	2011	Dagana	Drujeygang	19	18	146	141.63	287.06	2021-2031	10 Yrs
Gaytsholing	2012	Dagana	Khebisa	3	44	181.46	181.46	379.33	2023-2033	10 Yrs
Norbu Dungkar	2013	Dagana	Dorona	17	9	68.97	56.59	86.06	2023-2033	10 Yrs
Yeserling	2013	Dagana	Tashiding	18	4	23	23	163.49	2023-2033	10 Yrs
Samdrup choiling	2013	Dagana	Dorona	8	9	76.99	61.38	118.38	2023-2033	10 Yrs

Norbuzingkha	2015	Dagana	Tsendagang	214	204	58.16	58.16	138.2	2026-2035	10 Yrs
Tashi Dargey	2015	Dagana	Drujeygang	11	43	150	150	195.44	2026-2035	10 Yrs
Patala-Menchuna	2015	Dagana	Drujeygang	19	48	80.495	80.495	408.85	2026-2035	10 Yrs
Akhochen Phuensum	2015	Dagana	Khebisa	39	3	91.77	91.77	163.44	2026-2035	10 Yrs
Soarlum	2015	Dagana	Gesarling	11	2	7.625	7.625	46.49	2026-2035	10 Yrs
Bana Phunsum	2015	Dagana	Lajab	16	11	72.72	72.72	323.82	2026-2035	10 Yrs
Balung	2015	Dagana	Lajab	103	111	47	46.803	130.516	2026-2035	10 Yrs
Upper Gangzor	2025	Dagana	Tsendagang	40	8	60.092	60.092	52.46	2026-2035	10 Yrs
Balleygang Gongphel	2016	Dagana	Gozhi	22	12	25.7	25.7	10.667	2017-2027	10 Yrs
Phuensum	2017	Dagana	Gozhi	10	12	40.72	40.72	2.9948	2017-2027	10 Yrs
Khagochen	2017	Dagana	Kana	97	28	237	237	300.752	2017-2027	10 Yrs
Pungshi	2017	Dagana	Kana	39	7	197.494	197.494	98.876	2017-2027	10 Yrs
Patekha	2020	Dagana	Tsangkha	58	30	35.03	35.03	27.45	2020-2030	10 Yrs
Thanamkhaidzong	2020	Dagana	Lajab	16	12	108	108	227.99	2020-2030	10 Yrs
Phuensum (Kana)	2020	Dagana	Kana	41	23	320	320	879.5	2020-2030	10 Yrs
Kawakha	2020	Dagana	Tashiding	52	2	74.55	65.54	95.34	2020-2030	10 Yrs
Lamcheythang	2020	Dagana	Tashiding	28	8	51.2	48.188	9.7	2020-2030	10 Yrs
Sipa	2021	Dagana	Lajab	27	6	195.94	194.26	731.61	2021-2031	10 Yrs
Gelechu CF	2022	Dagana	Tsangkha	27	4	59.29	59.26	162.83	2021-2031	10 Yrs
Yangchenma CF	2025	Dagana	Gozhi	14	4	60.793	3.38	15.75	2025-2035	10 Yrs

2.4.1.3 Private Forests

As governed by Forest and Nature Conservation Act of Bhutan 2023, any private registered land may be managed as private forest or agro forestry for domestic and commercial harvest of forest produce which shall be facilitated by DoFPS. The registration and certification of private forests encourage individuals to cultivate high value timber species and other forest resources in their land, which otherwise are left fallow. These initiatives contribute to sequestering carbon and also ensure sustainable land management. However, only three PF has been established in Dagana, provided with technical backstopping from the forestry officials.

Table 5. Details on private forest under DFO, Dagana

Details of Owner		Details of Private Forests								
Name of Owner	**CID No**	**Name of the Private Forest**	**Dzongkhag**	**Gewog**	**Thram No**	**Year of Establishment**	**Total Area (Ha)**	**Area under Forest (Ha)**	**Annual Allowable Cut (AAC) - m3**	**Plan Period**
Dhan Bdr Waiba	10308001563	Tashiding	Dagana	Tashiding	705	2021	3.56	1.35	–	–
Gemba	10307000120	Lajab	Dagana	Lajab	05	2024	–	1.04	–	–
Chenga Lhamo	11315000495	Lajab	Dagana	Lajab	842	2024	–	0.32	–	–

2.4.2 Cross-Cutting Management Regimes

Namchella catchment area under Trashiding gewog is designated as HCV under Dagana to ensure effective management and conservation of the drying water source. The area was designated after thorough screening. The Division has three NWFP management groups out of which, two are outside any other management regimes. These have been formed to facilitate the sustainable utilization of forest resources such as cane and Piper species for the benefit of local communities. These groups enable communities to generate income from the use of NWFPs. Besides, the Dagachu was designated as Key Biodiversity Area (KBA) to protect Ardea insignis and Tor putitora. And, the establishment of bio-pesticide plantations are some of the cross-cutting measures adopted in the Division.

Table 6. Cross-cutting regimes under DFO, Dagana

Sl No	Cross cutting management regimes/interventions	Name of area-based management regimes / location	Dzongkhag	Gewog	Year of operationalization of cross cutting regime	Total area under management intervention (ha)	Area covered by area-based plan (ha)	Key management interventions	Plan period of the area-based management plan
1	Non-wood forest products	Devitar	Dagana	L/kha	2014	700.8	–	The management plan focuses on the harvesting prescription of *Piper mullesua, Piper longum, Thysanolaena latifolia, Wallichia oblongifolia,* and *Ziziphus mauritiana*. There is no management intervention as such for NWFP management plan	2024-2034
2	Non-wood forest products	Dorjiphu	Dagana	Karmaling	2014	189.7	–	The management plan focuses on the harvesting prescription of *Piper mullesua, Piper longum,* and *Thysanolaena latifolia.* There is no management intervention as such for NWFP management plan	2024-2034
3	Non-wood forest products	Lajab LFMA	Dagana	Lajab	2021	24.9	24.9	The management plan focuses on the harvesting prescription of Plectocomia *himalayana*	2021-2030
4	Plantation and nursery	Sibsooni	Dagana	L/kha	2020	1	–	Bio-pesticide plantation and maintenance until the survival rate is successful	
5	Key Biodiversity Area	Dagachhu	Dagana	Kana, Tsendagang, Drujeygang, Trashiding, Khebisa	2023	–	–	1. Habitat protection & restoration 2. Enhance SMART Patrolling 3. Conduct awareness & advocacy programs 4. Promote establishment of Nature-based enterprises for local communities	2023-2033
6	Eco-tourism and recreational area	Do Namkhai Kaw	Dagana	Kana	2022	–	–	–	–
7	HCV	Namchag CF	Dagana	Trashiding	2024	44	41	Conservation of only water source with no alternative for the public and residence of Trashiding gewog	–

Several challenges hinder the effective implementation of existing management regimes, including:

- Inadequate Monitoring: Plans are not consistently and effectively monitored.
- Implementation Inconsistencies: Discrepancies arise in the implementation of plans across different areas.
- Limited Resources: Insufficient budget restricts the ability to monitor plans and schemes effectively.
- Ineffective Implementation: Plans are not consistently implemented as intended.

To address these issues, establishing accountability for plan implementation is crucial. When plans are not effectively implemented, thorough studies should be conducted to identify and address the underlying challenges and issues.

2.5 Forest Resources and Utilization

2.5.1 Forest Resources

The following section discusses the various forest parameters under the DFO, Dagana including the stem count, stem density, volume, biomass and carbon. The estimates are calculated using the area under the different forest types and the per ha estimates of the parameters for the different forest types as reported in the NFI report (FMID, 2023).

2.5.1.1 Forest Cover by Land Area

The total forest area is estimated to be 88.51 % (1,40,179.81 ha) of the total land area while the remaining 11.49 % (18205.50 ha) of the total land area is estimated to be the non-forest area.

Table 7. Total land area by forest

Forest Cover (ha)	Forest Cover (%)
140179.81	88.51%

2.5.1.2 Forest Cover by Forest Types

The forest areas are further segregated into different forest types in Table 8. Warm Broadleaved Forest dominates the forests in Dagana accounting for 32.61% of the total forest. This is followed by Cool Broadleaved Forests (19.24%), Evergreen Oak Forests (17.86%), and Subtropical Forests (17.29%). Other forest types, such as Chir Pine, Blue Pine, Spruce, and Juniper Rhododendron, each cover less than 3% of the total forest area. Hemlock forest (4.66 %) and Fir forests (5.36 %) also contribute to forest coverage for the Division.

Table 8. Forest cover by forest types

Forest Types	Forest Cover (ha)	Forest Cover (%)
Subtropical Forest	24234.26	17.29%
Chir Pine Forest	649.11	0.46%
Warm Broadleaved Forest	45713.51	32.61%
Evergreen Oak Forest	25042.14	17.86%
Cool Broadleaved Forest	26976.01	19.24%
Blue Pine Forest	1311.56	0.94%
Spruce Forest	611.46	0.44%
Hemlock Forest	6530.31	4.66%
Fir Forest	7509.19	5.36%
Juniper Rhododendron Forest	1602.26	1.14%

2.5.1.3 Stem Density by Forest Types

Dagana is part of Bhutan's extensive natural landscape and contributes to the country's commitment to environmental conservation. Dagana's forests are characterized by a mix of subtropical, temperate, and alpine vegetation, making it home to a wide variety of flora and fauna. As per the NFI 2023 (Volume I), the warm broadleaved forest has highest tree count followed by cool broad leaf forest whereas Chir pine forest has lowest tree count. Tree density in the different forest types ranges from 254 to 426 trees per ha and the tree count in all Forest Types except Sub-tropical, Chir Pine, and Juniper Rhododendron forests.

Table 9 shows the total tree count by forest type. Overall, the broadleaved forest dominates the tree count with warm broadleaved forest constituting 53.15% of all estimated trees in the Division. The total tree count is the lowest in Chir Pine, Spruce, Juniper Rhododendron, and Blue Pine forests, all contributing less than 2% each to the total tree count in the forest.

Table 9. Tree density by forest types

Tree count by Forest types	Forest Area (Ha)	Tree count/ha	Total tree count
Subtropical Forest	24234.26	310.00	7512620.64
Chir Pine Forest	649.11	254.00	164874.78
Warm Broadleaved Forest	45713.51	375.00	17142564.46
Evergreen Oak Forests	25042.14	417.00	10442573.08
Cool Broadleaved Forest	26976.01	417.00	11248994.21
Blue Pine Forest	1311.56	426.00	558725.31
Spruce Forest	611.46	401.00	245197.43
Hemlock Forest	6530.31	406.00	2651304.16
Fir Forest	7509.19	402.00	3018694.06
Juniper Rhododendron Forest	1602.26	269.00	431007.50

2.5.1.4 Growing Stock by Forest Types

An analysis of growing stock per hectare across various forest types showcases the distribution of total growing stock within a specific area as depicted in table 10. The average growing stock stands at 283.22 m^3/ha, leading to a total growing stock of around 39.7 million m^3. Among the forest types, Warm Broadleaved Forest and Cool Broadleaved Forest exhibits the highest total growing stock of approximately 10.4 million m^3 and 10.2 million m^3 respectively, with a growing stock density of 228 m^3/ha and 379.15 m^3/ha respectively. The Chir Pine Forest has the lowest total stock at about 0.076 million m^3, with a growing stock density of 116.93 m^3/ha.

Table 10. Growing stock by forest types

Average growing stock/ha	283.22		
Total growing stock	39702335.11		
Growing stock by Forest types	Forest area(ha)	Growing stock/ha	Total growing stock
Subtropical Forest	24234.26	160.00	3877481.62
Chir Pine Forest	649.11	116.93	75900.82
Warm Broadleaved Forest	45713.51	228.03	10424050.60
Evergreen Oak Forests	25042.14	341.01	8539620.73
Cool Broadleaved Forest	26976.01	379.15	10227952.40
Blue Pine Forest	1311.56	209.17	274339.37
Spruce Forest	611.46	384.84	235316.16
Hemlock Forest	6530.31	442.70	2890966.39
Fir Forest	7509.19	398.82	2994814.84
Juniper Rhododendron Forest	1602.26	101.04	161892.18

2.5.1.5. Basal Area by Forest Types

The table 11 illustrates the distribution of basal area across various forest types, revealing an average of approximately 31.03 m^2/ha and a total of around 458.68 million m^2. Among these, the Warm Broadleaved Forest has the highest total basal area, around 1.26 million m^2, corresponding to a density of 27.67 m^2/ha, indicative of its substantial biomass, followed by Cool Broadleaved Forest with 1.15 million m^2 to its density of 42.89 m^2/ha. On the other hand, the Chir Pine Forest records the lowest total basal area at 0.98 million m^2, with a density of 15.14 m^2/ha.

Table 11. Basal area by forest types

Total basal area	458682923.13		
Basal Area by Forest types	**Forest area (ha)**	**Basal area/ha**	**Total basal area**
Subtropical Forest	24234.26	20.08	486623.94
Chir Pine Forest	649.11	15.14	9827.53
Warm Broadleaved Forest	45713.51	27.67	1264892.82
Evergreen Oak Forests	25042.14	38.07	953354.27
Cool Broadleaved Forest	26976.01	42.89	1157001.07
Blue Pine Forest	1311.56	23.14	30349.50
Spruce Forest	611.46	36.95	22593.45
Hemlock Forest	6530.31	46.51	303724.72
Fir Forest	7509.19	44.47	333933.68
Juniper Rhododendron Forest	1602.26	15.34	24578.67

2.5.1.6 Biomass Stock

The table 12 summarizes biomass stock across various forest types, indicating a total biomass and its distribution among different pools. The overall biomass is estimated at approximately 38.34 million tonnes, which includes 28.20 million tonnes of Above Ground Biomass (AGB), 7.39 million tonnes of Below Ground Biomass (BGB), 0.81 million tonnes of Coarse Woody Debris (CWD) and 1.94 million tonnes of litter.

Table 12. Biomass stock by forest types in million tonnes.

Pools		**AGB**	**BGB**	**CWD**	**Litter**
Total Biomass (tonnes)	million tonnes	28.20	7.39	0.81	1.94
Biomass by Forest types	**Forest area (ha)**	**AGB**	**BGB**	**CWD**	**Litter**
Subtropical Forest	24234.26	2.64	0.75	0.06	0.28
Chir Pine Forest	649.11	0.06	0.02	0.00	0.01
Warm Broadleaved Forest	45713.51	8.16	2.13	0.24	0.56
Evergreen Oak Forests	25042.14	6.29	1.63	0.07	0.30
Cool Broadleaved Forest	26976.01	7.07	1.83	0.23	0.46
Blue Pine Forest	1311.56	0.16	0.04	0.01	0.04
Spruce Forest	611.46	0.15	0.04	0.00	0.00
Hemlock Forest	6530.31	1.70	0.44	0.11	0.11
Fir Forest	7509.19	1.83	0.48	0.09	0.16
Juniper Rhododendron Forest	1602.26	0.12	0.03	0.00	0.01

Notably, the Warm Broadleaved Forest has the highest biomass, with approx. 28.2 million tonnes of AGB and 7.39 million tonnes of BGB, indicating its high productivity. On the contrary, the Spruce Forest exhibits the lowest biomass values, with only 0.15 million tonnes of AGB and 0.04 million tonnes of BGB.

2.5.1.7 Carbon Stock

An overview of carbon stock across various forest types within Dagana DFO is detailed in table 13, which provides comprehensive information on the carbon stock. A total carbon estimate of approximately 27.31 million tonnes. This total includes about 13.26 million tonnes of above-ground biomass (AGB), 3.47 million tonnes of below-ground biomass (BGB), 0.38 million tonnes of Coarse Woody Debris (CWD), 0.91 million tonnes of litter, and 9.30 million tonnes of Soil Organic Carbon (SOC).

Table 13. Carbon stock by forest types in million tonnes

Pools		AGB	BGB	CWD	Litter	SOC
Total carbon (million tonnes)		13.26	3.47	0.38	0.91	9.30
Carbon stock by Forest types	**Forest area (ha)**	**AGB**	**BGB**	**CWD**	**Litter**	**SOC**
Subtropical Forest	24234.26	1.24	0.35	0.03	0.13	0.84
Chir Pine Forest	649.11	0.03	0.01	0.00	0.01	0.02
Warm Broadleaved Forest	45713.51	3.84	1.00	0.11	0.26	2.52
Evergreen Oak Forests	25042.14	2.96	0.76	0.03	0.14	2.07
Cool Broadleaved Forest	26976.01	3.32	0.86	0.11	0.21	2.26
Blue Pine Forest	1311.56	0.08	0.02	0.00	0.02	0.06
Spruce Forest	611.46	0.07	0.02	0.00	0.00	0.06
Hemlock Forest	6530.31	0.80	0.21	0.05	0.05	0.61
Fir Forest	7509.19	0.86	0.22	0.04	0.08	0.72
Juniper Rhododendron Forest	1602.26	0.06	0.02	0.00	0.01	0.15

2.5.1.8 Biomass and Carbon Increment

The biomass and carbon increment across various forest types is presented in table 14 and table 15, highlighting significant annual increases in both carbon and biomass. The biomass increment is approximately 3,165,077.26 tonnes/yr, with a corresponding carbon increment of around 1,485,989.06 tonnes/yr. Among the forest types, the Warm Broadleaved Forest exhibits the highest total biomass increment of about 12,754,067.96 tonnes, with a per hectare increase of 2.79 tonnes/ha/yr.

Table 14. Biomass increment by forest types

	Biomass		Carbon
Annual Increment (tonnes/yr)	3165077.26		1485989.06
Biomass increment by Forest Types			
Forest types	**Forest area (Ha)**	**Biomass Increment (tonnes/ha/yr)**	**Total increment**
Subtropical Forest	24234.26	2.94	71248.7244
Chir Pine Forest	649.11	1.84	1194.3624
Warm Broadleaved Forest	45713.51	2.79	127540.6929
Evergreen Oak Forests	25042.14	0.77	19282.4478
Cool Broadleaved Forest	26976.01	2.13	57458.9013
Blue Pine Forest	1311.56	3.45	4524.882
Spruce Forest	611.46	3.2	1956.672
Hemlock Forest	6530.31	2.44	15933.9564
Fir Forest	7509.19	2.19	16445.1261
Juniper Rhododendron Forest	1602.26	0.58	929.3108

Similarly, it also demonstrates a substantial carbon increment of approximately 5,988,469.19 tonnes/yr. Conversely, the Juniper Rhododendron Forest shows the lowest increments, with only 92,930.98 tonnes/yr of biomass and 43,260.98 tonnes/yr of carbon.

Table 15. Carbon increment by forest types

Carbon Increment by Forest types	Forest area (Ha)	Carbon Increment (tonnes/ha/yr)	Total increment
Subtropical Forest	24234.26	1.38	33443.2788
Chir Pine Forest	649.11	0.86	558.2346
Warm Broadleaved Forest	45713.51	1.31	59884.6981
Evergreen Oak Forests	25042.14	0.36	9015.1704
Cool Broadleaved Forest	26976.01	1	26976.01
Blue Pine Forest	1311.56	1.62	2124.7272
Spruce Forest	611.46	1.51	923.3046
Hemlock Forest	6530.31	1.15	7509.8565
Fir Forest	7509.19	1.03	7734.4657
Juniper Rhododendron Forest	1602.26	0.27	432.6102

2.5.1.9 Carbon sequestration

The total carbon sequestration rate of Dagana Dzongkhag is 4.69 tonnes CO2 ha-1 yr-1, sequestering a total of 718,722.61 tonnes CO2 yr-1as reported in the NFI II. However, the carbon sequestration capacity of areas falling under Dagana DFI is estimated using the total area under forest and the sequestration rate of the different forest types as discussed in Table 14 above. Therefore, the total carbon sequestration capacity of DFO Dagana is 545,460.98 tonnes CO2 yr-1.

Area	Biomass Growth (tonnes)	Carbon Fraction	CO2 fraction/ equivalent	Total Carbon Sequestration (tonnes CO2)
DFO, Dagana	316515.08	0.47	3.67	545460.98

This significant capacity for carbon uptake reflects the health and productivity of the forest ecosystems managed by the office. Effective management practices and conservation efforts have fostered an environment conducive to enhanced carbon storage, playing a vital role in climate change mitigation. The continued focus on sustainable forest management will be essential in maintaining and potentially increasing these carbon sequestration rates, benefiting both local biodiversity and global climate health.

2.5.1.10 Key Flora and Fauna Species

With 88.51 % of its total area under forest coverage, the Division is home to a rich diversity of flora and fauna, harboring several globally threatened species, underscoring the ecological significance of the area and the necessity for enhanced conservation efforts. The presence of these species highlights the importance of ongoing and future initiatives to protect and preserve the biodiversity.

Conserving globally threatened species is crucial as they are at the risk of extinction and play vital roles in maintaining ecological balance. Their loss can lead to cascading effects that disrupt ecological stability and biodiversity. While it is essential to prioritize the conservation of threatened species due to their immediate risk of extinction, it is also important to conserve species classified as least concern. These species, although not currently endangered, contribute significantly to ecosystem functionality and resilience.

Effective conservation strategies should, therefore, include measures to protect both high-risk species and those not presently under threat, ensuring long-term ecological health and biodiversity. By adopting a comprehensive approach to conservation, we can safeguard the diverse ecology, supporting both threatened and least concern species. This dual approach not only addresses the immediate risks faced by endangered species but also strengthens the overall ecosystem, promoting stability and resilience across the region.

Mammals

Among 49 species of wild mammals observed through the National Tiger Survey (2022), Rapid Biodiversity Survey (2023), and other wildlife surveys, 21 are globally threatened. The Division is home to one critically endangered mammal, six endangered, and eight vulnerable species of mammals, as shown in the table below:

Table 17. Globally threatened mammals under DFO, Dagana

Sl. No.	Common Name	Scientific Name	IUCN Status	Year of Assessment
1	Himalayan Red Panda	*Ailurus fulgens*	Endangered	2015
2	Himalayan Serow	*Capricornis sumatraensis*	Vulnerable	2020
3	Gaur	*Bos gaurus*	Vulnerable	2016
4	Asiatic Wild Dog (Dhole)	*Cuon alpinus*	Endangered	2015
5	Sambar	*Rusa unicolor*	Vulnerable	2015
6	Asian Elephant	*Elephas maximus*	Endangered	2020
7	Tiger	*Panthera tigris*	Endangered	2020
8	Clouded Leopard	*Neofelis nebulosa*	Vulnerable	2016
9	Common Leopard	*Panthera pardus*	Vulnerable	2020
10	Snow Leopard	*Panthera uncia*	Vulnerable	2017
11	Hispid Hare	*Caprolagus hispidus*	Endangered	2019
12	Chinese Pangolin	*Manis pentadactyla*	Critically Endangered	2019
13	Himalayan Musk Deer	*Moschus leucogaster*	Endangered	2016
14	Himalayan Black Bear	*Ursus thibetanus*	Vulnerable	2016
15	Black Panther	*Panthera onca*	Vulnerable	2020

Birds

About 300 species of birds are observed within the jurisdiction of DFO, Dagana. The RBA report (2023) could make a checklist of 115 species, while the data maintained by the field staff indicated more than 300 species of avifauna.

Figure 11. Critically endangered WBH sighted at Homa confluence

The following species are listed as vulnerable, endangered and critically endangered as per IUCN red list of categories:

Table 18. Globally threatened birds of DFO, Dagana

Sl. No.	Common Name	Scientific Name	IUCN Status	IUCN Assessment Year
1	White-bellied Heron	*Ardea insignis*	Critically endangered	2007
2	Great Hornbill	*Buceros bicornis*	Vulnerable	2020
3	Rufous-necked Hornbill	*Aceros nepalensis*	Vulnerable	2020
4	Wreathed Hornbill	*Rhyticeros undulatus*	Vulnerable	2018
5	Steppe Eagle	*Aquila nipalensis*	Endangered	2015

Fishes

Out of 60 recorded species of fishes recorded from DFO, Dagana, Tor putitora, and Pterocryptis barakensis are endangered, while Devario assamensis and Schizothorax richardsonii are vulnerable.

Table 19. Globally threatened fishes of DFO, Dagana

Sl. No	Species	Family	Conservation Status	IUCN Assessment Year
1	*Tor putitora*	Cyprinidae	Endangered	2010
2	*Devario assamensis*	Cyprinidae	Vulnerable	2009
3	*Schizothorax richardsonii*	Cyprinidae	Vulnerable	2010
4	*Cyprinus carpio*	Cyprinidae	Vulnerable	2012
5	*Pterocryptis barakensis*	Siluridae	Endangered	2010

Flora

A total of 491 species of flowering plants were documented within the Division. Among these, Agarwood (Aquilaria malaccensis) is classified as critically endangered, while Teak (Tectona grandis) is categorized as endangered according to the IUCN Red List. The orchid species known as Fairrie's Paphiopedilum (Paphiopedilum fairrieanum) was observed by field staff during the field work, is critically endangered and it is protected as schedule I species under Forest and Nature Conservation Act of Bhutan, 2023.

Table 20. Globally threatened flora under DFO, Dagana

Sl. No.	Common Name	Scientific Name	IUCN Status	IUCN Assessment Year
1	Agarwood	Aquilaria malaccensis	Critically Endangered	2018
2	Teak	Tectona grandis	Endangered	2021
3	Fairrie's Paphiopedilum	Paphiopedilum fairrieanum	Critically Endangered	2014

2.5.2 Function Mapping

Forest function mapping is vital for numerous reasons, particularly its contribution to biodiversity conservation by identifying and protecting critical habitats. It supports sustainable resource management by pinpointing areas appropriate for resource extraction without compromising ecological integrity. Furthermore, this mapping preserves essential ecosystem services such as water regulation, soil stabilization, and carbon sequestration that are crucial for both environmental health and human well-being. It plays a significant role in climate change mitigation by identifying regions with high carbon storage potential and enhances disaster risk reduction by clarifying the protective functions of forests. Economically, forest function mapping fosters sustainable benefits for

local communities through eco-tourism and resource harvesting, while also informing effective forest management policies and land use plans that balance ecological, social, and economic priorities. In the context of the Divisional Forest Office management plan, this mapping is especially important as it guides decision-making processes, ensures that areas not currently under management are considered, and aligns with the codes of best management practices to enhance overall forest stewardship and sustainability.

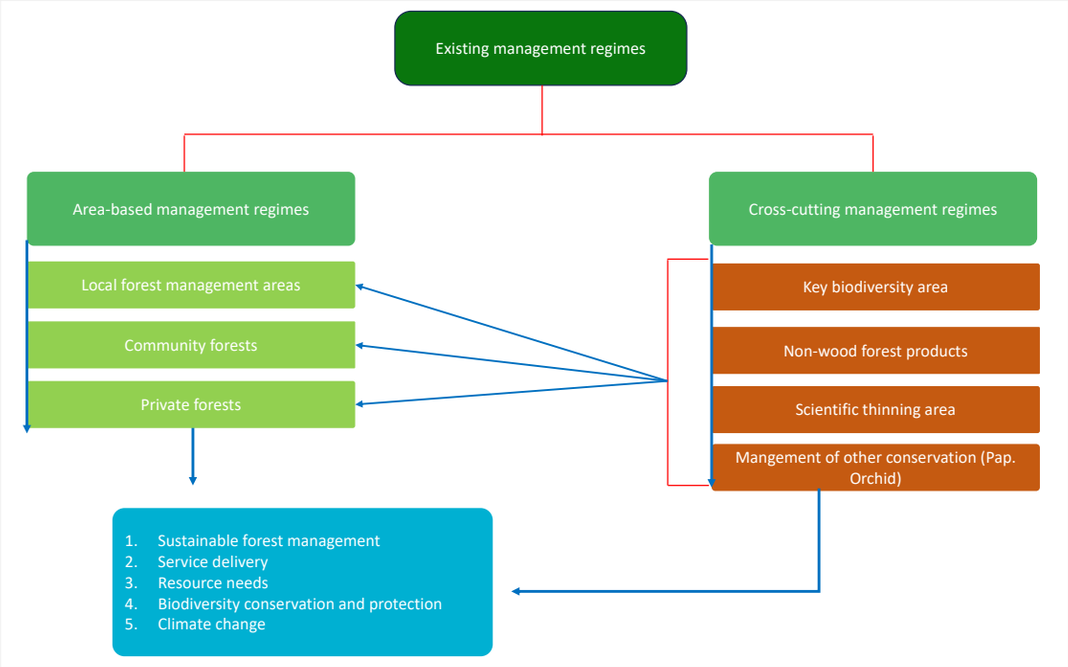


Figure 12. Thematic representation of existing management regimes

2.5.2.1 Area under Existing Management Regimes

The management regimes such as Key Biodiversity Areas (KBA), Non-Wood Forest Products (NWFP) collection areas, Community Forests (CFs), Local Forest Management Area (LFMA), and Scientific Thinning Areas are essential for ensuring effective forest conservation and sustainable management practices. The Division can strategically plan and implement management activities that promote biodiversity conservation, optimize resource use, and enhance community involvement. This approach not only facilitates the protection of critical habitats but also supports local livelihoods through sustainable practices aligned with ecological integrity.

Table 21. Areas under existing management regimes

Sl. No	EMR	Area ha
1	CF	3454.17
2	LFMA	15155.53
3	KBA	916.58
4	Scientific thinning	45036.99
5	NWFP collection area	809.06
6	Pap. Orchid area	4.57

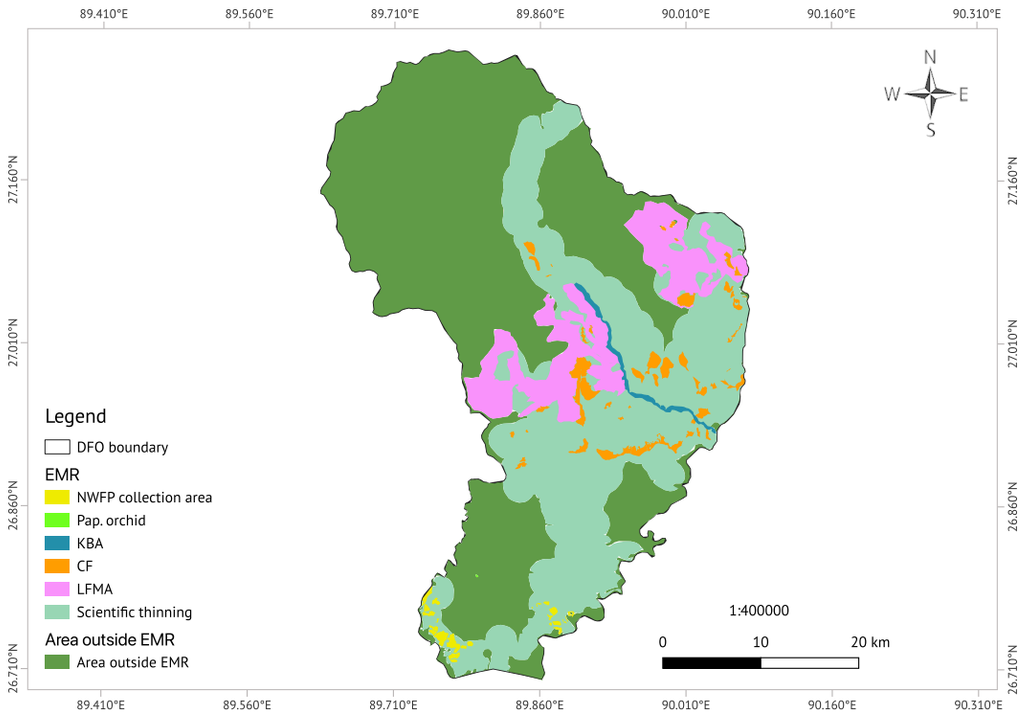


Figure 13. Area under existing management regimes

2.5.2.2 Management Circles outside Existing Management Regimes

The figure 13 and table 22 outlines the area statements for the management and working circles within the Division. The total area of the division is 1,58,384.19 ha, with management circles designated for various purposes. Within the management circles covering the entire area, the protection circle encompasses 13,853.85 ha, the production circle spans 1,31,010.02 ha, and the non-production circle covers 13,520.68 ha, totaling to 1,58,384.55 ha. Additionally, the management circles outside existing regimes include a protection circle of 8,650.42 ha, a production circle of 1,26,083.64 ha, and a non-production circle of 6,618.63 ha, amounting to 1,41,352.69 ha. This structured categorization facilitates targeted management practices, ensuring the sustainable use and conservation of forest resources.

Table 22. Management circles outside existing management regimes

Management and Working Circles	Area (ha)
Area of Division	158574.19
Management Circles for whole area	
Protection circle	13853.85
Production circle	131010.02
Non-production	13520.68
Total	**158384.55**

Management circle outside existing management regimes	
Protection circle	8650.42
Production circle	126083.64
Non-production	6618.63
Total	**141352.69**
EMR	**17031.86**

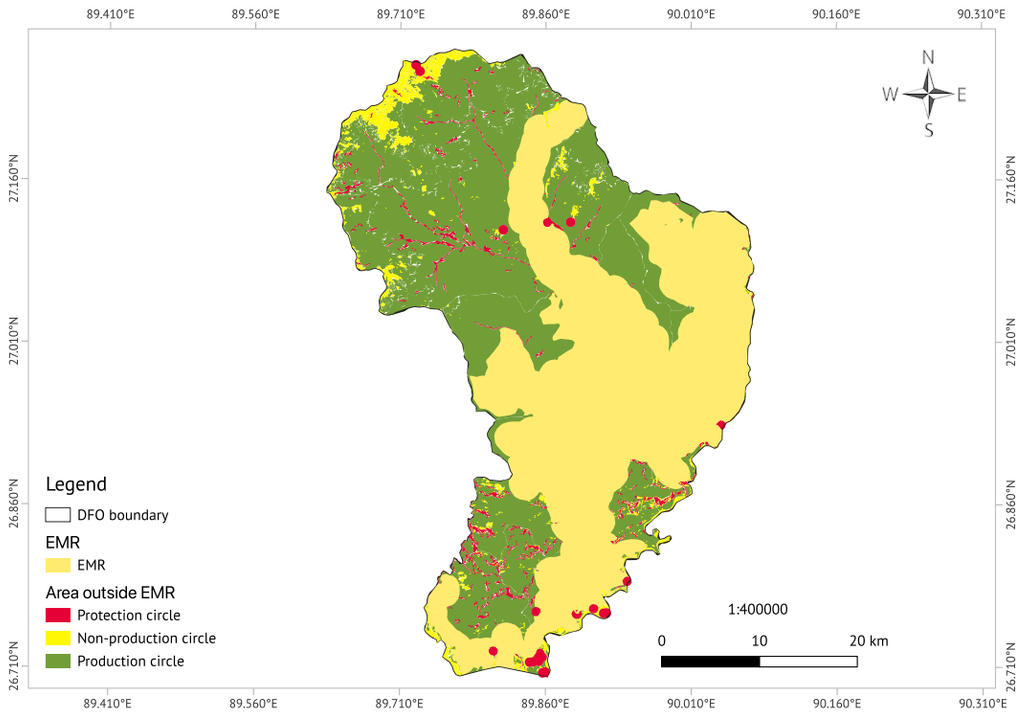


Figure 14. Forest function map showing the management circles

A) Production Circle

The production area outside existing management regimes comprises various forest types, covering a total of 1,31,010.02 ha. The forest broadly calculated as production area includes 21,883.59 ha conifer forests and 1,09,126.43 ha of broadleaved forests. The diverse composition of these forest types underscores the potential for sustainable resource management and production outside the established management areas, emphasizing the importance of integrating these regions into broader conservation and utilization strategies.

The Annual Allowable Cut (AAC) is calculated for area identified as potential production areas using formula:

$$AAC(m^3) = \frac{Net\ Operable\ Area}{Rotation\ Age} \times \left(\frac{Average\ Volume}{ha}\right)$$

Where:

1. Rotation age: 130 years (Rotation age: 120 years + 10 years-Regeneration period)
2. Average volume/ha is considered 276.17 m3/ha for DFO, Dagana.

The total Annual Allowable Cut (AAC) that can potentially be extracted from the production area of 126,083.64 ha is 187,495.102 cubic meters for both commercial and rural use.

B) Protection Circle

The protection circles formulated within the Division encompass several critical areas, ensuring the conservation of vital ecological functions. The Soil Protection circle spans 3766.80 ha, focusing on areas with slopes exceeding 45 degrees, which are crucial for preventing erosion and maintaining soil stability. The Major River and Streams Buffer cover 8136.37 ha, with a designated buffer of 30 meters to safeguard water quality and aquatic ecosystems. Additionally, the Water Sources Buffer, measuring 186.61 ha, also adheres to a 30-meter buffer zone to protect essential water resources. Lastly, the Cultural Protection Buffer, encompassing 1764.07 ha, is set at a 500-meter radius to preserve areas of cultural significance. These carefully delineated buffers play a vital role in promoting ecological integrity and protecting natural resources in the region.

Table 23. Protection circles

Sl. No	Protection circles	Area (ha)
1	Soil protection	3766.80
2	Religious site protection	8136.37
3	Water source protection	186.61
4	River and stream protection	1764.07
		13853.85

C) Non-Production Circle

The non-production circles identified within the Division comprise of various land classes. These areas include 807.48 ha alpine scrubs, 42.95 ha built-up land, 4,497.20 has cultivated land, and 245.03 ha by landslides. Additionally, the non-production circles encompass 1,562.96 ha meadows, 15.21 ha non-built-up land, 236.86 ha rocky outcrops, and 3,473.44 ha shrubs. Water bodies cover a total area of 770.55 ha.

Table 24. Non-production circle

Sl. No	Non-production circles	Area (ha)
1	Alpine Scrubs	807.48
2	Built up	42.95
3	Chhuzhing	1168.49
4	Kamzhing	3063.70
5	Lake	6.81
6	Landslides	251.28
7	Meadows	2218.02
8	Non-Built up	5.94
9	Orchards	448.29
10	Rivers	1091.26
11	Rocky Outcrops	364.04
12	Shrubs	4052.42
		13520.68

2.5.3 Forest Resource Utilization

The Division is responsible for managing forest resources within Dagana district. Its primary function is the allocation of these resources to the public residing in the 13 Gewogs (administrative regions) of Dagana. Beside the resource allocation, the Division also facilitates the import and export of forest products as it shares its boundary with India. This additional function contributes to the economic activity within the Division. The Forest resource utilization is detailed below in table 25.

Table 25. Forest resource utilization details for DFO Dagana

Sl. No	Resources Allotted	Year	Quantity	Unit	Remarks
1	Volume of Commercial Timber Allotted	2019	126.93	m^3	Commercial timber allotted for different purpose upon realizing commercial royalty (for const. of Lhakhang, ad-hoc area activities- NRDCL, Lhakhang and dzong construction)- allotted-710.9 m^3
		2020	5.05		
		2021	7.7		
		2022	45.82		
		2023	525.4		
2	Volume of Rural Timber Allotted	2019	4007.71	m^3	For New House Construction allotted; 4376.56 m^3 for 147 applicants. Renovation/Extension: 2596.13 m^3 for 225 applicants.
		2020	1225.56		
		2021	1346.76		
		2022	209.47		
		2023	183.27		

3	Rural/commercial firewood	2019	3719.8	m^3	Firewood for rural purpose; 10,940.24 m^3 for 586 applicants, Firewood for funeral purpose-25 m^3 Commercial - 1772.3 m^3
		2020	2187.5		
		2021	516		
		2022	990.04		
		2023	3526.9		
4	Chadri purpose	2019-23	0.34	m^3	For domestic purpose
5	Fencing post	2019-2023	244.09	m^3	Fencing post allotted year wise; 2019-81.48 m3 2020-76.76 m3 2021- 9.56 m3 2022- 45.12 m3 2023-31.17 m3
6	Flag poles	2019-2023	258.26	m^3	Allotted flag poles; rural- 2020-7.54 m3 2021-12.27 m3 2022- rural 38.65 m3 2023- 104 m3 (rural), 47.9 m3(comm.)
7	Livestock shed new const./ renovation (cattle/piggery/poultry)	2019	19.32	m^3	Allotted timber for livestock shed const./repair- 43.6 m^3. Allotted for domestic market
		2020	8.42		
		2021	12.1		
		2022	0.68		
		2023	3.08		
8	Toilet and other const. (watch tower, furniture, khamey, farm guard)	2019	18.51	m^3	Allotted timber for toilet/others construction- 136.67 m^3. Allotted for domestic market
		2020	93.21		
		2021	22.12		
		2022	2.83		
		2023	0		
9	Timber allotted (Removal of forest produce from Pvt. land)	2023	2016.76	m^3	**Particular** / **Sum of M3** Cham: 13.19 Dangchung: 2.38 Drashing: 1885.62 Poles (0-6'): 75.12 Poles (12’1” to 17’11”): 25.88 Poles (18’ and over): 9.23 Poles (6'1"-12'): 0.17 Tsim: 5.17 Grand Total: 2016.76

10	Mushroom billet	2019-2023	9.46	m^3	Allotted billets for rural-3.36 m3 & commercial-6.1 m3
11	Bakal	2019-2023	26.93	m^3	Allotted Bakal for Commercial- 21.1 m3, rural-5.07 m3 2020-160 nos.
12	Aggregates	2019-2023	107	TL	For domestic purpose (surface collection)
13	Boulder (rock fragment with size greater than 25.6 cm (10.1 in) in diameter.)	2019	81	TL	Allotted for domestic market & export- 1013 TL
		2020	85		
		2021	39		
		2022	82		
		2023	726		
14	Clay soil	2019-2023	8	TL	Allotted for domestic market
15	Gravels	2023	4892	TL	Allotted 7165 TL for domestic market
		2022	-		
		2021	1045		
		2020	411		
		2019	817		
16	Sand	2023	1798	TL	Allotted for domestic market
		2022	555		
		2021	1094		
		2020	1964		
		2019	1605		
17	Stone	2023	1551	TL	Allotted for domestic market
		2022	329		
		2021	1199		
		2020	883		
		2019	1110		
18	Stone Dust	2019-2023	1	TL	Allotted for domestic market
19	Stone chips	2022	94	TL	Allotted for domestic market
		2021	253		

		2020	46		
		2019	78		
20	Beetle nut	2019-23	5	kg	Allotted for domestic market
21	Charcoal	2019-2023	510	kg	Allotted for domestic market
22	Ferns	2020-2023	6420	kg	Allotted for domestic market
23	*Oroxylum indicum* (Flower)	2019-2023	50	kg	Allotted for domestic market
24	Small bamboo	2019-2023	4611	Nos.	Allotted for domestic market
25	Leaf mould	2019-2023	5	TL	Allotted for domestic market
26	*Cymbidium* sp (Olatshey)	2021	110	Bundle	Allotted for domestic market
27	Top soil	2023	79	TL	Allotted for domestic market
		2021	138		
		2020	66		
		2019	66		
28	Bamboo mat	2023	100	Pcs	Allotted for domestic market
29	Bambusa spp (*Bambusa alamii Bambusa clavata Bambusa multiplex, B.nutans, B.vulgaris,* Dendrocalamus spp)	2023	5402	Nos.	Allotted for commercial/ domestic purpose
		2021	8775		
		2020	6480		
		2019	4159		
			680	TL	
30	*Calamus acanthospathus*	2019-2023	13	Pcs	Allotted for domestic market
31	*Phellinus linteus (Mulberry Mushroom)*	2019-2023	610	Kg	Allotted for domestic market
32	*Pinus roxburghii (Khotey salla, thangchuu) needle*	2019-2023	3	TL	Allotted for domestic market

33	*Pinus walliciana needles*	2019-2023	4	TL	Allotted for domestic market
34	*Piper* spp *(P. nigrum, P.longum,P. pedicellrtum*	2023	447	kg	Allotted for domestic market
		2022	555		
		2020	252		
35	*Plectocomia himalayana* (Patsha)	2019-2023	105	bundle	Allotted for domestic market
36	*Pouzolzia* spp. *(*Chipley, yongjiba, yangziba or yongeebu*)*	2023	1020	kg	Allotted for commercial purpose
		2020	950		
		2021	200		
37	*Rubia cordifolia* (Rubia, majito, tsoy)	2023	1600	kg	Allotted for commercial purpose
38	*Rubus biflorus*	2023	1000	kg	Allotted for commercial purpose
39	*Picorrhiza* spp	2021	110	kg	Allotted for domestic market
40	*Tupistra nutans* (Ground orchid, wang pemo, wang pem, nakima, shan khuley)	2019-2023	15	kg	Allotted for domestic market
41	*Thysanolaena* spp. (Tsakusha, kucho, amleso)	2019-2023	82	Bundle	Allotted for domestic market
42	FC issued in SRF for Developmental Activities	2023	487.637	acres	Included new farm road construction, Approached Road, chain-linked fencing, Ecotourism trail development, archery range, Const. of Government quarter, Const. of transmission line, land lease, land exchange, Telecom tower, water pipeline, land substitution, surface collection Religious site trail development.
		2022	31.59	acres	
		2021	39.7	acres	
		2020	8890.76	acres	
		2019	104.13	acres	

43	SRF Land Destroyed by Forest Fires	2019	0	ha	SRF land destroyed by forest fires
		2020	0		
		2021	0		
		2022	0		
		2023	93.89		

Notes: T/L: Truckloads, NWFP: Non-Wood Forest Products, SRF: State Reserved Forest

The Division plays a crucial role by managing the wood-based industries, ensuring a sustainable supply of raw materials. As of 2023, there are 11 primary wood-based industries (two sawmills and nine furniture units) with the jurisdiction of the Division, adding value to raw wood through processing and manufacturing. The wood-based industries can be environmentally sustainable when managed correctly. Sustainable forestry practices and recycling initiatives help ensure that wood resources are used responsibly, promoting biodiversity and reducing carbon footprints. The Division have registered one primary and eight secondary wood-based industries as tabulated in table 26.

Table 26. WBIs under the Division

Category	Type	Status	Numbers
Secondary	Furniture Unit	Operational	8
Primary	Wood Handicraft Units and WBIs	Operational	3
		Total	**11**

To ensure a long-term supply for these industries, the Division collaborates with local communities, fostering sustainable forestry practices through the establishment of Community Forests (CFs) and Non-Wood Forest Products (NWFP) management groups. As of 2025, 35 CFs and 3 NWFP management groups are in operation within the division. Additionally, two local forest management plans with a ten-year tenure are approved and under implementation as shown in table 27 and 28. These initiatives promote the responsible use of forest resources and contribute to the region's economic well-being.

Table 27. Potential supply of timber from Local Forest Management area of Kana Gewog

Product	Total Production Potential	Silvicult. Annual Potential	Sustainable Annual Supply Potential*	Annual
Demand				
Drashing/shingleps	180750	18075	533	97
Chams	112640	11264	332	24
Tsims	122184	12218.4	360	0
Poles	485419	48541.9	1432	0

The Annual Allowable Cut for the Kana LFMA is fixed at 23428 m3

Table 28. Potential supply of timber from Local Forest Management area of Lajab Gewog

Product	Total Production Potential	Silvicult. Annual Potential	Sustainable Annual Supply Potential*	Annual
Demand				
Drashing/shingleps	73962	7397	47	30
Chams	66804	6680	43	10
Tsims	48409	4840	42	0
Poles	58466	5847	51	0

The Annual Allowable Cut for the Lajab LFMA is fixed at 10,311 m3

2.6 Local People and Livelihood

2.6.1 Demography

Dagana district is home to a diverse population. The Population and Housing Census of Bhutan (PHCB, 2017) reported a total population of 24,531 individuals residing in about 5,600 households. The population distribution shows a slightly higher proportion of males (12,714) to females (11,817). The population is predominantly rural (19,818), with only a small fraction residing in urban areas (4,713).

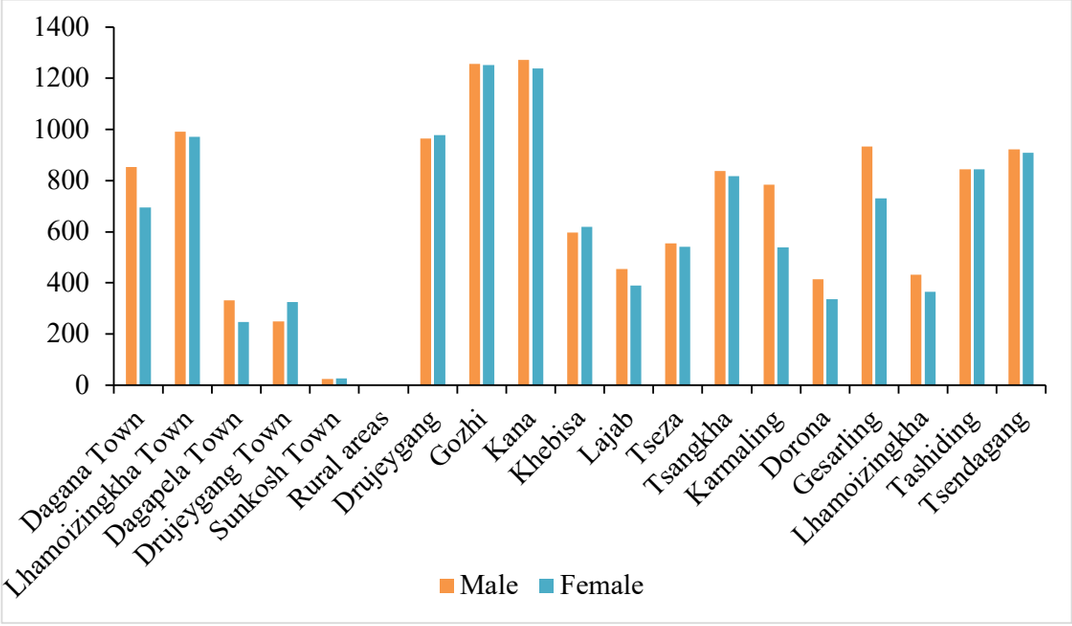


Figure 15. Gender structure of urban areas and rural areas under DFO, Dagana

As shown in figure 16, among the urban dwellers, Lhamoizingkha town has the highest population (1961), while Sunkosh town is being resided by only 52 people, making it the least settled urban area in the district. Similarly, with 2510 population, Kana gewog has the highest population, while Dorona gewog has the lowest (752).

The population age-sex structure reveals a youthful demographic, with a substantial proportion of the population below the age of 19 as shown in figure 17. The sex ratio stands at 107.9 males for every 100 females, which is indicative of a relatively balanced gender distribution. The working-age population (15 years and above) in Dagana is 17,941 individuals.

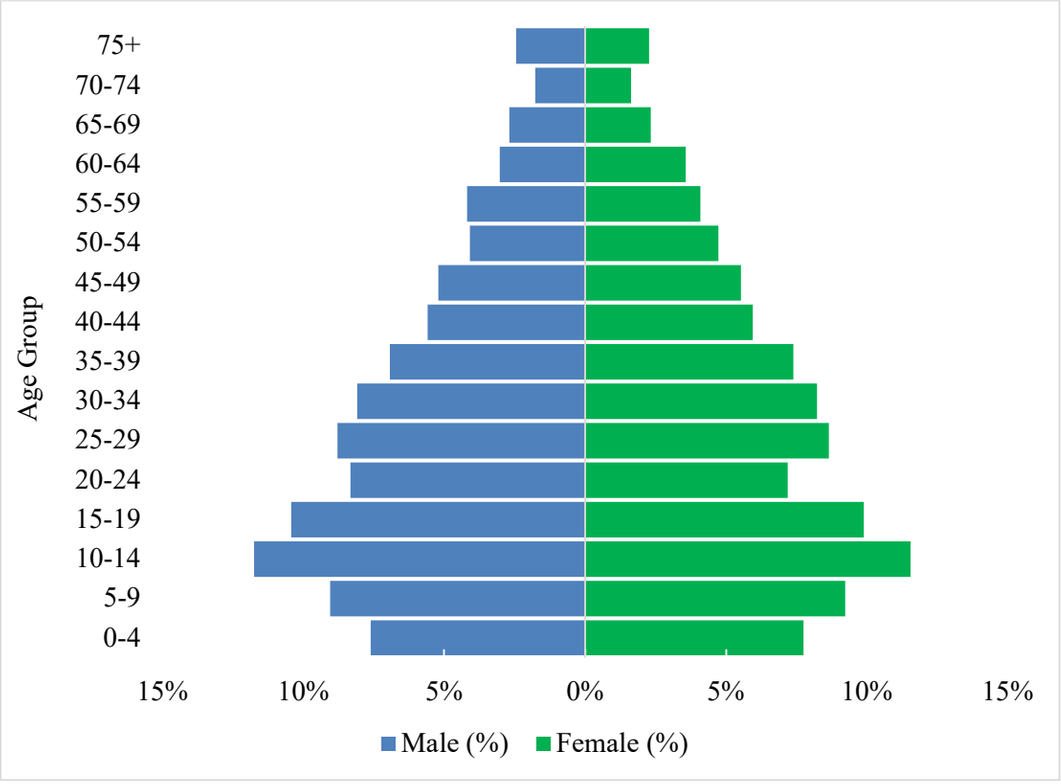


Figure 16. Age distribution of population under DFO, Dagana

2.6.2 Literacy

As per the Social-economic survey (SES) conducted in 2023, approximately 58.45 % of the population within Division were found to be illiterate, followed by 19.48 % with primary level of education and non-formal education (8.29 %). Only 2.76 % had the tertiary level of education, while 2.28 % of the population has formal monastic education and lay monk (Figure 18). A significant portion of the population is illiterate, with only a small percentage reaching tertiary or monastic education levels.

The high illiteracy rate (58.45%) and the predominantly male-headed households indicate limited capacity for knowledge dissemination and adaptive strategies that are essential for climate resilience. Enhancing education levels, particularly among women, could increase community capacity to respond to climate-related challenges.

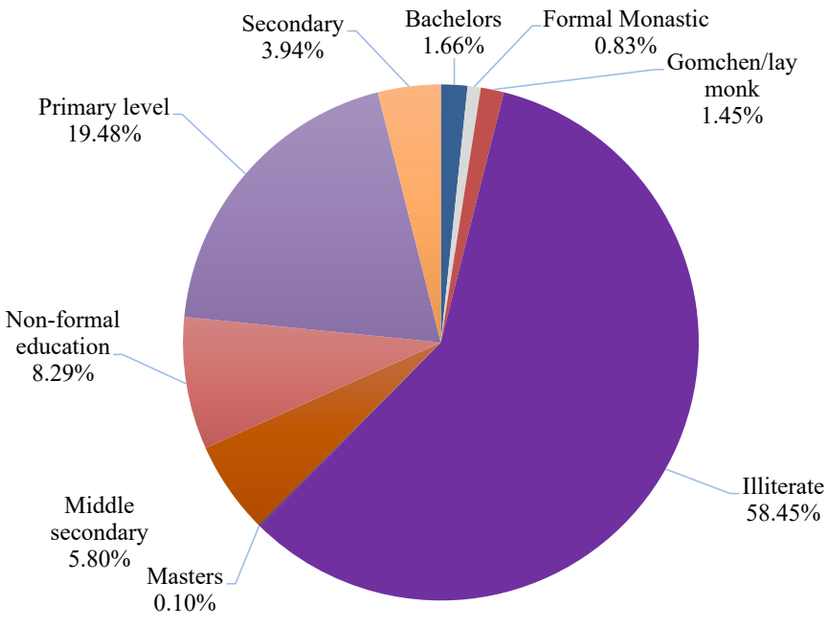


Figure 17. Literacy level of people of Dagana

2.6.3 Landholding

The landholdings within Division are categorized into Chhuzhing (wet land), Kamzhing (dry land), kitchen gardens, orchards, and Kidu land (user certificates). The SES conducted in 2023 yielded a collective land ownership by local communities summing up to 3,194.73 acres, distributed among 965 households with each household owning an average of 3.32 acres of land. Kamzhing, used primarily for cereals and dry crops, constitutes 68.34% of the total land area. Chhuzhing, essential for rice cultivation, accounts for 28.57%. The remaining 3.09% of the land constitutes kitchen gardens, orchards, and Kidu land (land with user certificates) as shown in table 29. This land distribution aids both agricultural productivity and community welfare, emphasizing sustainable land management practices in the Division.

Table 29. Landholding categories

Landholding categories	Areas (acres)	Areas (%)
Chhuzhing	675.03	21.13
Kamzhing	2358.01	73.81
Kidu land (Land User Certificate)	10.09	0.32
Kitchen Garden	14.46	0.45
Orchard	137.14	4.29
Grand Total	**3194.73**	**100.00**

2.6.4 Agricultural Management and Challenges

Farmers primarily grow vegetables such as ginger, potato, chillies, cabbage, cauliflower, radish, garlic, saag (leafy greens), onion, pumpkin, chayote, brinjal (eggplant), cucumber, beans, and bitter gourd. Additionally, horticultural crops such as mandarins (orang-

es), bananas, avocados, cardamom, mangoes, guavas, lemons, and passion fruit, which are solely grown as cash crops. Varieties of cereals, including rice, maize, millet, sweet buckwheat, bitter buckwheat, wheat, barley, pulses (beans), mustard, dhal (lentils), and others are also cultivated by the communities. Among these cereals, maize is the most widely cultivated cereal. These crops and vegetables are essential for the local economy and food security, and they are directly influenced by the climatic conditions in the region (SES & CVCA, 2023).

However, several issues threaten agricultural productivity, including crop raid by wildlife, inadequate rainfall, a lack of water, a lack of labor, soil erosion and landslides, new or increased crop pests and diseases, windstorms, an increase in invasive weeds, deteriorating soil quality, and unpredictable rainfall.

2.6.5 Source of Income

The SES conducted in 2023 found that 77.82 % of the population depend solely on agriculture as their main source of income. However, alongside agriculture, the communities engage in rearing livestock and bees, business, sales of NWFPs and timber extracted from registered land, horticulture, labor wages, and tourism as shown in figure 18. Additionally, the communities have other sources of income beyond on-farm activities, such as salaries, remittances from family members abroad, carpentry work, vehicle hiring, performing rituals, contract work, support from children and family, and pensions.

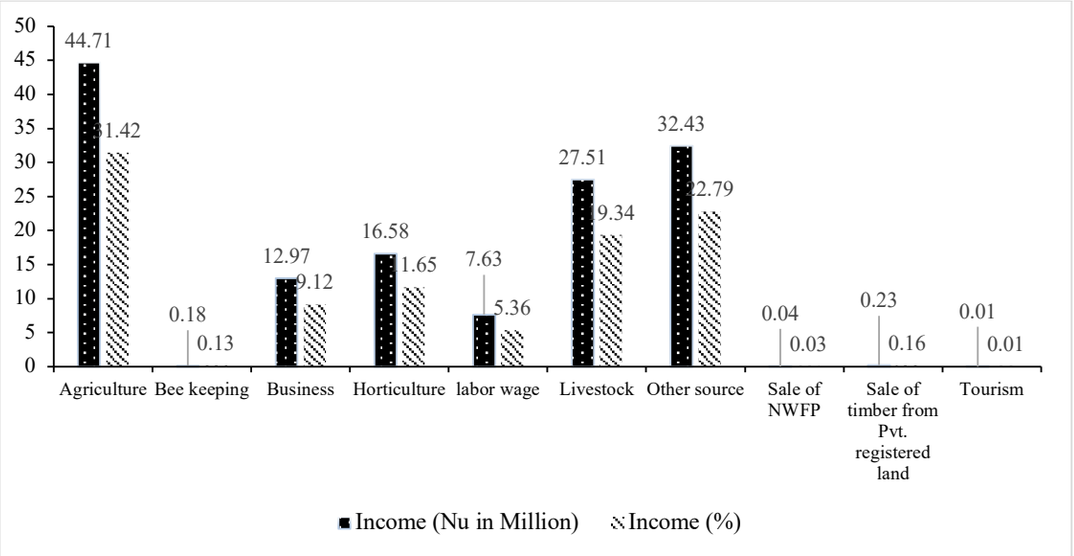


Figure 18. Sources of income

2.6.6 Livestock Management and Challenges

Livestock also serves as a key economic asset for rural households, enabling income generation and enhancing resilience against climate and economic shocks (RGoB, 2022; Dorji & Wangchuk, 2021). The SES (2023) recorded that in Dagana, livestock such as poultry, cattle, goats, sheep, pigs, and horses are being reared in the communities. Besides, the advancement and the supports from the government have led to increasing numbers of livestock mostly raised for commercial purposes. Poultry, fisheries and piggeries (figure 19) are some of the livestock farming which the communities have adopted to support their family.

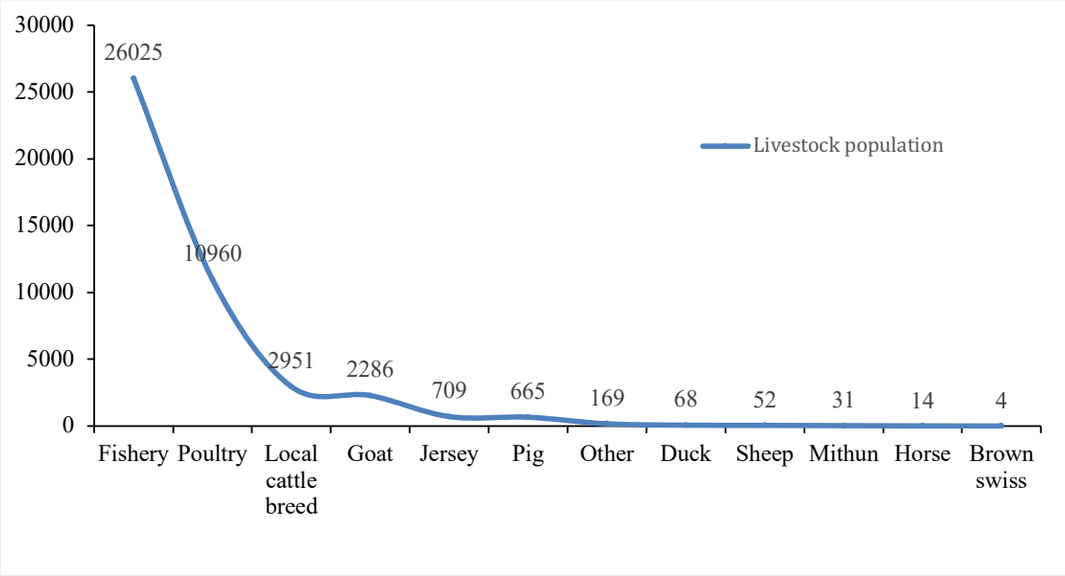


Figure 19. Numbers of livestock reared by the communities

Inadequate livestock support services, insufficient fodders and grazing land, loss to wild predators, pests and diseases, poor quality local breeds, labor and water shortages, and others have remained as the challenges in the communities depending on livestock.

2.6.7 Ethnobotanical Practices

Locals use of medicinal plants as is one of the most accessible and economical ways to cure a variety of illnesses and conditions (Sherub et al., 2021). The people of Dagana district possess rich ethno-medicinal knowledge; however, such indigenous practices are now only occasionally observed, primarily by the elderlies. Therefore, there is a concern with the possible extinction of their indigenous knowledge. A list of ethno-medicinal plants used by the people of Dagana are given below in Table 30.

Table 30. List of ethno-medicinal plants used by local people of Dagana

Sl. no.	Scientific Name	Family	Ethno-Medicinal Uses	Parts Used	Methods of Preparation
1	*Adhatoda vasica L.*	Acanthaceae	Relieving pain in joints	Stem and root	Crush and apply as poultice on the affected parts.
2	*Acorus calamus L.*	Acoraceae	Treatment of food poison	Root	Root is crushed into paste and taken orally.
3	*Sambucus sp. Wall. ex DC.*	Adoxaceae	Building immune system and treatment of constipation	Berries and flower	Raw berries and flowers are chewed.
4	*Allium sativum L.*	Amaryllidaceae	Treatment of diabetes and high blood pressure	Bulb	Bulb is crushed into paste and drank after mixing with hot water.
5	Rhus chinensis Mill.	Anacardiaceae	Treatment of diarrhea, dysentery, and cough	Fruits	Raw fruits are eaten or made into paste and taken orally.

6	*Coriandrum sativum L.*	Apiaceae	Treatment of constipation and diarrhea	Leaves	Crushed and drink the juice.
7	*Colocasia esculenta L. Schott*	Araceae	Relieving cough and fever	Rhizome	Rhizome is eaten raw.
8	*Tupistra aurantiaca (Baker) Wall. ex Hook. f.*	Asparagaceae	Relieving intense stomach ache	Flowers	Drink the decoction from flowers.
9	*Ageratina adenophora Spreng. R.M.King & H.Rob.*	Asteraceae	Blood coating and healing of cut wound	Leaves	Crush and apply the juice gently on the wound.
10	*Ageratum conyzoides L.*	Asteraceae	Blood coating and healing of cut wound	Leaves	Crush and apply the paste on affected area.
11	*Artemisia vulgaris L.*	Asteraceae	Cough relief and blood coating of cut wound	Stem and leaves	Crush and drink the liquid or apply on cut wound.
12	*Bidens pilosa L.*	Asteraceae	Treatment of external wounds and inflammation	Whole plant	Fresh plant is crushed, and paste is applied.
13	*Chromolaena odorata (L.) R.M.King & H.Rob.*	Asteraceae	Healing of wound and skin disease	Leaves and stem	Crush and apply on affected parts.
14	*Chrysanthemum sp.*	Asteraceae	Relieving headache	Leaves	Paste of fresh leaves is soaked in hot water for 1-2 hours and drank.
15	*Gynura nipalensis DC.*	Asteraceae	Treatment of cut wounds and diabetes	Leaves	Paste is applied on wounds; decoction from leaves is drank.
16	*Smallanthus sonchifolius (Poepp.) H.Rob*	Asteraceae	Treatment for lowering fat and blood pressure	Tuber	Tuber can be eaten directly.
17	*Xanthium indicum J. Koenig*	Asteraceae	Treatment of wound	Seeds	Poultice of seeds is applied on the wound.
18	*Calamus acanthospathus Griff.*	Arecaceae	Healing wound and fever	Whole plant	Smash and apply on wound or forehead.
19	*Aloe vera (L.) Burm.f.*	Asphodelaceae	Treatment of ulcers	Whole plant	Gel is squashed and applied on the body.
20	*Begonia sp.*	Begoniaceae	Relieving headache	Flowers and leaves	Crush flower and leaves, rub gently on forehead.
21	*Mahonia nipalensis DC.*	Berberidaceae	Treatment of dysentery and sore pain	Root, stem, and fruits	Decoction of root, stem, or fruits (or eaten raw) is drunk.
22	*Alnus nipalensis D.Don*	Betulaceae	Healing of burns	Bark	Crush and juice is applied on affected areas.
23	*Brassica juncea (L.) Czern.*	Brassicaceae	Relieving headache	Leaves and stem	Crush and apply the paste on head.
24	*Raphanus raphanistrum L.*	Brassicaceae	Treatment of snake poison	Root	Root is eaten raw to neutralize poison.
25	*Cannabis sativa L.*	Cannabaceae	Treatment of fungal infection/ringworm	Stem and leaves	Crush and apply the juice on infected parts.

26	*Terminalia chebula Retz.*	Combretaceae	Treatment of cough and cold	Fruits	Fruits are directly eaten.
27	*Cascuta reflexa Roxb.*	Convolvulaceae	Curing of jaundice	Whole plant	Crush and drink juice.
28	*Cupressus cashmeriana Royle ex Carrière*	Cupressaceae	Treatment of scabies	Stem	Portion of stem is burned, and coal is applied on affected area.
29	*Dioscorea hamiltonii Hook.f.*	Dioscoreaceae	Treatment for snake bite	Stem	Bind the stem above the bitten area to restrict blood flow.
30	*Gaultheria fragrantissima Wall.*	Ericaceae	Treatment of cough and stomach problems	Leaves and fruits	Drink the juice prepared from leaves or chew fruits raw.
31	*Rhododendron arboreum Smith*	Ericaceae	Treatment of cough and headache	Bark and leaves	Paste of leaves is applied on forehead, and juice from bark is taken orally.
32	*Euphorbia royleana Boiss.*	Euphorbiaceae	Treatment of cough and asthma	Stem	Latex from stem is taken in small quantities orally.
33	*Jatropha curcas L.*	Euphorbiaceae	Treatment of snake bite	Leaves	Leaves are crushed into paste and applied on bitten area.
34	*Ricinus communis L.*	Euphorbiaceae	Treatment of joint pain and fracture	Seeds	Crush seeds into paste and apply on affected part.
35	*Entada rheedii Spreng.*	Fabaceae	Curing itching in body	Bark and seeds	Poultice is applied on itching areas of the body.
36	*Erythrina arborescens Roxb.*	Fabaceae	Improve loss of appetite and treatment of boil	Root and bark	Root is taken to improve appetite; bark juice is applied on boils.
37	*Quercus griffithii Hook.f. & Thomson ex Miq.*	Fagaceae	Treatment of diarrhea and dysentery	Seed	Decoction is taken orally.
38	*Swertia petiolata Royle.*	Gentianaceae	Relieving headache	All parts	All parts of plant are eaten raw.
39	*Dichroa febrifuga Lour.*	Hydrangeaceae	Treatment of cough and fever	Roots, bark, and leaves	Crush and juice is taken orally.
40	*Juglans regia L.*	Juglandaceae	Treatment of dry skin problems	Seed	Oil is extracted and applied on affected areas.
41	*Elsholtiza blanda (Benth.) Benth.*	Lamiaceae	Reducing high blood pressure	Leaves	Leaves are chewed and eaten raw.
42	*Gmelina arborea Roxb. ex Sm.*	Lamiaceae	Relieving cough and ulcer	Bark	Chewing bark or drinking boiled extract.

43	*Cinnamomum impressinervium Meisn.*	Lauraceae	Treatment of diabetes	Leaves	Dried leaves are crushed into powder and taken orally.
44	*Cinnamomum tamala (Buch.-Ham.) Th. G. Nees*	Lauraceae	Treatment of ulcer and gastritis	Bark	Bark is peeled and eaten raw.
45	*Lindera neesiana (Wall. ex Nees)*	Lauraceae	Treatment of indigestion and headache	Leaves and bark	Decoction of leaves and bark is prepared and taken orally.
46	*Michelia champaca L.*	Magnoliaceae	Treatment of fever and headache	Flowers	Flowers are crushed and applied on forehead or taken as decoction.
47	*Albizia lebbeck (L.) Benth.*	Mimosaceae	Treatment of cough and bronchitis	Bark and seeds	Bark and seeds are crushed, and decoction is made and taken orally.
48	*Morus alba L.*	Moraceae	Treatment of skin diseases	Leaves	Leaves are crushed and applied on affected skin areas.
49	*Oroxylum indicum (L.) Kurz*	Bignoniaceae	Treatment of dysentery and jaundice	Bark	Decoction of bark is prepared and taken orally.
50	*Ficus racemosa L.*	Moraceae	Treatment of diarrhea and diabetes	Bark	Bark is crushed, and decoction is taken orally.
51	*Ficus religiosa L.*	Moraceae	Treatment of wounds and skin diseases	Bark	Bark is crushed and paste is applied on affected skin areas.
52	*Urtica dioica L.*	Urticaceae	Treatment of joint pain and rheumatism	Leaves	Leaves are boiled, and extract is applied on painful joints.
53	*Curcuma longa L.*	Zingiberaceae	Anti-inflammatory and antiseptic for cuts and wounds	Rhizome	Rhizome is ground into a paste and applied on wounds.
54	*Zingiber officinale Roscoe*	Zingiberaceae	Treatment of cold, cough, and nausea	Rhizome	Rhizome is boiled, and the decoction is taken as a drink.
55	*Tinospora cordifolia (Thunb.) Miers*	Menispermaceae	Treatment of fever and immune booster	Stem	Decoction of stem is prepared and taken orally.
56	*Solanum indicum L.*	Solanaceae	Treatment of toothache and mouth ulcers	Fruit	Fruit is chewed to relieve pain.
57	*Datura metel L.*	Solanaceae	Treatment of asthma and respiratory issues	Leaves	Leaves are dried and smoked for respiratory relief (caution: toxic plant).
58	*Withania somnifera (L.) Dunal*	Solanaceae	Stress relief and improvement of sleep quality	Roots	Decoction of roots is prepared and taken at night.

59	*Nicotiana tabacum L.*	Solanaceae	Insect bites and pain relief	Leaves	Fresh leaves are crushed and applied on affected areas.
60	*Swertia chirayita (Roxb. ex Flem.) Karst.*	Gentianaceae	Anti-malarial and treatment of jaundice	Whole plant	Decoction of whole plant is prepared and taken orally.
61	*Lilium polyphyllum D. Don ex Royle*	Liliaceae	Treatment of respiratory issues	Bulb	Bulb is boiled and eaten.
62	*Phyllanthus emblica L.*	Phyllanthaceae	Antioxidant and treatment of cold	Fruit	Fresh fruit is eaten, or juice is consumed.
63	*Tamarindus indica L.*	Fabaceae	Treatment of digestion issues	Pulp	Pulp is mixed in water and taken as a drink.
64	*Terminalia arjuna (Roxb. ex DC.) Wight & Arn.*	Combretaceae	Treatment of heart diseases	Bark	Bark is boiled, and decoction is taken for heart health.
65	*Rauvolfia serpentina (L.) Benth. ex Kurz*	Apocynaceae	Treatment of hypertension	Root	Root is powdered and taken in small doses.
66	*Catharanthus roseus (L.) G.Don*	Apocynaceae	Treatment of diabetes	Leaves	Leaves are crushed, and juice is taken orally.
67	*Cassia fistula L.*	Fabaceae	Treatment of constipation	Pulp	Pulp of the fruit is taken orally.
68	*Azadirachta indica A. Juss.*	Meliaceae	Treatment of skin diseases and infection	Leaves	Leaves are boiled, and the extract is applied on the skin or taken as a drink.
69	*Piper nigrum L.*	Piperaceae	Treatment of cough and sore throat	Fruits	Fruits are crushed and taken with honey.
70	*Punica granatum L.*	Lythraceae	Treatment of digestive disorders	Fruit	Fruit is eaten fresh or juice is taken.
71	*Ocimum sanctum L.*	Lamiaceae	Treatment of cough and cold	Leaves	Leaves are chewed raw or boiled in water for a decoction.
72	*Mimosa pudica L.*	Fabaceae	Treatment of wounds and cuts	Leaves	Leaves are crushed and applied on wounds.
73	*Syzygium cumini (L.) Skeels*	Myrtaceae	Treatment of diabetes	Seeds and fruit	Seeds are powdered and taken with water; fruit is eaten fresh.
74	*Mentha arvensis L.*	Lamiaceae	Treatment of digestive problems and cold relief	Leaves	Leaves are boiled in water and taken as a tea.

2.7 Human Wildlife Conflicts

Human-wildlife conflict (HWC) is a global issue that often results in serious economic and social losses. These conflicts manifest through livestock predation, property damage, human injuries or fatalities, and crop raid by wild animals, leading to competition over living space and food (Kusi et al., 2022; Poudel et al., 2022). HWC has emerged as a significant issue, impacting the livelihoods and posing safety risks to communities of Dagana as per the SES, 2023. The very reason for the feud resulted is due to the overlapping

and resources sharing between the wild animals and humans. According to Letro et al. (2021), an assessment of hotspots for HWC in Bhutan identified Dagana as in the sixth highest conflict prone area for crop and property loss and 13th for livestock depredation.

The HWC data repository maintained by the Division since its institutionalization from 2016 till 2020 revealed the highest occurrence of HWC at Lhamoizingkha, Trashiding, and Lajab gewog as shown in figure 20. The former two gewogs mostly struggles with human elephant conflict while the latter battles with bear and wild dogs. Based on this result, a separate HWC Conflict to Co-existence: C2C strategy has been developed for Trashiding and Lhamoizingkha gewog. This strategy is intended to minimize the feud between the local communities and the wildlife, furthering aiming to bring in harmonious co-existence.

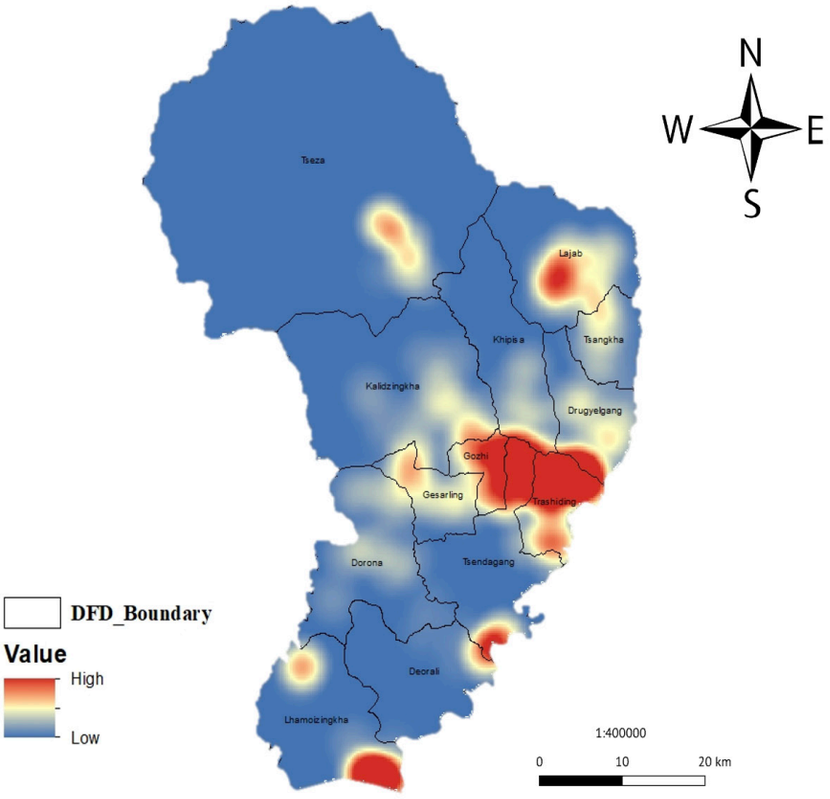


Figure 20. HWC hotspot map for DFO, Dagana based on data collected till 2020

According to data extracted from the SES and CVCA (2023), the Division recorded 1,389 Human-Wildlife Conflict (HWC)-related occurrences during the previous three years (2021–2023). The most common types of conflict are crop damage, property damage, and livestock depredation. Additionally, the survey discovered a concerning number of human casualties. The SES and CVCA (2023) recorded the highest average incidences of Human-Wildlife Conflict (HWC) in Trashiding gewog, followed by Drujeygang, Gozhi, and Tsendagang as shown in figure 25. Drujeygang experienced the highest crop damage incidents, with Trashiding and Gozhi also reporting significant losses. Livestock depredation was most prevalent in Lajab, Khebisa, and Kana. The highest incidences of property damage were in Karmaling, Drujeygang, and Lhamoizingkha. Lhamoizingkha gewog reported the highest number of human casualties, including one fatality and a significant injury. Human casualties were also observed in Dorona, Kana, Lajab, and Tsendagang over the past three years.

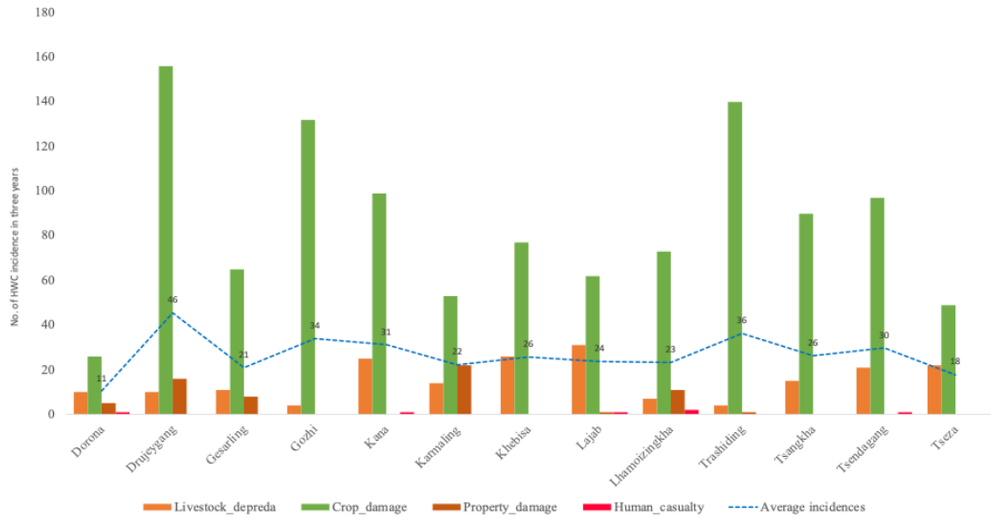


Figure 21. Figure showing the different categories of HWC incidences under DFO, Dagana

2.7.1 Crop Damages

Over the past three years (2021-2023), crop damage has been a significant issue, with maize being the most affected crop, followed by paddy and various other crops such as lentils, areca nut, cassava, cardamom, and pulses. The primary wildlife responsible for crop damage includes macaques, wild pigs, and barking deer. These incidents have had substantial economic impacts on local communities, affecting food security and agricultural productivity.

2.7.2 Livestock Depredation

Livestock depredation has also been a major concern, with local breeds of cattle, goats, and poultry being the most affected. The main predators include dholes, unidentified predators, and eagles. The loss of livestock has critical economic implications for farmers, who rely heavily on these animals for their livelihoods.

2.7.3 Property Damages

Property damage incidents have been reported, affecting houses, water infrastructure, storehouses, livestock sheds, kitchens, toilets, commercial farms, fences, and vehicles. Monkeys, elephants, and wild pigs are the primary culprits behind these damages. The financial burden of repairing and replacing damaged property poses a significant challenge to affected communities.

2.7.4 Human Casualty

Human casualties due to human-wildlife conflict have included fatalities and injuries. Elephants and Himalayan black bears have been responsible for severe incidents, while snakes and macaques have caused minor injuries. These incidents typically occur within settlements, agricultural fields, and on roads, highlighting the ongoing risk to human safety.

To mitigate these issues, it is crucial to implement and enhance community-based conflict mitigation measures, promote the use of wildlife deterrent technologies and practices, increase awareness and education programs about wildlife behavior and conflict prevention, strengthen rapid response mechanisms for conflict incidents, and develop and enforce policies that support coexistence and provide compensation for affected individuals.

2.8 Climate Change and Its Impacts

2.8.1 Climatic Conditions in the Area

Climate plays a crucial role in shaping the long-term evolution of vegetation, wildlife, and water resources. Temperature and precipitation, along with soil type and anthropogenic activities, are key factors driving climate change. The hydromet data from 2012 to 2023, derived from the National Center for Hydrology and Meteorology (NCHM), provides valuable insights into the climatic trends in Dagana.

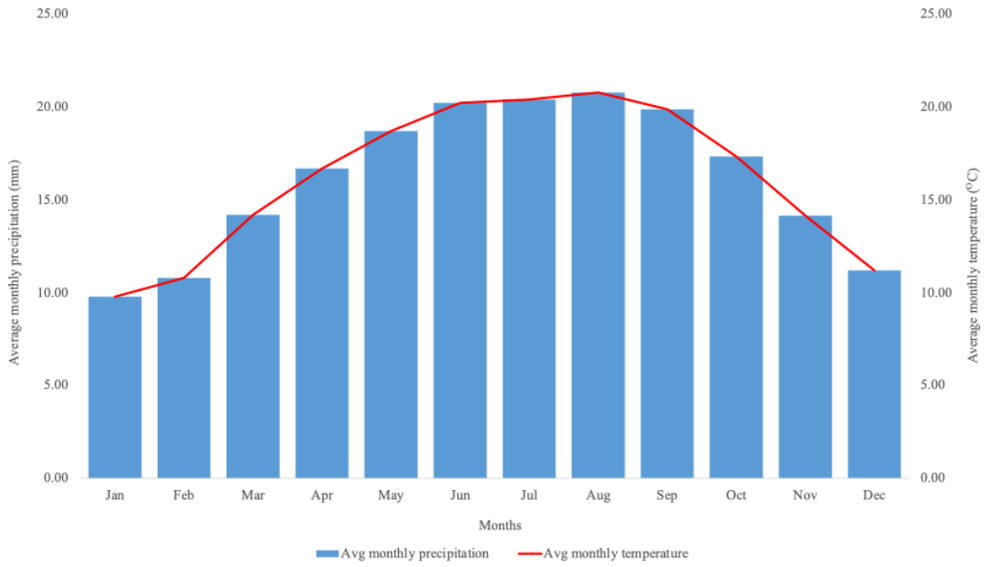


Figure 22. Graph showing the average monthly precipitation and temperature of Division

2.8.1.1 Temperature

The highest average annual temperature was recorded in 2017, while the lowest was in 2012 (figure 22). Monthly averages show the highest temperatures in August and the lowest in January. This warming trend during the February to August period aligns with the region's hotter months, influencing agricultural practices and human health. The subsequent decline in temperatures from August marks the transition towards cooler months, with seasonal fluctuations in temperature gaps.

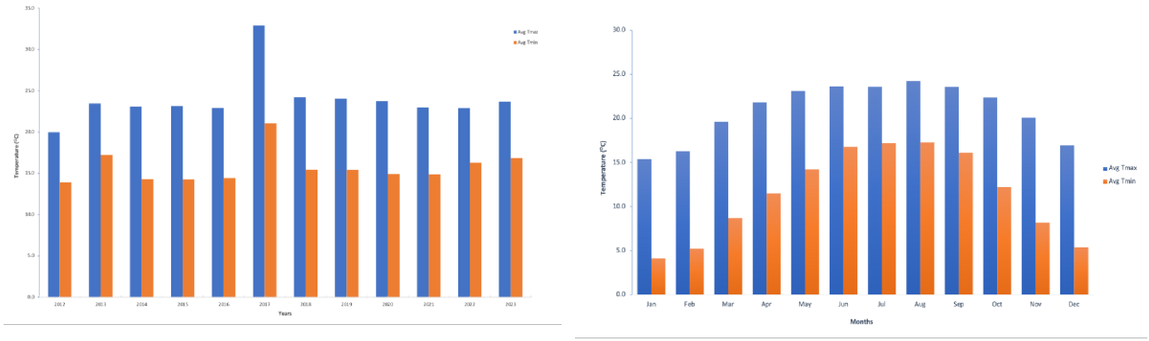


Figure 23. Average Annual Temperature (Left) and average monthly temperature (Right) from 2012 - 2023

2.8.1.2 Precipitation

The rainfall data from 2012-2023 shows that the highest annual rainfall was recorded in 2015, while the lowest was in 2012 (figure 24). The Division receives the highest rainfall in July, June, August, and September, with scanty rainfall in November, December, and January. This distinct monsoon season creates favorable conditions for agriculture but also poses challenges such as flooding and landslides, necessitating preparedness and mitigation strategies.

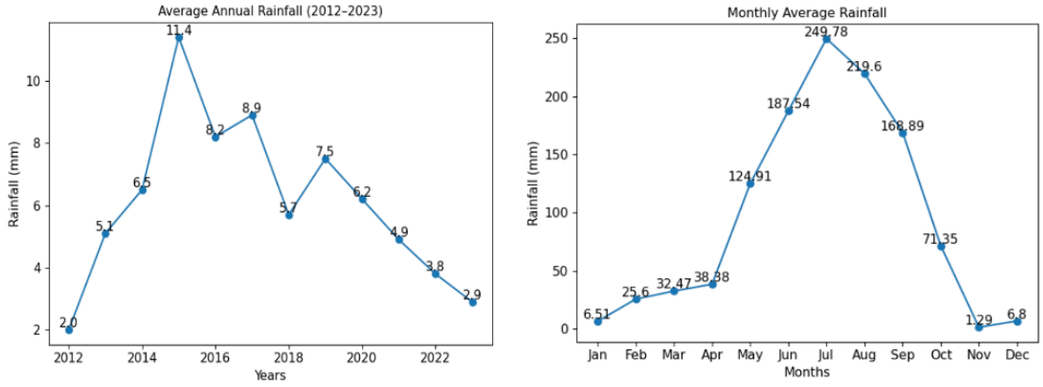


Figure 24. Average Annual Rainfall (Left) & Monthly Avg Rainfall (Right) from 2012 – 2023

Climate change poses a significant threat to the communities in the gewogs under the DFO, Dagana. Extreme weather events, altered rainfall patterns, water scarcity, and the emergence of diseases and pests are being experienced. Dagana district currently taps 695 water sources, with 35.11% of these sources in a drying-up while 2.30% already dried. Fluctuations in temperature and precipitation directly impact species, affecting interspecies competition, animal physiology, behavior, and species interactions. Limited water availability can compel wildlife to move beyond their original habitats to meet their resource requirements.

2.8.2 Vulnerability to Climate Change

Climate Vulnerability and Capacity Assessment survey carried out in 2023 observed that high vulnerability areas are predominantly located along the southern and eastern edges of Dagana, exhibiting a fragmented pattern interspersed with patches of low vulnerability (figure 25). This suggests that edge effects, potentially driven by factors like human activity, land use change, and exposure to climatic extremes, play a significant role in vulnerability within these regions (Dantas de Paula et al., 2016). Several isolated patches of high vulnerability are also observed within the central and northern parts of Dagana. This could be associated with fragmented forest cover or proximity to human settlements (Thakur et al., 2021). Additionally, factors such as land use changes, forest fragmentation and anthropogenic pressures are identified as one of the existing problems to vulnerability of forest globally (Roshani et al., 2022). The most forested areas of Dagana are less vulnerable, particularly in central and western regions where larger, contiguous forest areas are present. This suggests that intact forest cover and potentially favorable climatic conditions contribute to greater resilience within these areas (NEC, 2019).

Table 31. Vulnerability indices of communities to climate change under DFO, Dagana

Gewog	Exposure	Sensitivity	Adaptive capacity	Vulnerability
Tsendagang	0.544	0.632	0.232	-0.944
Drujeygang	0.528	0.655	0.303	-0.881
Trashiding	0.619	0.503	0.248	-0.875
Gesarling	0.542	0.500	0.259	-0.783
Tsangkha	0.619	0.590	0.426	-0.783
Khebisa	0.766	0.438	0.466	-0.739
Kana	0.566	0.493	0.326	-0.733
Gozhi	0.546	0.505	0.389	-0.662
Tseza	0.554	0.447	0.378	-0.624
Karmaling	0.419	0.326	0.123	-0.622
Lajab	0.460	0.576	0.511	-0.525
Dorona	0.812	0.122	0.490	-0.444
Lhamoizingkha	0.386	0.131	0.137	-0.380

Tsendagang Gewog is identified as the most vulnerable with the lowest vulnerability index of -0.944. This high vulnerability is attributed to its lower adaptive capacity (0.232), higher exposure (0.544), and higher sensitivity (0.632) to climate change. In contrast, Lhamoizingkha Gewog is identified as the least vulnerable with an index of -0.380. The lower vulnerability could be due to its lower sensitivity (0.131), and lower exposure (0.386). Similarly, Drujeygang Gewog is observed to be the second most vulnerable gewog under the Dagana DFO, mirroring the vulnerability patterns seen in Tsendagang due to similar factors of lower adaptive capacity, higher exposure, and higher sensitivity.

The difference in the vulnerability index between these gewogs is relatively small, indicating that the difference in the index is not so significant.

The findings from this study align with the nationwide climate vulnerability and capacity assessment conducted as part of the National Adaptation Plan (NAP) formulation process (NEC & UNDP, 2021). Although there were differences in indicators and assessment methods, both studies identified Southern Dzongkhags as being the most at risk from climate impacts.

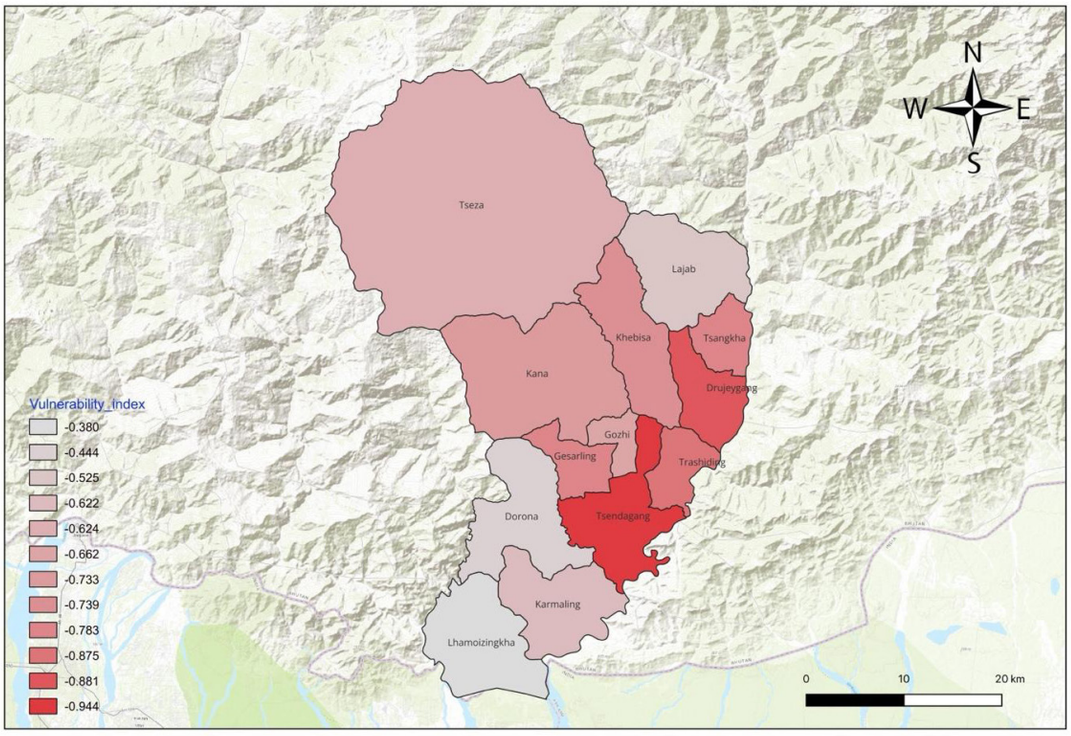


Figure 25. Vulnerability map of DFO, Dagana

2.8.3 Adaptation and Mitigation Measures

Households are employing a diverse array of adaptation strategies to address the impacts of climate change, showcasing their resourcefulness and resilience. The most common strategies include modifications in agricultural practices, such as switching to heat-resistant crop varieties, implementing conservation agriculture techniques, and investing in advanced irrigation systems and rainwater harvesting. In livestock management, adaptations involve selecting heat-tolerant breeds, relocating grazing areas, and improving pasture management.

Water management is critical, with households increasingly relying on wells, pipes, dams, and tanks to ensure consistent water access. Economic diversification, through business ventures, asset sales, and reliance on external support, also serves as a key coping mechanism. Additional adaptations include land management practices aimed at preventing soil erosion and landslides, installing fencing to protect grazing areas, and conserving key landscapes and ecosystem services.

Despite these efforts, significant challenges remain, which include resource constraints, knowledge gaps, and the necessity for responsive governance structures to support household adaptation initiatives. Addressing these challenges is crucial for enhancing the effectiveness and sustainability of household adaptation strategies.

2.8.4 Forest Carbon Sequestration and Climate Change Mitigation

The forests under the jurisdiction of DFO, Dagana sequester an approximately 4.69 tonnes of CO2 per hectare per year, contributing to a total carbon sequestration of around 7,18,722.61 tonnes annually. This substantial carbon absorption contributes significantly to climate change mitigation by offsetting greenhouse gas emissions. This also reflects the health and productivity of the forest ecosystems managed by the office. Effective management practices and conservation efforts have fostered an environment conducive to enhanced carbon storage, playing a vital role in climate change mitigation. The continued focus on sustainable forest management will be essential in maintaining and potentially increasing these carbon sequestration rates, benefiting both local biodiversity and global climate health.

2.9 High Conservation Value Areas

2.9.1 HCV Concept Overview

Natural habitats, including forests, possess inherent conservation values that encompass various biological, ecological, social, and cultural dimensions. These values, particularly those of profound significance – such as endemic species and culturally significant sites – are classified as "high conservation values" (HCVs). It can also be referred to as a natural habitat of a biological, ecological, social, or cultural value of outstanding significance or critical importance. HCVs are critical for guiding conservation efforts, as they highlight areas and attributes that require focused protection due to their outstanding significance. The concept of HCV was introduced as a framework for sustainable forestry in 1998 by the Forest Stewardship Council (FSC) – an international non-profit multi-stakeholder organization established in 1993 to promote responsible management of the world's forests and global forest certification.

Today, the HCV plays a key role in conservation strategies, helping organizations and governments to protect areas with significant environmental, social, and cultural importance globally. The HCVs are fundamental for biodiversity conservation and sustainable resource management. The integration of HCVs into forestry practices in Bhutan reflects the country's commitment to achieving a balance between economic development and environmental conservation. Moreover, the adoption of the HCV approach is in alignment with its national philosophy of Gross National Happiness (GNH) and the vision of upcoming Gelephu Mindfulness City (GMC), which prioritizes environmental conservation alongside economic progress. This holistic approach ensures that sustainable development is pursued in a manner that secures the well-being of current and future generations while preserving the country's rich biodiversity and cultural heritage.

As per National Interpretation for the Identification of High Conservation Values in Bhutan (2022), the HCV approach promulgates six categories of conservation values –

(1) Species diversity, (2) Landscape-level ecosystems mosaics and Intact-forest landscape (IFL), (3) Ecosystems and habitats, (4) Ecosystem services, (5) Community needs, and (6) Cultural values – each of which are described below:

1. Category 1 – Species diversity: Concentration of biological diversity including endemic species, and rare threatened or endangered species, that are significant at global, regional or national level.
2. Category 2 – Landscape-level ecosystems mosaics and IFL: Large landscape-level ecosystems, ecosystem mosaics and Intact Forest Landscapes (IFL) that at significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance.
3. Category 3 – Ecosystems and habitats: Rare, threatened, or endangered ecosystems, habitats or refugia.
4. Category 4 – Ecosystem services: Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes.
5. Category 5 – Community needs: Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous people (for livelihoods, health, nutrition, water, etc.), identified through engagement with these communities or indigenous peoples.
6. Category 6 – Cultural values: Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples, identified through engagement with these local communities or indigenous peoples.

2.9.2 HCVA in Dagana Dzongkhag

DFO, Dagana has identified and designated Namchella Catchment Area under Trashiding gewog, Dagana as the conservation area with high values. It covers an area of 43.94 ha, holding a substantial ecological, social and cultural significance. The Namchella catchment area is indispensable for local communities, serving as the primary source of drinking and irrigation water for the communities of four chiwogs – Trashiding, Norbuling, Namchella, and Shamdoley. Additionally, key institutions such as schools, religious sites, and government offices including the gewog centre rely on this catchment. The community does not have readily available alternative source other than the designated HCV. Thus, the essential role of the area in meeting the community needs emphasizes its irreplaceable value, particularly given the absence of feasible and affordable alternatives.

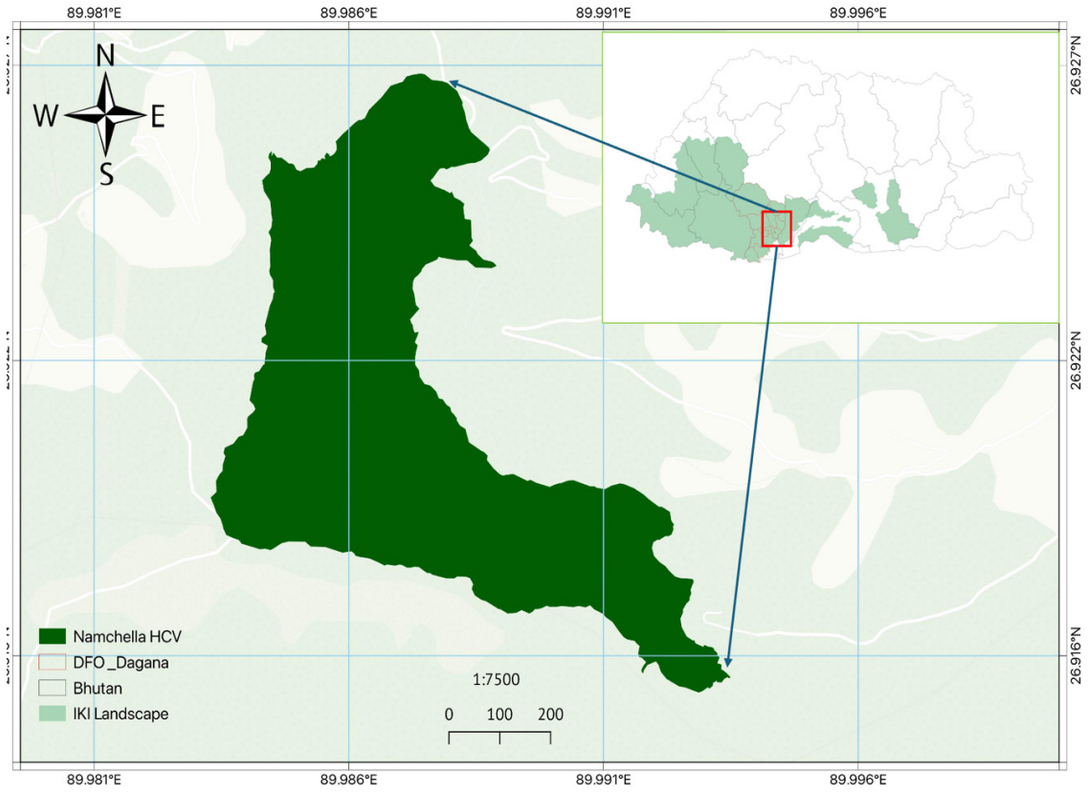


Figure 26. Map showing HCV under Dagana

The Namchella Catchment area lies between the geographic coordinates of 26.91856944° N, 89.98438889° E to 26.92522778° N, 89.988725° E and 26.91856944° N, 89.98348889° E to 26.91611667° N, 89.99348056° E. The designation of the Namchella Catchment Area as an HCV reflects its importance for biodiversity conservation, ecosystem services, and community well-being. Its critical role in water provisioning not only meets essential community needs but also aligns with country's broader conservation strategies, emphasizing sustainable resource management and environmental protection.

2.9.3 Significance of HCVA

The Namchella Catchment Area holds a considerable ecological, social, and cultural significance, justifying its designation as an HCV area under Dagana. Ecologically, this area supports a rich diversity of species, including several rare and endangered animals such as the Rufous-necked Hornbill, Himalayan Black Bear, and low concentrations of the Royal Bengal Tiger. The presence of these species signifies role of this area in preserving biodiversity and maintaining a balanced ecosystem. The Namchella Catchment also provides vital ecosystem services, primarily as a watershed that supplies essential drinking and irrigation water to the communities of four chiwogs of Trashiding gewogs and several government institutions. This service is critical for the survival of the communities, particularly in the absence of alternative and affordable water sources.

In terms of social and cultural significance, the Namchella Catchment is indispensable for meeting the basic needs of local communities, thus fulfilling HCV 5 (Community Needs) criteria. The area supports the livelihoods of local residents, sustaining agriculture and daily life, and is culturally embedded within the community's practices and traditions. The interrelationship between the ecological and social values in Namchella reinforces its designation as HCV. For an instance, preserving the watershed (HCV 4) directly benefits the communities that rely on it, while the presence of rare and threatened species (HCV 1) contributes to ecosystem health, supporting the area's water quality and habitat resilience.

Managing these areas for future generations is essential, as it ensures that both biodiversity and community resources remain sustainable over the long term. The Namchella Catchment also closely aligns with country's national conservation goals by promoting sustainable resource use and preserving cultural heritage within a landscape that supports both human and ecological health. Designating the Namchella Catchment as an HCV not only preserves its high conservation values but also secures its ecological and social benefits for the future generations.

2.9.4 Screening and Identification of the HCVA

HCVs screening was conducted to identify priority areas for HCV management and monitoring. This screening process, developed by the HCV Resource Network (HCVRN), involved desktop analysis using the National Interpretation for identification of HCVs in Bhutan (2022) and the data for presence of HCVs and threats. A workshop held in Thimphu (24th - 28th April 2023) documented appropriate monitoring and threat prevention to HCVAs.

The HCVRN toolkit outlines six key steps (figure 31) in the screening process, which are used to identify and prioritize areas with significant conservation value. This process aims to enhance biodiversity conservation, safeguard ecosystems and promote local community well-being. The screening process was supported by global HCVN specialists, in consultation with the DoFPS, participated by IKI Task Force members and field focal of the nine DFOs.

Figure 27. Stages of screening HCVz

Following the national level screening result, the DFO, Dagana has carried out field validation with staff, and further stakeholder consultation with the Local Government representatives, officials from government institutions, and public of four chiwogs of Trashiding gewog. Thus, the Division prioritized and finalized Namchella Catchment area as HCV area, which is categorized under HCV 5 due to its essential role in providing water for drinking and irrigation to the communities of Trashiding gewogs and government institutions. Apart from this, the identified area also falls under HCV 1 – due to a presence of rare species and threatened species, such as the Rufous-necked Hornbill, bear and lower concentration of tiger – and HCV 4 – due to its watershed functions.

Owing to the protection of the catchment area, the Namchella catchment area is categorized under HCV 4. The areas outside HCV are mostly under the scientific management broadly covered by the area-based management regimes, due to which the current site was chosen instead of other areas.

2.9.5 Threats and Strategic Approach to Mitigate the Threat

As per the HCV screening summary of all priority areas and threats, Namchella catchment area falls under Priority 1 (High HCV probability and high threat) where active response is needed with sound management plan (figure 28).

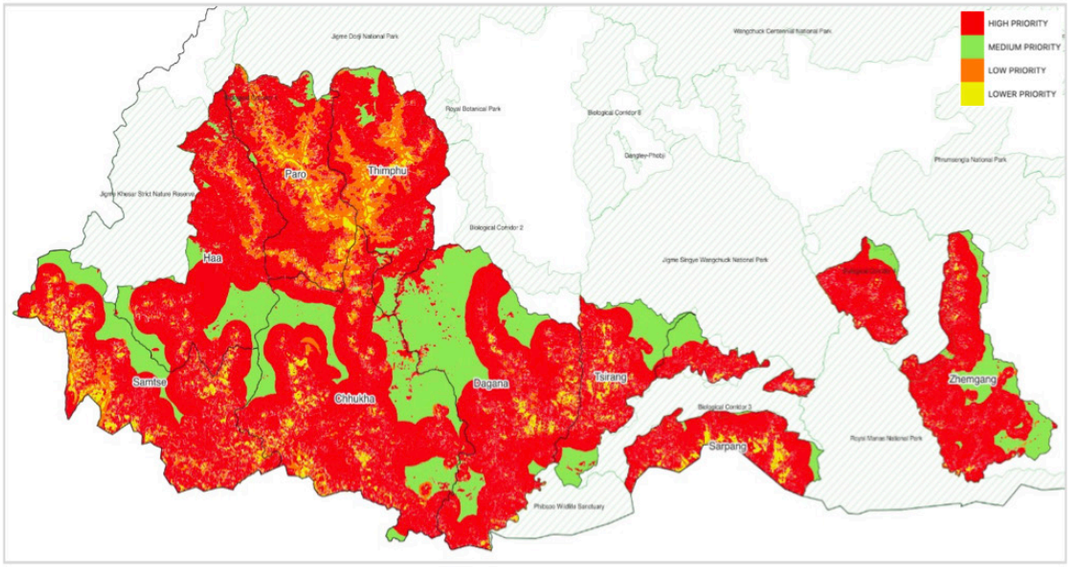


Figure 28. Priority map

The Namchella Catchment Area faces several threats that could impact HCVs within its boundaries as illustrated in table 32. Overharvesting of Non-Wood Forest Products (NWFPs), including medicinal plants and other valuable resources, threatens both HCV 1 and HCV 5 by reducing biodiversity and depleting essential resources that local communities rely on for their livelihoods. Habitat destruction and fragmentation due to infrastructure development, such as road construction, poses risks to HCV 1, HCV 4, and HCV 5, disrupting watershed functions, and affecting local access to natural resources. Illegal logging also impacts these same HCVs, as unauthorized removal of trees degrades forest structure, leading to erosion, habitat loss, and a decline in species diversity. Finally, forest fires pose a particularly severe threat to HCV 1, HCV 4, and HCV 5. Fires can destroy vegetation, compromise water regulation, and reduce biodiversity, ultimately destabilizing the ecosystem that the community depends on. Collectively, these threats highlight the urgent need for conservation and sustainable management practices to protect the Namchella Catchment Area's ecological, social, and cultural values.

Table 32. Threats within the designated HCV

Sl. No	Significant Threat	Affected HCVs
1	Overharvesting of NWFP	HCV 1 and HCV 5
2	Habitat Destruction and Fragmentation	HCV 1, HCV 4, and HCV 5
3	Illegal logging	HCV 1, HCV 4, and HCV 5
4	Poor waste management	HCV 1, HCV 4, and HCV 5

The following strategic approaches have been proposed to address the significant threats facing the Namchella Catchment Area and to safeguard its High Conservation Values (HCVs):

Table 33. Strategic approaches to addressing significant threats on HCV

Sl. No	Significant Threat	Proposed Strategic Approach
1	Overharvesting of NWFP	Sustainable livelihoods
2	Habitat Destruction and Fragmentation	Improve spatial planning and governance
3	Illegal logging	Sustainable livelihoods
		Institutional and HR Capacity
4	Poor waste management	Proper waste management enhanced

The detail on the threats and strategic approach is listed below:

1. **Overharvesting of Non-Wood Forest Products (NWFPs):** Overharvesting of NWFPs, such as medicinal plants and mushrooms, poses a risk to both biodiversity and local livelihoods. A strategy focused on sustainable livelihoods involves creating community programs that promote responsible harvesting practices, alternative income sources, and training in sustainable resource use. By providing these alternatives, communities are less likely to depend heavily on NWFPs, reducing pressure on forest resources and ensuring that harvesting remains within sustainable limits.
2. **Habitat Destruction and Fragmentation:** Infrastructure development – road construction – can fragment habitats, increase soil erosion, and disrupt water sources. To minimize these impacts, a focus on Improved Spatial Planning and Governance is essential. This approach involves strict land-use planning, environmental assessments, and regulation to control infrastructure projects. By integrating spatial planning with governance, development can be better aligned with conservation goals, reducing the ecological footprint of infrastructure and ensuring it does not negatively impact critical habitats and community resources.
3. **Illegal Logging:** Illegal logging degrades forest ecosystems, reducing biodiversity and undermining the forest's role in providing essential services. The Sustainable Livelihoods strategy aims to reduce local dependence on illegal

logging by offering alternative economic opportunities, such as eco-tourism or sustainable forestry practices. This reduces the incentive for illegal logging, while Institutional and HR Capacity Building strengthens the enforcement agencies' ability to monitor and manage forest resources effectively. Training and equipping these agencies can improve oversight, while community engagement in forest stewardship can help deter illegal activities.

4. **Poor Waste Management:** Poor waste management around the Namchella catchment area has emerged as a growing environmental concern, posing risks to water quality, ecosystem health, and public well-being. The indiscriminate disposal of plastics and chocolate wrappers by the school goers and domestic refuse in and around the catchment has increased due to rising human activities and inadequate waste collection and disposal systems. During monsoon seasons, improperly managed waste could frequently be washed into streams and springs, leading to contamination of drinking water sources, degradation of aquatic habitats, and increased health risks for downstream communities. The accumulation of waste could also disrupt natural drainage, exacerbate sedimentation, and diminish the aesthetic and ecological value of the catchment. Addressing this issue requires coordinated interventions such as strengthening waste segregation and collection mechanisms, enforcing environmental regulations, enhancing community awareness, and integrating waste management measures into watershed and forest management planning to safeguard the long-term sustainability of the Namchella water source.

In summary, these strategies work together to tackle the threats facing the Namchella Catchment Area, emphasizing sustainable practices, regulatory enforcement, and community-based management. By addressing the root causes of these threats, the proposed approaches aim to safeguard the area's High Conservation Values (HCVs) for future generations, supporting ecological integrity and the well-being of local communities.

2.9.6 Management and Monitoring of HCVA

The HCVA Management and Monitoring is developed as per Guidelines for Management and Monitoring Guidelines of High Conservation Value Area in Bhutan (2024), where HCV screening has indicated Priority 1 areas, the highest level of response for management is warranted to maintain and enhance HCVs. This is because there is a high likelihood of HCV being present, but they face a higher level of threat that can impact the HCV's future presence in the landscape. This is an active response that involves reducing threats and should involve most resources available at the DFO level for managing HCVs. In areas where there is a high likelihood of HCV presence but lower level of threats (Priority 2), a preventative response is warranted to 'prevent' threats from emerging in the future and thus potentially impact HCVs present. Where HCV has a lower likelihood of presence, but threats remain high (Priority 3), a precautionary response is preferred. This can include checking for HCV absence before any development or land change occurs, and then enforcing regulations and best management practices in development areas. Low priority areas (Priority 4) do not require an urgent response (but may be managed with habitat restoration in the future).

Table 34. Response framework for Priority Areas produced by HCV Screening

Threat level to HCVs	Probability of HCV Presence	
	Lower Probability	Higher Probability
Higher treat	**Priority 3** (Low HCV Probability & High Threat) **Precautionary Response**	**Priority 1** (High HCV Probability & High Threat) **Active Response**
Lower threat	**Priority 4** (Low HCV Probability & Low Threat) **Secondary Response**	**Priority 2** (High HCV Probability & Low Threat) **Preventative Response**

Management of HCVA is included under Chapter 5: Management Prescription, Implementation Plan including budget is in Chapter 6: Implementation Plan and Financial Outlay. The Monitoring plan for HCVA is included under Chapter 7 Monitoring and Evaluation.

Chapter 3: Threats and Challenges

3.1 Threats

The threats in the Division were identified through the SES and CVCA survey (2023) and engagement of forestry officials using the SWOT analysis, carried out during the consultation workshop on Training Need Assessment (TNA) by the consultant. Following are potential threats or challenges in the Division:

3.1.1 Human Wildlife Conflicts

Human-wildlife conflict (HWC) is a critical challenge in the Division, stemming from overlapping habitats between humans and wildlife. The district, rich in biodiversity, serves as a vital home to elephants, tigers, black bears, wild boars, dholes, and deer. However, this overlap often results in conflicts such as crop damage, livestock depredation, property damage, and, in some cases, human casualties. From 2021 to 2023, communities reported 1,389 HWC incidents, with crop damage being the most common (SES, 2023). Lhamoizingkha, Trashiding, and Lajab Gewogs were identified as conflict hotspots as per the data maintained from 2016 till 2020. Retaliatory killings further escalate the issue, jeopardizing both human safety and wildlife populations. The impacts of HWC are far-reaching, affecting livelihoods and increasing tension between conservation goals and community well-being.

This persistent conflict poses significant barriers to achieving the division's objectives. The constant threat of wildlife deters community participation in sustainable forest management and conservation initiatives, hindering efforts to enhance local engagement and livelihoods. Retaliatory actions against wildlife undermine biodiversity conservation and ecosystem services, compromising strategic habitat conservation and climate resilience. Additionally, resource depletion and conflict incidents stretch enforcement and monitoring capacities, making efficient public service delivery and forest resource management more challenging. Addressing HWC is, therefore, critical to aligning the division's vision of efficient service delivery, environmental stewardship, and community-driven conservation efforts with on-ground realities.

3.1.2 Illegal Activities

Illegal activities such as illegal logging, poaching, unsustainable collection of NWFPs, and illegal fishing are rampant throughout the world. These activities have devastating impacts, leading to biodiversity loss and the destruction of habitats, species, and ecosystems. It also contributes to climate change, soil erosion, and water pollution. The most common forest offense pertains to the illegal trade and transport of timber (FFF, 2019). Other offenses in the country include wildlife poaching, illegal harvesting of NWFP, illegal fishing, retaliatory killings of wildlife, and encroachment of State Reserve Forest

Land. The Forest Information Reporting and Monitoring System (FIRMS) data maintained by the Division for the past three years (2022-2024) reported an alarming 172 incidents, thereby causing a serious threat to the fulfillment of the Division's mandate. Illegal logging was seen as the most rampant form of illegal activity (116 incidences), followed by illegal NWFP collection, illegal fishing, misuse of subsidized timber, land encroachment, and poaching, as shown in the figure below.

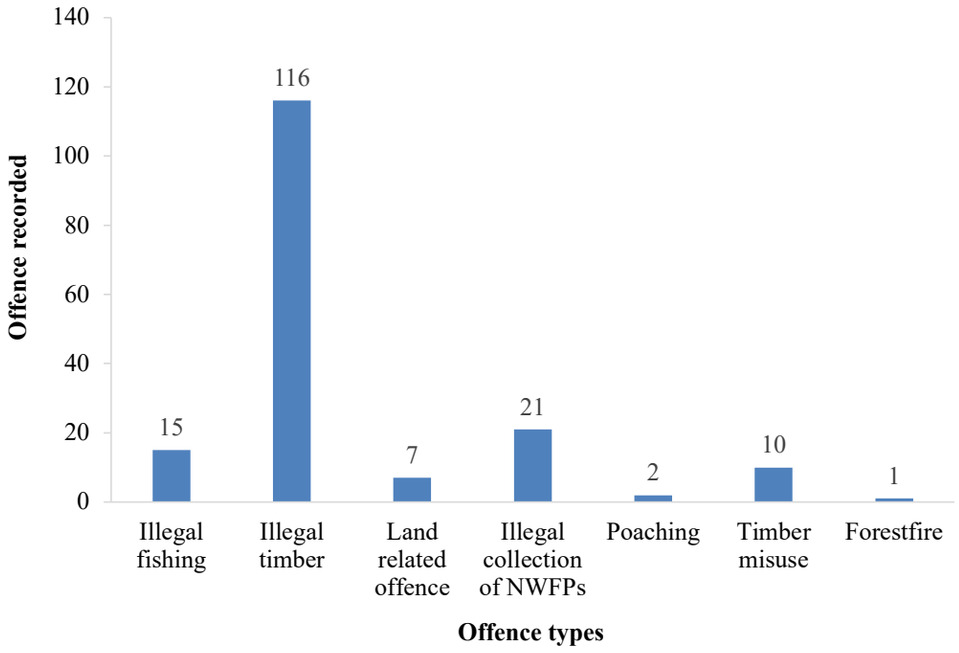


Figure 29. Different categories of illegal activities under DFO, Dagana

3.1.3 Drying Up of Water Sources

Based on data collected by the Division with financial assistance from the Watershed Management Division (WMD) in 2020, Dagana Dzongkhag currently has a record of 719 water sources. Tsangkha Gewog accounts for the highest number with 105 sources, followed by Kana Gewog with 99, and Drujeygang Gewog with 81. Of the total 719 sources, 271 are reported to be diminishing, and 12 have already dried, making Dagana the leading Dzongkhag in the country for drying water sources (Phuntsho et al., 2023). Within the division, 695 water sources are tapped by the communities under their jurisdiction to support their livelihoods. Among these, 244 sources are showing signs of drying, 16 have already dried up, while 435 sources have remained stable in their discharge. This data underscores the urgent need for effective water resource management and conservation measures to ensure the long-term sustainability of water supplies for local communities.

The depletion of Dagana's water sources is linked to extensive exploitation of forest resources, deforestation, agricultural expansion, developmental activities, lack of proper waste disposal facilities and plantation of non-native species disrupting hydrological cycles (RSPN & WMD, 2024; Samal, 2024). Additionally, climate change amplifies water scarcity by altering precipitation patterns (UNDP, 2014). The drying up of the lake in

Tsangkha, Dagana, has been linked to human interventions, including the planting of non-native species around the lake area (Bhutan Broadcasting Service, 2023; The Bhutanese, 2023). This activity has altered the lake's natural ecology, potentially affected water retention and contributing to its drying.

These challenges undermine the division's objectives to safeguard biodiversity, support ecosystem services, and promote sustainable livelihoods. Diminished water sources affect forest health, wildlife habitats, and the livelihoods of forest-dependent communities, reducing their engagement in conservation. Without effective water resource management and conservation strategies, achieving sustainable forest management, biodiversity protection, and community resilience becomes increasingly difficult, jeopardizing the division's goals.

3.1.4 Climate Change

Global climate trends, including rising temperatures and altered precipitation, drive extreme events, natural disasters, landslides, floods, and the spread of pests and diseases. The Intergovernmental Panel for Climate Change (IPCC, 2007) projects that Asia's mountains will face more extreme and variable weather. Mountain ecosystems and biodiversity are particularly vulnerable. In Bhutan, climate models predict that the tree line will shift northward and upward, encroaching on alpine scrub and meadows (ICIMOD,2021). Mobile wildlife, highly sensitive to climate shifts, is undergoing notable range changes, especially in the Himalayas. Anthropogenic activities such as improper waste disposal, developmental activities, agricultural land expansion, overexploitation of forest resources, and plantation of non- native species are the major factors that contribute to climate change.

The SES & CVCA survey (2023) identifies climate change impacts such as erratic rainfall, drought, extreme weather, and temperature fluctuations. Dagana's location, where warm air from Indian plains meets temperate cold air, results in mixed weather patterns, making it vulnerable to rapid pest outbreaks, forest fires, flash floods, landslides, and windstorms.

Heavy and unusual rainfall, rising temperatures, and extreme weather disrupt forest operations, damage infrastructure, and degrade habitats, hindering sustainable management and public service delivery. These climate impacts exacerbate biodiversity loss, increase forest vulnerability to pests and wildfires, and strain monitoring systems as resources shift to emergency responses. Erratic weather and resource depletion also undermine forest-dependent communities' livelihoods, reducing their participation in conservation and threatening the division's goals of environmental stewardship and economic growth. Addressing these challenges through adaptive strategies, resilient infrastructure, and community support is essential for achieving long-term sustainability.

3.1.5 Habitat Destruction and Fragmentation

In Bhutan, infrastructure development, including road construction, has led to significant environmental challenges. Poorly designed roads have caused habitat fragmentation, deforestation, soil erosion, and disturbances in wildlife corridors. For example, the construction of farm roads, while aiding rural development, has also been linked to erosion, loss of biodiversity, and disruption of hydrological processes, particularly in areas like Dagana (Waiba, 2018). Furthermore, the expansion of agricultural lands and settle-

ments has contributed to further habitat destruction. These impacts highlight the critical need for sustainable planning and practices to balance development with biodiversity conservation (Department of Forests and Park Services, 2024; ICIMOD, 2021).

Habitat destruction and fragmentation from infrastructure development, such as poorly designed roads, agricultural expansion, and settlements, have significantly hindered the Dagana DFO's objectives. Farm roads, while improving rural connectivity, have caused deforestation, soil erosion, and disrupted wildlife corridors, undermining biodiversity conservation and ecosystem resilience. These impacts weaken sustainable forest management efforts, disrupt hydrological processes, and reduce community engagement in conservation, hindering the division's goals of promoting environmental stewardship and sustainable livelihoods. Mitigating these challenges through sustainable planning and restoration measures is essential to achieving the division's mandates.

3.1.6 Poor Waste Management

The escalating issue of poor waste management in Dagana reflects a broader national concern, as Bhutan faces challenges stemming from rapid urbanization and shifting consumption patterns. Daily landfill disposal across the country averages 54 metric tons, emphasizing the magnitude of the problem. Inadequate waste collection services and recycling infrastructure, coupled with inconsistent enforcement of the 2012 Waste Prevention and Management Regulation, have resulted in widespread illegal dumping and improper disposal practices.

These challenges are further exacerbated by urbanization trends, projected to see over half of Bhutan's population residing in urban areas by 2047, leading to increased consumption and waste generation without parallel advancements in waste management systems. Consequently, environmental degradation manifests as soil, water, and air pollution, adversely affecting agricultural productivity, aquatic ecosystems, and public health. Public awareness regarding proper waste disposal remains limited, exacerbating the severity of the problem and undermining Bhutan's commitment to environmental conservation and sustainable development.

In Dagana, the impacts of inadequate waste management facilities directly hinder the realization of the DFO's strategic objectives. Poor waste disposal practices degrade land, water, and biodiversity, undermining sustainable forest management and efforts to promote economic growth and environmental stewardship. Habitat degradation due to pollution compromises biodiversity conservation and ecosystem resilience, while the lack of regulatory enforcement impedes effective forest resource management through monitoring and assessment. Additionally, the environmental consequences of improper waste disposal alienate local communities, reducing their participation in forest conservation and management initiatives critical for sustainable livelihoods. Addressing the waste management crisis is essential for safeguarding natural resources, achieving conservation goals, and upholding the DFO's commitment to promoting climate resilience and ecological integrity in Dagana.

3.1.7 Loss of Biodiversity

The loss of biodiversity in Dagana District poses a significant challenge to the region's ecological balance and undermines the country's constitutional mandate to maintain

60% forest cover. Despite Dagana's rich ecosystems, including forests, wetlands, and agricultural landscapes, human activities such as agricultural expansion, urbanization, and habitat destruction have led to significant habitat degradation and species decline. Climate change exacerbates these pressures, altering ecosystem dynamics and threatening vulnerable flora and fauna, including species like Paphiopedilum fairrieanum, Indotestudo elongata, and Elephas maximus. Furthermore, these issues disrupt traditional cultural practices deeply rooted in Dagana's natural heritage, such as the conservation-linked spiritual significance of sites like Do Namkhai Kaw and Tha Namkhai Dzong. These threats underscore the urgent need for strategic interventions to address biodiversity loss and promote ecological resilience.

This biodiversity crisis directly hinders the achievement of DFO, Dagana's objectives. Habitat loss and species extinction undermine efforts to safeguard biodiversity and ecosystem services, while challenges in managing natural resources make continuous monitoring and enforcement difficult. Unsustainable agricultural practices conflict with goals of sustainable forest management and environmental stewardship, impeding economic growth and ecological health. Moreover, the erosion of biodiversity limits opportunities to engage local communities in conservation efforts and promote sustainable livelihoods. Addressing these issues through sustainable practices, climate-resilient strategies, and enhanced community participation is essential for fulfilling DFO Dagana's vision of balancing development with environmental preservation.

3.1.8 Forest Fires

Forest fire incidents in Dagana, Bhutan, are a pressing concern predominantly driven by human activities such as carelessness and improper fire management practices. Common triggers include discarded cigarette butts, poorly extinguished campfires, and uncontrolled agricultural debris burning. Additionally, forest fires are sometimes ignited by electrical transmission lines when nearby trees or bamboo fall over them, sparking fires in dry conditions. The fire season in Dagana, from January to May, coincides with the drier months, further elevating the risk. The gewogs of Lajab, Tsangkha, and Drujeygang within the jurisdiction of DFO, Dagana, are highly susceptible to forest fires due to the dominance of chir pine (*Pinus roxburghii*) vegetation. These fires result in significant ecological damage, including habitat destruction, soil erosion, and loss of biodiversity. Preventive efforts, especially during high-risk periods, along with rehabilitation and reforestation of fire-damaged areas, are crucial for restoring ecological balance.

These forest fires present substantial challenges to fulfilling DFO Dagana's objectives. Habitat destruction and ecosystem fragmentation undermine biodiversity conservation, isolating wildlife populations and reducing genetic diversity essential for long-term species survival. Fires also disrupt critical ecosystem services such as carbon storage, water regulation, and soil stability, directly impacting sustainable forest management and environmental stewardship goals. Soil erosion and sedimentation caused by repeated fires harm water quality and hydropower operations, which are vital to Bhutan's economy. Moreover, the livelihoods of local communities, reliant on forest resources, are adversely affected. To mitigate these risks, a multi-faceted approach is essential, including promoting public awareness about fire safety, enforcing stricter regulations on agricultural and other fire-related practices, and implementing community-based prevention and response strategies. These measures are key to ensuring Dagana's ecological and economic resilience for generations.

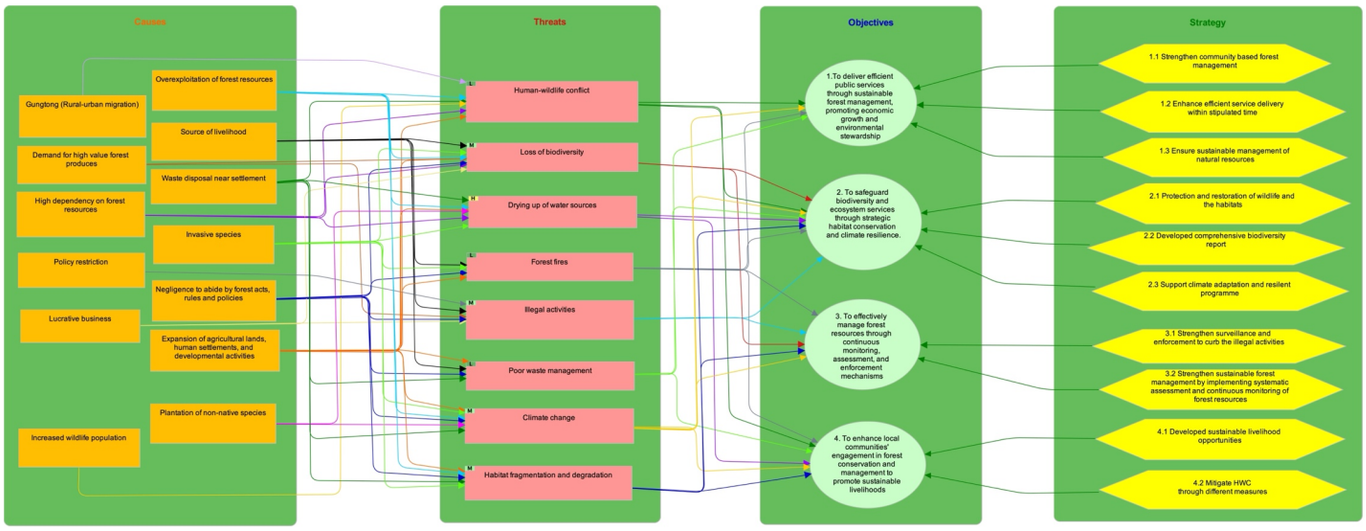


Figure 30. Conceptual model for implementation of strategies

3.2 Threat Rating

An assessment of main threats and their impact on different objectives was assessed using Miradi-software (vers. 4.6.0), considering three major criteria – Scope, Severity, and Irreversibility.

- Scope refers to the proportion of the threat that is likely to affect the target within 10 years under current circumstances.
- Severity is the level of damage to the biodiversity target expected within the scope, the level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances and trends
- Irreversibility is the degree to which the effects of a given threat can be undone and the targets affected by the threat restored, if the threat is stopped.

The nature of each threat ranking criteria are guided by four sub level criteria: 1: Low (The threat is likely to be very narrow in its scope, affecting the target across a small proportion (1-10%) of its occurrence/population), 2: Medium (The threat is likely to be restricted in its scope, affecting the target across some (11– 30%) of its occurrence/population), 3: High: The threat is likely to be widespread in its scope, affecting the target across much (31–70%) of its occurrence/population, 4: Very High The threat is likely to be pervasive in its scope, affecting the target across all or most (71-100%) of its occurrence/population. The overall threat ranking for the targets of DFO, Dagana is High, with drying up of water sources having a High threat, thereby having an impact on achieving the targets as illustrated in table 35.

Table 35. Threat rating

Threats / Targets	1. To deliver efficient public services through sustainable forest management, promoting economic growth and environmental stewardship.	2. To safeguard biodiversity and ecosystem services through strategic habitat conservation and climate resilience.	3. To effectively manage forest resources through continuous monitoring, assessment and enforcement mechanisms.	4. To enhance local communities' engagement in forest conservation and management to promote sustainable livelihoods.	Summary Threat Rating
Climate change	Medium	High	Medium	Low	Medium
Drying up of water sources		High		High	High
Forest fires	Low	Low	Low	Low	Low
Habitat fragmentation and degradation		Medium	Medium	Medium	Medium
Human-wildlife conflict	Low	Low		Medium	Low
Illegal activities		Low	High		Medium
Loss of biodiversity		Medium	Medium		Medium
Poor waste management	Low	Low		Low	Low
Summary Target Ratings:	Low	High	Medium	Medium	Overall Project Rating: High

3.3 Challenges

The Divisional Forest Office, Dagana encounters critical challenges that significantly impede its capacity to achieve its conservation and forest management objectives. Inadequate availability of advanced equipment limits the effectiveness of monitoring, enforcement, and habitat management activities, thereby constraining the implementation of sustainable forest management practices. Restricted transportation infrastructure and mobility options further exacerbate the situation, as they hinder access to remote forest areas, reducing the efficacy of biodiversity conservation efforts and community engagement initiatives. Additionally, the absence of consistent and strategic leadership compromises decision-making processes and weakens the alignment of organizational goals with staff efforts, leading to inefficiencies in achieving conservation targets.

Human resource limitations pose another significant constraint. Insufficiently trained personnel and an imbalance between staff capacity and workload restrict the adoption of evidence-based forest management techniques and innovative approaches to addressing emerging challenges, such as enhancing climate resilience and biodiversity conservation. The overburdened workforce faces delays in project implementation, enforcement activities, and stakeholder engagement, undermining the effectiveness of sustainable resource management strategies. Collectively, these constraints diminish the DFO's ability to fulfill its mandate of ensuring forest sustainability, ecosystem integrity, and community well-being.

Chapter 4: Management Prescription

4.1 Management Prescription for DFO

Based on the threats analyzed and their underlying causes, management interventions have been strategized in three key areas: Services, Technical, and Institutional, aligned with each objective of the Division.

Services focuses on delivering efficient forest services to the public, Technical involves managing interventions for the natural habitats of wildlife, and Institutional covers infrastructure development to address these threats. In total, there are 10 strategies targeting four objectives, supported by 53 activities aimed at addressing the specific threats and challenges within the DFO areas.

Objective 1: To deliver efficient public services through sustainable forest management, promoting economic growth and environmental stewardship

Strategy 1.1: Strengthen community-based forest management

- Action 1.1.1: Creation of NWFP management plans
- Action 1.1.2: Revision of CF and NWFP management plans
- Action 1.1.3: Training on basic office management, record and book keeping and CF governance for the CFMGs and NWFPMGs ensuring adequate gender representation.

Strategy 1.2: Enhance efficient service delivery within stipulated time

- Action 1.2.1: Training of staff on OFS, G2C and other online services.
- Action 1.2.2: Awareness and advocacy program on OFS and G2C to service users
- Action 1.2.3 Procurement of office stationeries and maintenance of offices equipment, computer, tools & field gears
- Action 1.2.4: Procurement of pool bikes for efficient mobility
- Action 1.2.5: Maintenance of office approach road (Road end to Division HQ)
- Action 1.2.6: Maintenance of offices and staff quarters
- Action 1.2.7: Construction of Conference Hall/Rangers' hall at Division HQ

Strategy 1.3: Ensure sustainable management of natural resources

- Action 1.3.1: Creation and Revision of LFMA

- Action 1.3.2: Operationalize the sustainable thinning plan
- Action 1.3.3: Plantation of native species in degraded lands
- Action 1.3.4: Training of staff on resource inventory and management plan writing ensuring adequate gender representation.

Objective 2: To safeguard biodiversity and ecosystem services through strategic habitat conservation and climate resilience.

Strategy 2.1: Protection and restoration of wildlife and the habitats

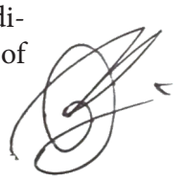
- Action 2.1.1: Conduct baseline habitat surveys to identify priority areas for restoration
- Action 2.1.2: Restoration of water holes
- Action 2.1.3: Enhance the capacity of staff on wildlife rescue with proportionate representation of males and females
- Action 2.1.4: Maintenance of corridors connecting the fragmented habitats
- Action 2.1.5: Conduct biodiversity (BMG) assessment in the identified grids

Strategy 2.2: Developed comprehensive biodiversity report

- Action 2.2.1: Assessment of flagship species (Cheetal, Freshwater mussels, tortoise)
- Action 2.2.2: Conduct research and monitoring of hornet and wasp populations
- Action 2.2.3: Carry out tiger population survey as a part of the nationwide tiger population revalidation surveys every five years
- Action 2.2.4: Determine the population or abundance of Musk Deer as a part of the nationwide survey
- Action 2.2.5: Conduct eDNA survey as a part of the nationwide eDNA survey
- Action 2.2.6: Carry out a survey of pangolin populations to assess their status, distribution, and conservation needs
- Action 2.2.7: Conduct detail survey to establish baseline data for biodiversity and publication

Strategy 2.3: Support climate adaptation and resilient programme

- Action 2.3.1: Coordination meeting with IFFCG annually before the onset of fire season
- Action 2.3.2: Conduct forest fire awareness campaigns
- Action 2.3.3: Investing in climate-smart forestry by promoting agroforestry programs to enhance carbon sequestration, improve soil health, diversify incomes, and increase climate resilience for local communities of Gozhi



- Action 2.3.4: Assess Springsheds, critical watersheds, and key water sources to determine priority sites for targeted management interventions
- Action 2.3.5: Springshed management intervention for the drying water sources
- Action 2.3.6: Revival of lake (Cleaning, protection and maintenance of twin lakes) at Gozhi
- Action 2.3.7: Organize awareness campaigns to reduce illegal dumping and promote proper waste management
- Action 2.3.8: Installation of signages and information boards at strategic location for proper waste management
- Action 2.3.9: Equip forest fire-fighting equipment to IFFCG members, field offices, local communities and relevant stakeholders

Objective 3: To effectively manage forest resources through continuous monitoring, assessment, and enforcement mechanisms

Strategy 3.1: Strengthen surveillance and enforcement to curb the illegal activities

- Action 3.1.1: Conduct SMART patrolling to curb the wildlife poaching, illegal activities, and improper waste disposal in developmental activities
- Action 3.1.2: Enhance the capacity of the forestry officials in planning and conducting patrolling using SMART Connect
- Action 3.1.3: Train staff on use of advanced technologies such as drones and AI enabled surveillance devices for real-time monitoring
- Action 3.1.4: Conduct basic first aid, survival skill, arms handling, and uniform discipline to the forestry staff
- Action 3.1.5: Develop investigative skill of forestry officials (Investigation and legal documentation, cyber surveillance, and wildlife forensic)
- Action 3.1.6: Carry out drone patrolling
- Action 3.1.7: Conduct awareness on the existing Forest and Nature Conservation Act of Bhutan and Rules and Regulations

Strategy 3.2: Strengthen sustainable forest management by implementing systematic assessment and continuous monitoring

- Action 3.2.1: Carry out forest inventory as a part of National Forest Inventory
- Action 3.2.2: Conduct the assessment of Pest and Diseases
- Action 3.2.3: Establish baseline data for invasive species
- Action 3.2.4: Assist in conducting Bhutan METT+ assessment

- Action 3.2.5: Assessment to determine the effectiveness of HWC intervention in two hotspot gewogs (Lhamoizingkha and Trashiding)

Objective 4: To enhance local communities' engagement in forest conservation and management to promote sustainable livelihoods

Strategy 4.1: Developed sustainable livelihood opportunities

- Action 4.1.1: Enhancement eco-tourism site at Gumti
- Action 4.1.2: Establish forest-based enterprise (Menchu business in CF) at Bjurugang under Kana Gewog

Strategy 4.2: Mitigate HWC through different measures

- Action 4.2.1: Development of C2C strategies for Lajab, Dorona and Karmaling gewog
- Action 4.2.2: Capacity building of QRT members
- Action 4.2.3: Equip Quick Response Team (QRT) members with vital tools to manage and mitigate human-wildlife conflict effectively
- Action 4.2.4: Create awareness on HWC and co-existence to the public

4.2 Management of HCVA

Table 36. Management prescriptions for HCV

Sl.#	Strategy	Outcomes	Outputs	Activity
1	1. Improved Spatial Planning and Governance	Environment friendly infrastructure	Environment friendly infrastructure developed through adoption of IWRM principles for improved watershed management	1.1. Implement bioengineering/ SLM techniques
2				1.2. Periodic monitoring of the catchment area
3	2. Sustainable livelihoods	Sustainable and Legal Harvesting of Timber and NWFPs	Alternative livelihoods identified (incl. Ecotourism, NWFP, NbS)	2.1. Community capacity building through in-country exchange program (CF, PES, SLM, SFM, etc.)
4				2.2. Domestication/cultivation of NWFPs through establishment of community based NWFP nursery
5			CF management plan revised or amended	2.3. Revision of CFMP incorporating the sustainable harvesting of forest resources
6	3. Institutional & HR Capacity	Waste management enhanced	CFMG members trained in proper waste management	3.1. Awareness on proper waste management
7				3.2. Installation of waste bins and signages

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 organizations 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 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 utmost 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.

4.4 Environmental and Social Safeguards (ESS)

The Environmental and Social Safeguards (ESS) system is designed to identify and manage potential negative environmental or social impacts associated with various actions. Through screening these actions, the ESS enables early detection of issues that could adversely affect the environment or communities. This proactive approach facilitates the

development of suitable measures to avoid, minimize, or compensate for negative impacts, ensuring that actions are both environmentally and socially responsible. Environmental and Social Safeguards (ESS): The ESS will allow screening potential actions that can cause negative environmental or social impacts and develop suitable measures to avoid, minimize, or compensate for these impacts. It also ensures that the implementation and effectiveness of mitigation measures are monitored and that any impacts arising during execution of the management prescriptions are addressed. The ESS components should be considered during the planning process and implementation of the management prescriptions. The ESS will be guided by the ESS framework prepared by WWF Bhutan.

A key aspect of the ESS is its role in monitoring the implementation and effectiveness of mitigation measures. This involves continuous oversight to confirm that the measures are working as intended and addressing any unforeseen impacts that may arise during the execution of management prescriptions. Integrating these safeguards ensures that environmental and social considerations are incorporated at every stage, resulting in more comprehensive and effective management strategies. Additionally, the ESS has been incorporated into the actions of the management prescription, with a formulated financial outlay to support its implementation.

To operationalize Environmental and Social Safeguards (ESS) in the DFO Management Plan, comprehensive occupational health and safety measures are embedded across all field activities to protect staff, rangers, and community participants. For instance, for biodiversity monitoring, safety is ensured through team-based fieldwork, GPS and communication tools, regular safety briefings, and field kits containing insect repellents and emergency supplies. Fencing and infrastructure activities require helmets, gloves, safe lifting practices, and first-aid readiness, while also emphasizing ergonomic tools and scheduled breaks to prevent fatigue. In human–wildlife conflict (HWC) mitigation, patrols are conducted in groups with non-lethal deterrents, guided by clear SOPs, and supplemented with awareness training to reduce risk perceptions among local communities. Fire management protocols include firefighting PPE, hydration and rest schedules, trained rapid response teams, and community fire drills to strengthen preparedness. Together, these measures not only safeguard participants but also foster a culture of responsibility and resilience in conservation activities.

4.5 Grievance Redressal Mechanism (GRM)

This Grievance Redress Mechanism (GRM), for the purpose of receiving and responding to the any grievances arises from the implementation of the activities planned for the Division and addressing the grievances in timely and effective manner helps in resolving the issues for improved mutual understanding and coordination, strengthen accountability and provides a foundation for increased collaboration, that ensures successful and impactful implementation of the activities.

The grievances can be raised by any stakeholder, community, group or an individual person, who may be negatively affected (herein as affected parties) by the activities implemented in this plan and this mechanism shall not be a retaliation against those who report complaints. The Grievances shall be processed through following channels and process;

The Greivance shall be raised through phone calls of DFO, Dagana

Divisional Forest Office, Dagana
Telephone: +975 17151359
Suggestion box at Division HQ

OR it may be raised through any of the Range Officers under this Division or through Chief Forestry Officer.

The complaints or grievances should include the following information;

- Full details of the complainant including name, address and contact information,
- Full documents and evidences including any other relevant information which will support investigations to resolve the complaint,

Any earlier actions taken, if any, to resolve the problem, including contact with DFO, Dagana with proposed solution, if you see and have, any or whether confidentiality is requested (stating the reason). The complaint or grievance can be filed either in English or Dzongkha.

Complaint review process involves:

- Grievance/Complaint Team will assess the eligibility of the complaint and provide a response accordingly, within 10 working days after receiving the complaint.
- If the complaint is eligible, the Grievance/Complaint Team will come up with a plan and define a timeframe to investigate the complaint. The team will then communicate this information to the complainant within 10 working days.
- The team will then investigate the matter, with additional technical support as needed, including support from the Head offices. Based on the results, the team will then work with the affected parties to develop and implement an action plan and timeframe of steps required to resolve any issues identified.
- A summary of the complaint raised, actions taken, conclusions drawn, follow-up plan and timeframe for completion will be documented and communicated as agreed between the parties. The complaint/grievance team will facilitate support to further clarify, assess, and resolve issues raised as needed including, if appropriate, engaging input from outside experts.

If the grievances or complaints are not resolved at the level of the Division Complaint Resolution committee, such grievances will be escalated to the Department to address them.

The Grievances/Complaint Resolution Committees for DFO, Dagana comprises of following members;

1. Chief Forestry Officer, Chairperson
2. The Section Heads, Members
3. The Concern Range Officer, Member

Chapter 5: Implementation Plan and Financial Outlays

The current plan marks the first-ever management plan for the Divisional Forest Office, Dagana and is designed to align with Bhutan's broader goals of sustainable development, effective service delivery, livelihood enhancement, and biodiversity conservation, similar to Protected Area (PA) conservation plans. The successful implementation of the outlined programs over the next decade will depend on a secure and sustainable funding mechanism. While substantial support is expected from the WWF–IKI Project (8 years) and the United Nations Environment Programme (UNEP, 5 years), a notable funding gap persists beyond the contributions of WWF–IKI, BFL, and the Royal Government of Bhutan (RGoB).

To bridge this gap, it is essential for the management to proactively diversify funding sources by engaging with both national and international conservation partners. Potential avenues include the WWF–Bhutan Program, Bhutan Trust Fund for Environmental Conservation (BTFEC), Tarayana, the Bhutan Foundation, and the Royal Society for the Protection of Nature (RSPN). These resources will be critical for financing activities that are either excluded from or insufficiently supported by the IKI and UNEP/SAFE project. Moreover, strengthening partnerships and fostering long-term collaboration with donors will be vital to ensure continuity and resilience in implementation.

The 10-year management plan (2026–2034) for DFO, Dagana entails a total projected budget of Nu. 115.658 million, of which Nu. 113.298 million is allocated for DFO management, while Nu. 2.36 million is designated for High Conservation Value Area (HCVA) initiatives. The bulk of this funding is anticipated from WWF–IKI, UNEP, and RGoB. However, to mitigate potential shortfalls, supplementary funding will be sought from conservation partners such as BTFEC, Bhutan Foundation, Tarayana, and RSPN.

5.1 Implementation Plan and Financial Outlays of FO

Table 37. Implementation framework

Objectives	Strategies	Action	Year (2026-2034) along with budget outlay (Nu. in million)										Total Amount	Remarks
			I	II	III	IV	V	VI	VII	VIII	IX	X		
1. To deliver efficient public services through sustainable forest management, promoting economic growth and environmental stewardship	1.1 Strengthen community-based forest management	1.1.1 Creation of NWFP management plans	0.150										0.150	
		1.1.2 Revision of CF and NWFP management plans		0.600	0.180			0.420	0.300	0.420	0.240	0.180	2.340	Nu. 0.06 for each management plan
		1.1.3 Training on basic office management, record and book keeping and CF governance for the CFMGs and NWFPMGs ensuring adequate gender representation.			0.250		0.350		0.500		0.500		1.600	Nu. 0.60 from UNEP
	1.2 Enhance efficient service delivery within stipulated time	1.2.1 Training of staff on OFS and G2C and other services	0.350			0.350		0.350			0.350		1.400	

		1.2.2 Awareness and advocacy program on OFS and G2C to service users	1.950			1.950			1.950		1.950		7.800	
		1.2.3 Procurement of office stationeries and maintenance of offices equipment, computer, tools & field gears		4.000			4.000				4.000		12.000	
		1.2.4 Procurement of pool bikes for efficient mobility				5.000							5.000	
		1.2.5 Maintenance of office approach road (Road end to Division HQ)			7.000								7.000	
		1.2.6 Maintenance of offices and staff quarters					8.000						8.000	
		1.2.7 Construction of Conference Hall/ Rangers' hall at Division HQ				7.000							7.000	
	1.3 Ensure sustainable management of natural resources	1.3.1 Creation and Revision of LFMA	0.300	1.400	1.400	1.400	2.100						6.600	RGoB
		1.3.2 Operationalize the sustainable thinning plan	0.150	0.150	0.150								0.450	RGoB
		1.3.3 Plantation of native species in degraded lands	0.825	0.825	0.500	0.500	0.550						3.200	UNEP

		1.3.4 Training of staff on resource inventory and management plan writing with ensuring adequate gender representation.	0.350				0.350				0.350		1.050	
2. To safeguard biodiversity and ecosystem services through strategic habitat conservation and climate resilience.	2.1 Protection and restoration of wildlife and the habitats	2.1.1 Conduct baseline habitat surveys to identify priority areas for restoration		0.100		0.100						0.100	0.300	
		2.1.2 Restoration of water holes		0.350		0.350						0.350	1.050	
		2.1.3 Enhance the capacity of staff on wildlife rescue with proportionate representation of males and females		0.300			0.300			0.300			0.900	
		2.1.4 Maintenance of corridors connecting the fragmented habitats			0.300		0.300			0.300			0.900	
		2.1.5 Conduct biodiversity (BMG) assessment in the identified grids	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	6.000	
	2.2 Developed comprehensive biodiversity report	2.2.1 Assessment of flagship species (Cheetal, Freshwater mussels, tortoise)			0.550			0.550			0.550		1.650	

		2.2.2 Conduct research and monitoring of hornet and wasp populations			1.200								1.200	
		2.2.3 Carry out tiger population survey as a part of the nationwide tiger population revalidation surveys every five years			1.250				1.450				2.700	NCD
		2.2.4 Determine the population or abundance of Musk Deer as a part of the nationwide survey		0.365									0.365	NCD
		2.2.5 Conduct eDNA survey as a part of the nationwide eDNA survey		0.225									0.225	NCD
		2.2.6 Carry out a survey of pangolin populations to assess their status, distribution, and conservation needs					1.300						1.300	
		2.2.7 Conduct detail survey to establish baseline data for biodiversity and publication		1.000	0.200								1.200	

	2.3 Support climate adaptation and resilient programme	2.3.1 Coordination meeting with IFFCG annually before the onset of fire season	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	1.000	
		2.3.2 Conduct forest fire awareness campaigns	0.200		0.200		0.200		0.200		0.200		1.000	
		2.3.3 Investing in climate-smart forestry by promoting agro-forestry programs to enhance carbon sequestration, improve soil health, diversify incomes, and increase climate resilience for local communities of Gozhi				0.250	0.250						0.500	UNEP
		2.3.4 Assess Springsheds, critical watersheds, and key water sources to determine priority sites for targeted management interventions		0.150		0.150		0.150					0.450	
		2.3.5 Springshed management intervention for the drying water sources		0.250		0.368		0.250					0.868	UNEP (Nu. 0.368)

		2.3.6 Revival of lake (Cleaning, protection and maintenance of twin lakes) at Gozhi					0.300						0.300	
		2.3.7 Organize awareness campaigns to reduce illegal dumping and promote proper waste management			0.100			0.100			0.100		0.300	UNEP
		2.3.8 Installation of signages and information boards at strategic location for proper waste management		0.100						0.100			0.200	
		2.3.9 Equip forest fire-fighting equipment to IFFCG members, field offices, local communities and relevant stakeholders			0.500				0.500				1.000	
3. To effectively manage forest resources through continuous monitoring, assessment, and enforcement mechanisms	3.1 Strengthen surveillance and enforcement to curb the illegal activities	3.1.1 Conduct SMART patrolling to curb the wildlife poaching, illegal activities, and improper waste disposal in developmental activities	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	3.000	

		3.1.2 Enhance the capacity of the forestry officials in planning and conducting patrolling using SMART Connect		0.300		0.300		0.300		0.300		0.300	1.500	
		3.1.3 Train staff on use of advanced technologies such as drones and AI enabled surveillance devices for real-time monitoring			0.350			0.350					0.700	
		3.1.4 Conduct basic first aid, survival skill, arms handling, and uniform discipline to the forestry staff	0.100							0.100			0.200	
		3.1.5 Develop investigative skill of forestry officials (Investigation and legal documentation, cyber surveillance, and wildlife forensic)	0.300						0.300				0.600	
		3.1.6 Carry out drone patrolling	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	1.000	
		3.1.7 Conduct awareness on the existing Forest and Nature Conservation Act of Bhutan and Rules and Regulations		0.500			0.500			0.500			1.500	

	3.2 Strengthen sustainable forest management by implementing systematic assessment and continuous monitoring	3.2.1 Carry out forest inventory as a part of National Forest Inventory							4.850				4.850	
		3.2.2 Conduct the assessment of Pest and Diseases				1.500					1.500		3.000	
		3.2.3 Establish baseline data for invasive species					1.000					1.000	2.000	
		3.2.4 Assist in conducting Bhutan METT+ assessment	0.100		0.100								0.200	IKI, WWF BT
		3.2.5 Assessment to determine the effectiveness of HWC intervention in two hotspot gewogs (Lhamoizingkha and Trashiding)			0.400								0.400	IKI, WWF BT
4. To enhance local communities' engagement in forest conservation and management to promote sustainable livelihoods	4.1 Developed sustainable livelihood opportunities	4.1.1 Enhancement ofeco-tourism site at Gumti		0.600									0.600	
		4.1.2 Establish forest-based enterprise (Menchu business in CF) at Bjurugang under Kana Gewog			2.000								2.000	

	4.2 Mitigate HWC through different measures	4.2.1 Development of C2C strategies for Lajab, Dorona and Karmaling gewogs		1.200									1.200	
		4.2.2 Capacity building of QRT members	0.150		0.150			0.150			0.150		0.600	
		4.2.3 Equip Quick Response Team (QRT) members with vital tools to manage and mitigate human-wildlife conflict effectively	0.500				0.500						1.000	
		4.2.4 Create awareness on HWC and co-existence to the public			0.650			0.650				0.650	1.950	
Total	113.298													

5.2 Implementation Plan and Financial Outlay for High Conservation Value

Table 38. implementation framework for High Conservation Value

Sl.#	Strategy	Outcomes	Outputs	Activity	Location	Time-frame	Budget in million (Nu)
1	1. Improved Spatial Planning and Governance	Environment friendly infrastructure	Environment friendly infrastructure developed through adoption of IWRM principles for improved watershed management	1.1. Implement bioengineering/ SLM techniques	Namchella	Mar-28	0.40
				1.2. Periodic monitoring of the catchment area	Namchella	Mar-30	0.20
2	2. Sustainable livelihoods	Sustainable and Legal Harvesting of Timber and NWFPs	Alternative livelihoods identified (incl. Ecotourism, NWFP, NbS)	2.1. Community capacity building through in-country exchange program (CF, PES, SLM, SFM, etc.)	Namchella	Regular	0.35
				2.2. Domestication/cultivation of NWFPs through establishment of community based NWFP nursery	Namchella	Nov-31	0.50
			CF management plan revised or amended	2.3. Revision of CFMP incorporating the sustainable harvesting of forest resources	Namchella	Dec-25	0.06
3	3. Institutional & HR Capacity	Waste management enhanced	CFMG members trained in proper waste management	3.1. Awareness on proper waste management	Namchella	Jun-29	0.20
				3.2. Installation of waste bins and signages	Namchella	Jan-32	0.15
Total							1.86

Chapter 6: Monitoring and Evaluation

This chapter outlines how the implementation of the plan will be monitored and evaluated. The M&E plan (Table 39: Monitoring & Evaluation Framework) ensure synergy with the Implementation Framework and also include the indicators against which the performance of the Division will be measured. The output indicator basically describes the achievement of the actions identified under Chapter 5. The gender mainstreaming actions will also be clearly defined in the output indicators. Additionally, the division will also prepare an Annual Operational Plan (Annexure I) of the Division which shall be approved by the Department.

6.1 Monitoring and Evaluation of DFO

Table 39: Monitoring & Evaluation framework

Objectives	Action	Output Indicator	Unit	Base-line / Target	Year (2025-2034) along with budget outlay (Nu. in million)									
					I	II	III	IV	V	VI	VII	VIII	IX	X
1. To deliver efficient public services through sustainable forest management, promoting economic growth and environmental stewardship	1.1.1 Creation of NWFP management groups	NWFP management plans prepared and submitted for approval	Number	3	3								
	1.1.2 Revision of CF and NWFP management plans	Number of plans revised and submitted for approval	Number	30		1	3			7	5	7	4	3
	1.1.3 Training on basic office management, record and book keeping and CF governance for the CFMGs and NWFPMGs ensuring adequate gender representation.	Number of individuals trained	Number	102			102		102		102		102	
	1.2.1 Training of staff on OFS and G2C (can include other online services)	Number of staff trained	Number	43	43			43		43			43	
	1.2.2 Awareness and advocacy program on OFS and G2C to service users	Number of gewogs	Number	13	13			13			13		13	

	1.2.3 Procurement of office stationeries and maintenance of offices equipment, computer, tools & field gears	Office stationaries procured, and equipment maintenance carried out	Number	3		1			1				1	
	1.2.4 Procurement of pool bikes for efficient mobility	Staff issued with pool bike	Number	3				3						
	1.2.5 Maintenance of office approach road (Road end to Division HQ)	Office approach road maintenance carried out	Number	1			1							
	1.2.6 Maintenance of offices and staff quarters	Offices and staff quarter maintenance carried out	Number	1					1					
	1.2.7 Construction of Conference Hall/Rangers' hall at Division HQ	Conference hall constructed	Number	1				1						
	1.3.1 Creation and Revision of LFMA	Number of LFMP created & revised	Number	10	2	2	2	2	2					
	1.3.2 Operationalize the sustainable thinning plan	Operationalize thinning plan	Number	10	2	2	2							
	1.3.3 Plantation of native species in degraded lands	Degraded area brought under plantation	Area (ha)	30	7.5	7.5	5	5	5					
	1.3.4 Training of staff on resource inventory and management plan writing with at least a representation of female staff	Staff trained on resource inventory and management plan writing	Number	43	43				43				43	

2. To safeguard biodiversity and ecosystem services through strategic habitat conservation and climate resilience.	2.1.1 Conduct baseline habitat surveys to identify priority areas for restoration	Baseline survey for restoration carried out	Number	3		1		1						1
	2.1.2 Restoration of waterholes	Restoration of waterholes	Number	9		9		9						9
	2.1.3 Enhance the capacity of staff on wildlife rescue with proportionate representation of males and females	Number of staff trained	Number	43		43			43			43		
	2.1.4 Maintenance of corridors connecting the fragmented habitats	Number of corridors maintained	Number	3			1		1			1		
	2.1.5 Conduct biodiversity (BMG) assessment in the identified grids	Reports submitted	Number	10	1	1	1	1	1	1	1	1	1	1
	2.2.1 Assessment of flagship species (Cheetal, Freshwater mussels, tortoise)	Number of surveys carried out	Number	3			1			1			1	
	2.2.2 Conduct research and monitoring of hornet and wasp populations	Number of surveys carried out	Number				1							
	2.2.3 Carry out tiger population survey as a part of the nationwide tiger population revalidation surveys every five years	Number of surveys carried out	Number	2			1				1			
	2.2.4 Determine the population or abundance of Musk Deer as a part of the nationwide survey	Number of surveys carried out	Number	1		1								
	2.2.5 Conduct eDNA survey as a part of the nationwide eDNA survey	Number of surveys carried out	Number	1		1								

	2.2.6 Carry out a survey of pangolin populations to assess their status, distribution, and conservation needs	Number of surveys carried out	Number						1					
	2.2.7 Conduct detail survey to establish baseline data for biodiversity and publication	Number of surveys carried out	Number											
	2.3.1 Coordination meeting with IFFCG annually before the onset of fire season	Meeting conducted and report submitted	Number	10	1	1	1	1	1	1	1	1	1	1
	2.3.2 Conduct forest fire awareness campaigns	Awareness created on forest fires and report submitted	Number	5	1		1		1		1		1	
	2.3.3 Investing in climate-smart forestry by promoting agroforestry programs to enhance carbon sequestration, improve soil health, diversify incomes, and increase climate resilience for local communities of Gozhi	Agroforestry promoted	Area (acres)	2				1	1					
	2.3.4 Assess springsheds, critical watersheds, and key water sources to determine priority sites for targeted management interventions	Number of surveys carried out	Number	3		1		1		1				
	2.3.5 Springshed management intervention for the drying water sources	Management intervention carried out	Number	3		1		1		1				
	2.3.6 Revival of lake (Cleaning, protection and maintenance of twin lakes) at Gozhi	Lake revival initiative carried out and report submitted	Number	1					1					

	2.3.7 Organize awareness campaigns to reduce illegal dumping and promote proper waste management	Number of gewogs imparted with awareness on waste mgt	Number	13			13			13			13	
	2.3.8 Installation of signages and information boards at strategic location for proper waste management	Number of signages installed	Number	24		12						12		
	2.3.9 Equip forest fire-fighting equipment to IFFCG members, field offices, local communities and relevant stakeholders	Forest firefighters equipped with firefighting equipment	Number	30			15				15			
3. To effectively manage forest resources through continuous monitoring, assessment, and enforcement mechanisms	3.1.1 Conduct SMART patrolling to curb the wildlife poaching, illegal activities, and improper waste disposal in developmental activities	Number of patrols conducted	Number	4640	464	464	464	464	464	464	464	464	464	464
	3.1.2 Enhance the capacity of the forestry officials in planning and conducting patrolling using SMART Connect	Staff capacity enhanced in planning and conducting patrolling using SMART Connect	Number	43		43		43		43		43		43
	3.1.3 Train staff on use of advanced technologies such as drones and AI enabled surveillance devices for real-time monitoring	Number of staff trained	Number	43			43			43				

	3.1.4 Conduct basic first aid, survival skill, arms handling, and uniform discipline to the forestry staff	Number of staff trained	Number	43	43							43		
	3.1.5 Develop investigative skill of forestry officials (Investigation and legal documentation, cyber surveillance, and wildlife forensic)	Number of staff trained	Number	43	43						43			
	3.1.6 Carry out drone patrolling	Drone patrols carried out	Number	240	24	24	24	24	24	24	24	24	24	24
	3.1.7 Conduct awareness on the existing Forest and Nature Conservation Act of Bhutan and Rules and Regulations	Awareness on FNCRR and FNCA carried out	Number	3		1			1			1		
	3.2.1 Carry out forest inventory as a part of National Forest Inventory	NFI carried out	Number	1							1			
	3.2.2 Conduct the assessment of Pest and Diseases	Survey for pest and diseases carried out	Number	2				1					1	
	3.2.3 Establish baseline data for invasive species	Baseline data for invasive species generated and published	Number											1
	3.2.4 Assist in conducting Bhutan METT+ assessment	Assisted in completion of Bhutan METT+ assessment	Number	2	1		1							

	3.2.5 Assessment to determine the effectiveness of HWC intervention in two hotspot gewogs (Lhamoizingkha and Trashiding)	Assessment on the effectiveness of HWC intervention carried out	Number	1			1							
4. To enhance local communities' engagement in forest conservation and management to promote sustainable livelihoods	4.1.1 Enhancement eco-tourism site at Gumti	Existing eco-tourism site enhanced	Report	1		1								
	4.1.2 Establish forest-based enterprise (Menchú business in CF) at Bjurugang under Kana gewog	Menchu shed established	Number	1			1							
	4.2.1 Development of C2C strategies for Lajab, Dorona and Karmaling gewog	C2C strategies developed	Number	3		3								
	4.2.2 Capacity building of QRT members	Number of QRT members trained	Number	130	130		130			130			130	
	4.2.3 Equip Quick Response Team (QRT) members with vital tools to manage and mitigate human-wildlife conflict effectively	QRT equipment issued to groups	Number	130	130				130					
	4.2.4 Create awareness on HWC and co-existence to the public	Awareness created on HWC & co-existence and report submitted	Number	3			1			1				1

Monitoring will be done annually by the DFO, Dagana based on the annual operational plan developed for the division. Evaluation of the plan will be done twice during the entire plan period. A midterm review (in the 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 – DFO, Dagana – and external committee, constituted by members from the functional division.

Further, evaluation will 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 objective to use Bhutan METT+ is to evaluate the management effectiveness of Division Forest Office. Similar to the Protected Areas, Bhutan METT + evaluation will be carried out once in every five years.

The Bhutan METT+ will be conducted at two levels (Mid-term and Final Evaluation), 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; 1. CFO, 2. Section Heads and 3. At least 2 officers from Range Offices.

The External Assessment will 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.

6.2 Monitoring and Evaluation of HCV

Table 40: Monitoring and evaluation of HCV

Sl.#	Strategy	Outcomes	Outputs	Activity	Location	Time-frame	Budget in million (Nu)	Indicator	Target
1	1. Improved Spatial Planning and Governance	Environment friendly infrastructure	Environment friendly infrastructure developed through adoption of IWRM principles for improved watershed management	1.1. Implement bioengineering/SLM techniques	Namchella	Mar-28	0.40	No. of sites developed	2 sites
				1.2. Periodic monitoring of the catchment area	Namchella	Mar-30	0.20	No of reports submitted	8 nos
2	2. Sustainable livelihoods	Sustainable and Legal Harvesting of Timber and NWFPs	Alternative livelihoods identified (incl. Ecotourism, NWFP, NbS)	2.1. Community capacity building through in-country exchange program (CF, PES, SLM, SFM, etc.)	Namchella	Regular	0.35	No of CFMG members benefitted	15 HHs
				2.2. Domestication/cultivation of NWFPs through establishment of community based NWFP nursery	Namchella	Nov-31	0.50	No of NWFP nursery developed	1 no
			CF management plan revised or amended	2.3. Revision of CFMP incorporating the sustainable harvesting of forest resources	Namchella	Dec-25	0.06	Approved revised management plan	1 CFMP
3	3. Institutional & HR Capacity	Waste management enhanced	CFMG members trained in proper waste management	3.1. Awareness on proper waste management	Namchella	Jun-29	0.20	No of awareness created	3 times
				3.2. Installation of waste bins and signages	Namchella	Jan-32	0.15	No of waste bins and signages installed	4 bins and 2 signages

Chapter 7: Stakeholder Consultation and Endorsement

7.1 Stakeholder Consultation

The DFO management plan has been drafted in consultation with the staff of Divisional Forest Office, Dagana in several instances. However, on December 07, 2024, the Division conducted the stakeholder consultation meeting for the local government representatives at Gesarling to finalize the DFO Management Plan for further endorsement. The consultation meeting was attended by 82 local leaders and four staff of the Division, with five females. The following members were consulted by four officials from Division, who made the presentation on the Draft DFO management plan:

7.2 Finalization and Endorsement of the DFO Management Plan

The management plan, finalized by the Divisional Forest Office, Dagana, shall be submitted for review by FMID and subsequently endorsed by the Technical Advisory Committee (TAC) of the Department. The technically reviewed and endorsed Plan will then be recommended for approval to the Ministry by the head of the Department. The Head of the Ministry will approve the plan for implementation.

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Annexure I. Annual Operation 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 FMID latest by 31 July*						
Name of the office:						
Plan Period:						
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 (in %age)	Brief report on the progress of the activi- ties		Remarks (Justification/ reasoning if not completed or not implemented)	
II. ANNUAL OPERATIONAL PLAN SCHEDULE						
II.a. DETAILS OF THE PLANNED ACTIVITIES						
Output Indicator as per the management plan/APA	Activities	Target with Unit	Timeline	Budget (in Nu. (m))	Fund Source	Specify location, if relevant
Program 1: Nature Conservation1						
Program II: Forest Resources Management2						

Program III: Social Forestry and Extension3						
Program IV: Forest Protection and Enforcement4						
Program V: Administration and Direction5						
1. Program I shall include but not limited to; Surveys, research, HWC management, habitat management, watershed & wetland protection, ecotourism & nature recreation, waste management, wildlife rescue & rehabilitation.						
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 offence compounding/prosecution, forestry clearances, pest & diseases surveillance, forest fire management.						
5. Program V shall include but not limited to; Division Forest Office management plan preparation, work planning, coordination meetings, administrative and accounting activities, monitoring and evaluation, data management.						
*Note: Activities such as Awareness, capacity building, etc to be tagged with respective program activities.						

Annexure II: Bhutan METT+ form (refined for DFO)

Name, affiliation and contact details for the person responsible for completing the Bhutan METT + (email etc.)				
Date assessment carried out				
Name of Divisional Forest Office				
WDPA site code (codes can be searched for on: www.protectedplanet.net/)				
Designations	National	IUCN Category National Category (to list based on site needs-CF, WFMU, LFMPs)		International (see below)
Location of Divisional Forest Office (province and if possible map reference)				
Date of establishment (dd/mm/yyyy)				
Ownership details (please tick)	SRFL	Private	Community	Other
Management Authority				
Size of Divisional Forest Office (sq.km)				
Number of staff	Permanent:		Temporary (same):	
Annual budget (Nu) – excluding staff salary costs	Current budget (operational costs, e.g. staff costs):		Capital budget (infrastructure development etc):	
What are the main values for which the area is designated				
List the two primary protected area / forest division management objectives				
Management objective 1				
Management objective 2				
No. of people involved in completing assessment				
Including: (highlight where appropriate)	Forest Division Manager	Forest Division staff	Other Forest Division agency staff	NGO
	Local community	Donors	External experts	Other
Please note if assessment was carried out in association with a particular project, on behalf of an organization or donor.				
Information on International Designations (where applicable)				
UNESCO World Heritage site				
Date listed	Site name		Site area	
Criteria for designation (i.e. criteria i to x)				
Statement of Outstanding Universal Value				

Ramsar site				
Date listed	Site name and number		Site area	
Criteria for Designation & ecological character (see Ramsar Information Sheet)				
UNESCO Man and Biosphere Reserves				
Date listed	Site name		Site area	
			Total:	
			Core:	
			Buffer:	
			Transition:	
Criteria for designation				
Fulfilment of three functions of MAB (conservation, development and logistic support.)				
Please list other designations and any supporting information below				
Name:	Detail:			
Name:	Detail:			
Name:	Detail:			

Divisional Forest Office Threats: Assessment Sheet 1			
In the assessment below threats should be:			
Ranked as of high significance if they are seriously degrading values; medium if they are having some negative impact and low if they are present but not seriously impacting values. Not applicable (N/A) is selected when the threat is either not present or not applicable in the Forest Division			
Note that threats ranked as of medium and high significance can be assessed in more detail using Assessment Sheet 2.			
Assessed at three levels:			
1.Current threat: in which case a 'C' is put in either the High, Medium or Low box			
2.Potential threat: in which case a 'P' is put in either the High, Medium or Low box			
3.Issues: in which case an 'I' is put in either the High, Medium or Low box			

Each threat identified could have both a current threat assessment (e.g. assessed as low) and a potential threat (e.g. assessed as medium). The category of 'issues' has been added because some management issues may not be strictly regarded as threats but need constant management intervention to ensure they do not become a threat. For example, plants collected for medicinal use could be a management issue; or a current or potential threat if management activities are not effective in controlling the collection levels or processes.

Guidance in making the assessment
Unlike many other countries in the region (and worldwide) the level of threats is fairly low at present in Bhutan and thus what might be considered of high threat here, may not be at anything like the same scale as in other countries. Guidance in what is meant by the categories high, medium and low threats in a Bhutanese context has thus been developed for threats marked ** (see Annex 1). Threat categories with specific guidance are marked by a *.

Specific guidance on assessing threats in the Bhutanese context are also given in boxes below each threat.								
1. Residential and commercial development within a protected area / forest division								
Threats from human settlements or other non-agricultural land uses with a substantial footprint								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				1.1 Housing and settlement	Could be based on built up areas from LULC 2016 in relation to the Total Divisions area			
				1.2 Commercial and industrial areas	Extent of industrial areas to the total areas of the FDs			
				1.3 Tourism and recreation infrastructure	Based on the presence of absence of Tourism plans, facilities and services existing within the FDs			

2. Agriculture and aquaculture within a protected area / forest division								
Threats from farming and grazing as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				2.1 Annual and perennial non-timber crop cultivation				
				2.1a Medicinal plant cultivation*	No quantification in this section for assessment			
				2.2 Wood and pulp plantations				
				2.2a Community forestry				
				2.2b Private forestry (e.g. planting of exotic species)				
				2.3 Livestock farming and grazing**	Based on the % area impacted by presence of livestock on the actual Division area			
				2.3a Land encroachment for agriculture				
				2.3b Land lease of government reserve land for commercial farming	Land lease area record from DLLC (Dzongkhag land leasing committee) which can be based on actual land leased with LUC(land user certificate)			
				2.4 Freshwater aquaculture				

Threat 2.1a Medicinal plant cultivation: Note that the collection of species from the wild is covered in threat 5.2								
3. Energy production and mining within a protected area / forest division								
Threats from production of non-biological resources								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				3.1 Oil and gas drilling	Not relevant			
				3.2 Mining and quarrying**	Area of mines and quarry (in % of area to total area of DFO)			
				3.3 Energy generation, including from hydropower dams*	Impact based or area covered/utilized for hydropower dams, residents, channels, power houses, etc...			
3.3 Energy generation including HEP: This question looks specifically at threats within the Divisional Forest Office. Most of the hydropower developments in Bhutan are outside protected areas but distant HEP systems can still impact on the Forest Division, the impact of such threats is covered in threat 7.2.								

4. Transportation and service corridors within a Divisional Forest Office								
Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				4.1 Roads and railroads (include road-killed animals) **	Number of species kills recorded along the roads or likely to occur			
				4.2 Utility and service lines (e.g. electricity cable lines, telephone lines) */**				
				4.3 Flight paths*	Could be minimal impacts along flight paths (Druk air, Tashi air, Helicopter>..) particularly due to noise			
4.2 Utility and service lines: Given the pace of infrastructure development in Bhutan (e.g. high-tension cables, service centres, etc) it was felt this threat should consider both impacts in the Forest Division and in the buffer zones.								
4.3 Flight paths: It should be stressed that this threat is considering flight paths of aeroplanes, hot air balloons, gliders etc, not the flight paths of birds								

5. Biological resource use and harm within a Divisional Forest Office								
Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also, persecution or control of specific species (note this includes hunting and killing of animals)								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				5.1 Hunting, killing and collecting terrestrial animals (including killing of animals as a result of human/ wildlife conflict)	No need to fill this section			
				5.1a Human wildlife conflict**	Record of HWC in respective forest Divisions			
				5.1b Wildlife Poaching**				
				5.2 Gathering terrestrial plants or plant products (non-timber)				
				5.2a Mushrooms**				
				5.2b Plant species for medicinal use**				
				5.2c Plant species for food**				
				5.3 Illegal logging and timber harvesting**				
				5.3a Legal logging and timber harvesting**				
				5.4 Fishing and harvesting aquatic resources	Date from Illegal fishing record as well as fishery groups established			

6. Human intrusions and disturbance within a Divisional Forest Office								
Threats from human activities that alter, destroy or disturb habitats and species associated with non-consumptive uses of biological resources								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				6.1 Recreational activities and tourism	No rating			
				6.1a Unmanaged ecotourism**				

				6.2 War, civil unrest and military exercises*				
				6.3 Research, education and other work-related activities in forest divisions				
				6.4 Activities of FD Managers (e.g. construction or vehicle use, artificial watering points and dams)				
				6.5 Deliberate vandalism or destructive activities				
6.2 War, civil unrest and military exercises: in the case of Bhutan war and civil unrest should include intrusion of political insurgency from across the border								
7. Natural system modifications								
Threats from other actions that convert or degrade habitat or change the way the ecosystem functions								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				7.1 Fire and fire suppression (including arson) **	Impacts on FD from activities carried out in the adjoining divisions/ parks/ State			
				7.2 Dams, hydrological modification and water management/ use*/**				
				7.3a Increased fragmentation within forest division				
				7.3b Isolation from other natural habitat (e.g. deforestation, dams without effective aquatic wildlife passages)				
				7.3c Other 'edge effects' on protected area values				

				7.3d Loss of keystone species (e.g. top predators, pollinators etc)				
Whereas threat 3 looked at impacts of infrastructure development in Divisional Forest Office, threat 7 looks at impacts which may occur from developments far away from the actually protected area. As noted above most of the hydropower developments in Bhutan are outside protected areas but distant HEP systems can still impact on the Divisional Forest Office Threat 7.2 should record impacts on habitat or changes in the way the ecosystem functions, such as changing water flow patterns.								

8. Invasive and other problematic species and genes								
Threats from terrestrial and aquatic non-native and native plants, animals, pathogens/microbes or genetic materials that have or are predicted to have harmful effects on biodiversity following introduction, spread and/or increase								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				8.1a Invasive non-native/alien plants (weeds)				
				8.1b Invasive non-native/alien animals				
				8.1c Invasive non-native/alien freshwater fish				
				8.1d Pathogens (non-native or native but creating new/increased problems)	Consider diseases here			
				8.2 Introduced genetic material (e.g. genetically modified organisms)				
9. Pollution entering or generated within a Divisional Forest Office								
Threats from introduction of exotic and/or excess materials or energy from point and non-point sources								
High	Medium	Low	N/A					
				9.1 Household sewage and urban waste water				
				9.1a Sewage and waste water from protected area facilities (e.g. toilets, hotels etc)				

				9.2 Industrial, mining and military effluents and discharges (e.g. poor water quality discharge from dams, e.g. unnatural temperatures, de-oxygenated, other pollution)				
				9.3 Agricultural and forestry effluents (e.g. excess fertilizers or pesticides)				
				9.4 Garbage and solid waste**				
				9.5 Air-borne pollutants				
				9.6 Excess energy (e.g. heat pollution, lights etc)				

10. Geological events								
Geological events may be part of natural disturbance regimes in many ecosystems. But they can be a threat if a species or habitat is damaged and has lost its resilience and is vulnerable to disturbance. Management capacity to respond to some of these changes may be limited.								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				10.1 Volcanoes	Not really relevant			
				10.2 Earthquakes/ Tsunamis	Based on the history of earthquake damages/records from dzongkhag disaster management			
				10.3 Avalanches/ Landslides	Mapp out landslides areas within the Division and compare to the total area of the Division as well take into consideration the severity of impacts from landslide in adjoining areas			
				10.4 Erosion and siltation/ deposition (e.g. shoreline or riverbed changes)				

11. Climate change and severe weather								
Threats from long-term climatic changes which may be linked to global warming and other severe climatic/ weather events outside of the natural range of variation								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				11.1 Habitat shifting and alteration				

				11.2 Droughts	Basis on weather data from NCHMS for assessment rather the social data collection for uniformity			
				11.3 Temperature extremes				
				11.4 Storms and flooding				
12. Specific cultural and social threats								
High	Medium	Low	N/A		Assessment Methods/Guide Note			
				12.1 Loss of cultural links, traditional knowledge and/or management practices	E.g. Change or decrease of Traditional grazing practices			
				12.2 Natural deterioration of important cultural site values				
				12.3 Destruction of cultural heritage buildings, gardens, sites etc				

Protected Area /Forest Division Threats: Assessment Sheet 2		
As the severity and impact of threats in Bhutan are expected to increase over the next few years, in part due to infrastructure development and the relative ease of access/communications that new roads and mobile phone coverage are allowing, the Bhutan METT + includes a more detailed assessment of major threats.		
The assessment form allows a more detailed assessment of the current or potential threats identified as having medium or high significance in Assessment Sheet 2		
1. Specify threat: Housing and settlement		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
2. Specify threat: Commercial and industrial areas		
Threat (specific if current or potential):		

Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
3. Specify threat: Tourism and recreation infrastructure		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
4. Specify threat: Wood and pulp plantations		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
5. Specify threat: Community forestry		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	

6. Specify threat: Livestock farming and grazing		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
7. Specify threat: Land encroachment for agriculture		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
8. Specify threat: Land lease of government reserve land for commercial farming		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
9. Specify threat: Energy generation, including from hydropower dams*		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat

A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
10. Specify threat: Roads and railroads (include road-killed animals) **		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
11. Specify threat: Utility and service lines (e.g. electricity cable lines, telephone lines) */**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
12. Specify threat: Human Wildlife Conflict		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	

13. Specify threat: Wildlife Poaching**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
14. Specify threat: Plant species for medicinal use**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
15. Specify threat: Plant species for food**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin-uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
16. Specify threat: Illegal logging and timber harvesting**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat

A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
17. Specify threat: Legal logging and timber harvesting**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
18. Specify threat: Fishing and harvesting aquatic resources		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
19. Specify threat: Garbage and solid waste**		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	

20. Specify threat: Earthquakes		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin- uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
21. Specify threat: Landslides		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin- uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
22. Specify threat: Erosion and siltation/ deposition (e.g. shoreline or riverbed changes)		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not contin- uous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
23. Specify threat: Storms and flooding		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat

A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
23. Specify threat: Loss of cultural links, traditional knowledge and/or management practices		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	
24. Specify threat: Natural deterioration of important cultural site values		
Threat (specific if current or potential):		
Impact of threat		Management response
Extent: Describe the extent of the im- pact under one of the three descriptors given below	Severity: Describe how severe the impact under one of the three descriptors given below	Action: What actions are planned or have taken place to manage the threat
A: Small section of the site (5-10%):	A: Minor impact:	
B: Several areas of the site (11-50%):	B: Major impact but not continuous:	
C: Most of the site (51-100%):	C: Major continuous impact:	

Protected Area /Forest Division Management Activities: Assessment Sheet 3	
Please tick the two critical management activities currently undertaken in the protected area	Comment/Explanation
o Law enforcement and surveillance	
o Promoting sustainable resource use	
o Working with local communities	
o Education and awareness	
o Demarcation and zoning	
o Monitoring	
o Research	
o Management planning	
o Ecotourism	
o Building institutional and governance capacity	
o Species management	
o Infrastructure development	
o Fundraising	
o Restoration	
o Fire management	
o Resolving tenure problems	
o Human-wildlife conflict management	
o Alien species control	
o External communication and publicity	
o Equipment and facilities	
o Improving habitat	
o Species (re)introduction / control / breeding	
o Working with regional authorities	
o Other	

Protected Area / Forest Division Management Effectiveness: Assessment					
Issue	Criteria	Score: Tick only one box per question		Comment/ Explanation	Next steps
1. Legal status Does the protected area/ forest division have legal status (or in the case of private reserves is covered by a covenant or similar)? Context	The protected area/forest division is not gazetted/covenanted	0			
	There is agreement that the protected area/Forest Division should be gazetted/covenanted but the process has not yet begun	1			
	The protected area /Forest Division is in the process of being gazetted/covenanted but the process is still incomplete (includes sites designated under international conventions, such as Ramsar, or local/traditional law such as community conserved areas, which do not yet have national legal status or covenant)	2			
	The protected area/Forest Division has been formally gazetted/ covenanted	3			
2. Protected area/forest division regulations Are appropriate regulations in place to control land use and activities (e.g. hunting)? Planning	There are no regulations for controlling land use and activities in the protected area /forest division	0			
	Some regulations for controlling land use and activities in the protected area / Forest Division exist but there are major weaknesses	1			
	Regulations for controlling land use and activities in the protected area / Forest Division exist but there are some weaknesses or gaps	2			
	Regulations for controlling inappropriate land use and activities in the protected area/ Forest Division exist and provide an excellent basis for management	3			

3. Law enforcement Can staff (i.e. those with responsibility for managing the site) enforce protected area / Forest Division rules well enough? Input	The staff have no effective capacity/resources to enforce protected/forest division area legislation and regulations	0			
	There are major deficiencies in staff capacity/resources to enforce protected area/ forest division legislation and regulations (e.g. lack of skills, no patrol budget, lack of institutional support)	1			
	The staff have acceptable capacity/resources to enforce protected area legislation and regulations but some deficiencies remain	2			
	The staff have excellent capacity/resources to enforce protected area/forest division legislation and regulations	3			
4. Protected area/forest division objectives Is management undertaken according to agreed objectives? Planning	No firm objectives have been agreed for the protected area/forest division	0			
	The protected area/forest division has agreed objectives, but is not managed according to these objectives	1			
	The protected area/forest division has agreed objectives, but is only partially managed according to these objectives	2			
	The protected area/forest division has agreed objectives and is managed to meet these objectives	3			

5. Protected area/forest division design Is the protected area/ forest division the right size and shape to meet the objectives (protect species, habitats, ecological processes and water catchments of key conservation concern, resource utilization) Planning	Inadequacies in protected area/ forest division design mean achieving the major objectives of the protected area is very difficult	0			
	Inadequacies in protected area/ forest division design mean that achievement of major objectives is difficult but some mitigating actions are being taken (e.g. agreements with adjacent land owners for wildlife corridors or introduction of appropriate catchment management)	1			
	Protected area/forest division design is not significantly constraining achievement of objectives, but could be improved (e.g. with respect to larger scale ecological processes)	2			
	Protected area/forest division design helps achievement of objectives; it is appropriate for species and habitat conservation; and maintains ecological processes such as surface and groundwater flows at a catchment scale, natural disturbance patterns etc	3			
6. Protected/forest division area boundary demarcation Is the boundary known and demarcated? Process	The boundary of the protected area/forest division is not known by the management authority or local residents/neighboring land users	0			
	The boundary of the protected area/forest division is known by the management authority but is not known by local residents/ neighboring land users	1			
	The boundary of the protected area/forest division is known by both the management authority and local residents/neighboring land users but is not appropriately demarcated	2			

	The boundary of the protected area / forest division is known by the management authority and local residents/neighboring land users and is appropriately demarcated	3			
7. Management plan Is there a management plan and is it being implemented? Planning	There is no management plan for the protected area/forest division	0			
	A management plan is being prepared or has been prepared but is not being implemented	1			
	A management plan exists but it is only being partially implemented because of funding constraints or other problems	2			
	A management plan exists and is being implemented	3			
Bhutan METT+: If a management plan is just running out and there is a process underway to redo the plan this is equivalent to score 3: a management plan exists					
Additional points: Planning					
7a. Planning process	The planning process allows adequate opportunity for key stakeholders to influence the management plan	1			
7b. Planning process	There is an established schedule and process for periodic review and updating of the management plan	1			
7c. Planning process	The results of monitoring, research and evaluation are routinely incorporated into planning	1			

8. Regular work plan Is there a regular work plan and is it being implemented Planning/Outputs	No regular work plan exists	0			
	A regular work plan exists but few of the activities are implemented	1			
	A regular work plan exists and many activities are implemented	2			
	A regular work plan exists and all activities are implemented	3			

9. Resource inventory Do you have enough information to manage the area? Input	There is little or no information available on the resource (critical habitats, species (flora & fauna), growing stocks and cultural values) of the protected area/forest division	0			
	Information on the resource (critical habitats, species (flora & fauna), growing stocks and cultural values) of the protected area/forest division not sufficient to support planning and decision making	1			
	Information on the resource (critical habitats, species (flora & fauna), growing stocks and cultural values) of the protected area/forest division sufficient for most key areas of planning and decision making	2			
	Information on the resource (critical habitats, species (flora & fauna), growing stocks and cultural values) of the protected area/forest division sufficient for all areas of planning and decision making	3			
10. Protection systems Are systems in place to control access/resource use in the protected area/ forest division ? Process/Outcome	Protection systems (patrols, permits etc) do not exist or are not effective in controlling access/resource use	0			
	Protection systems are only partially effective in controlling access/resource use	1			
	Protection systems are moderately effective in controlling access/resource use	2			
	Protection systems are largely or wholly effective in controlling access/ resource use	3			

11. Research Is there a programme of management-orientated survey and research work? Process	There is no survey or research work taking place in the protected area/ forest division	0			
	There is some survey and research work but it is not directed towards the needs of protected area / forest division management	1			
	There is some survey and research work which is at least partly directed towards the needs of protected area / forest division management	2			
	There is a comprehensive, integrated programme of survey and research work, which is relevant to management needs	3			

12. Resource management Is active resource management being undertaken? Process	Active resource management is not being undertaken	0			
	Very few of the requirements for active management of critical habitats, species, ecological processes, cultural values and sustainable resource production are being implemented	1			
	Many of the requirements for active management of critical habitats, species, ecological processes, cultural values and sustainable resource production are being implemented but some key issues are not being addressed	2			
	Requirements for active management of critical habitats, species, ecological processes, cultural values and sustainable resource production are being substantially or fully implemented	3			
12a: Management of NTFPs	A management plan exists for the management of all major non timber forest products actively collected within the protected area / forest division	1			
12b: Management of medicinal plants	A management plan exists for the management of all major medicinal plants actively collected within the protected area / forest division	1			

12c: Management of Other conservation areas (OCAs)	A management plan exists for all other conservation areas (OCAs) within the protected area/forest division	1			
Bhutan METT+: consideration of this question includes issues relating to land leasing					
13. Staff numbers Are there enough people employed to manage the protected area forest division? Inputs	There are no staff	0			
	Staff numbers are inadequate for critical management activities	1			
	Staff numbers are below optimum level for critical management activities	2			
	Staff numbers are adequate for the management needs of the protected area / forest division	3			
14. Staff training Are staff adequately trained to fulfil management objectives? Inputs/Process	Staff lack the skills needed for protected area / forest division management	0			
	Staff training and skills are low relative to the needs of the protected area /forest division	1			
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2			
	Staff training and skills are aligned with the management needs of the protected area / forest division	3			
15. Current budget Is the current budget sufficient? Inputs	There is no budget for management of the protected area / forest division	0			
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1			
	The available budget is acceptable but could be further improved to fully achieve effective management	2			
	The available budget is sufficient and meets the full management needs of the protected area / forest division	3			

Bhutan METT+: Budgets in Bhutan are divided by capital budget (infrastructure development etc) and current budget (operational costs, e.g. staff costs). Consideration of both budgets should be made when answering question 15 (and 16 and 17). The comment/explanation column should be used to detail specific issues concerning budget allocations etc.					
16. Security of budget. Is the budget secured? Inputs	There is no secure budget for the protected area/forest division and management is wholly reliant on outside or highly variable funding	0			
	There is very little secure budget and the protected area/forest division could not function adequately without outside funding	1			
	There is a reasonably secure core budget for regular operation of the protected area/forest division but many innovations and initiatives are reliant on outside funding	2			
	There is a secure budget for the protected area/ forest division and its management needs	3			
17. Management of budget Is the budget managed to meet critical management needs? Process	Budget management is very poor and significantly undermines effectiveness (e.g. late release of budget in financial year)	0			
	Budget management is poor and constrains effectiveness	1			
	Budget management is good and actions are prioritised when funds are inadequate to meet management needs	2			
	Budget management is excellent and meets management needs	3			
18. Equipment Is equipment sufficient for management needs? Input	There are little or no equipment and facilities for management needs	0			
	There are some equipment and facilities but these are inadequate for most management needs	1			
	There are equipment and facilities, but still some gaps that constrain management	2			
	There are adequate equipment and facilities	3			

Bhutan METT+: Most protected areas cover large areas, there are thus likely to be differences in equipment availability in park/ division headquarters and guard posts around the park. Question 18 should consider equipment across the whole protected area / forest division and specific concerns regarding availability should be included in the comment/explanation and next steps column					
19. Maintenance of equipment Is equipment adequately maintained? Process	There is little or no maintenance of equipment and facilities	0			
	There is some ad hoc maintenance of equipment and facilities	1			
	There is basic maintenance of equipment and facilities	2			
	Equipment and facilities are well maintained	3			
20. Education and awareness Is there a planned education programme linked to the objectives and needs? Process	There is no education and awareness programme	0			
	There is a limited and ad hoc education and awareness programme	1			
	There is an education and awareness programme but it only partly meets needs and could be improved	2			
	There is an appropriate and fully implemented education and awareness programme	3			

21. Planning for land and water use Does land and water use planning outside the protected area/forest division recognize the protected area/ forest division and aid the achievement of objectives? Planning	Adjacent land and water use planning does not take into account the needs of the protected area/forest division and activities/policies are detrimental to the survival of the area	0			
	Adjacent land and water use planning does not take into account the long-term needs of the protected area/forest division, but activities are not detrimental the area	1			
	Adjacent land and water use planning partially takes into account the long-term needs of the protected area/forest division	2			
	Adjacent land and water use planning fully takes into account the long-term needs of the protected area/forest division	3			

Bhutan METT +: This question is specific to activities outside of the protected area / forest division. EIAs are supposed to take place for any developments. Issues in Bhutan include hydropower, transmission lines and mining.					
Additional points: Land and water planning					
21a: Land and water planning for habitat conservation	Planning and management in the catchment or landscape containing the protected area/ forest division incorporates provision for adequate environmental conditions (e.g. volume, quality and timing of water flow, air pollution levels etc) to sustain relevant habitats	1			
21b: Land and water planning for connectivity	Management of corridors linking the protected area/forest division provides for wildlife passage to key habitats outside the protected area (e.g. to allow migratory fish to travel between freshwater spawning sites and the sea, or to allow animal migration)	1			
21c: Land and water planning for ecosystem services and species conservation	Planning addresses ecosystem-specific needs and/or the needs of particular species of concern at an ecosystem scale (e.g. volume, quality and timing of freshwater flow to sustain particular species, fire management to maintain grassland habitats etc.)	1			
22. State and commercial neighbors Is there co-operation with adjacent land and water users? Process	There is no contact between managers and neighboring official or corporate land and water users	0			
	There is contact between managers and neighboring official or corporate land and water users but little or no cooperation	1			
	There is contact between managers and neighboring official or corporate land and water users, but only some co-operation	2			

	There is regular contact between managers and neighboring official or corporate land and water users, and substantial co-operation on management	3			
22a: State and commercial neighbors	There is regular contact and substantial cooperation with any hydropower developers and operators whose operations impact protected area /forest division management	1			
22b: State and commercial neighbors	There is regular contact and substantial cooperation with any developers and operators of linear infrastructure (e.g. transmission lines and/or roads) whose operations impact protected area / forest division management	1			
22c: State and commercial neighbors	Where the protected area/forest division provides important natural resources for commercial operations (e.g. municipal water companies or hydropower operators) payments for ecological services agreements are in place	1			
23. Local communities Do local communities' resident or near the protected area/ forest division have input to management decisions?	Local communities have no input into decisions relating to the management of the protected area/forest division	0			
	Local communities have some input into discussions relating to management but no direct role in management	1			
Process	Local communities directly contribute to some relevant decisions relating to management but their involvement could be improved	2			
	Local communities directly participate in all relevant decisions relating to management, e.g. co-management	3			
Additional points Local communities					
23a: Impact on communities	There is open communication and trust between local people, stakeholders and protected area/ forest division managers	1			

23b: Impact on communities	Programmes to enhance community welfare, while conserving protected area/forest division resources, are being implemented	1			
23c: Impact on communities	Local people actively support the protected area/forest division	1			
24. Economic benefit Is the protected area/ forest division providing economic benefits to local communities, e.g. income, employment, payment for environmental services? Outcomes	The protected area/forest division does not deliver any economic benefits to local communities	0			
	Potential economic benefits are recognized and plans to realize these are being developed	1			
	There is some flow of economic benefits to local communities	2			
	There is a major flow of economic benefits to local communities from activities associated with the protected area/forest division	3			
25. Monitoring and evaluation Are management activities monitored against performance? Planning/Process	There is no monitoring and evaluation in the protected area/ forest division	0			
	There is some ad hoc monitoring and evaluation, but no overall strategy and/or no regular collection of results	1			
	There is an agreed and implemented monitoring and evaluation system but results do not feed back into management	2			
	A good monitoring and evaluation system exists, is well implemented and used in adaptive management	3			
26. Visitor facilities Are visitor facilities adequate? Outputs	There are no visitor facilities and services despite an identified need	0			
	Visitor facilities and services are inappropriate for current levels of visitation	1			

	Visitor facilities and services are adequate for current levels of visitation but could be improved	2			
	Visitor facilities and services are excellent for current levels of visitation	3			
27. Commercial tourism operators Do commercial tour operators contribute to protected area/ forest division management? Process	There is little or no contact between managers and tourism operators using the protected area/ forest division	0			
	There is contact between managers and tourism operators but this is largely confined to administrative or regulatory matters	1			
	There is limited co-operation between managers and tourism operators to enhance visitor experiences and maintain protected area / forest division values	2			
	There is good co-operation between managers and tourism operators to enhance visitor experiences, and maintain protected area/forest division values	3			
28. Fees If fees (e.g. entry fees) are applied, do they help protected area/forest division management? Inputs/Process	Although fees are theoretically applied, they are not collected	0			
	Fees are collected, but make no contribution to the protected area/forest division or its environs	1			
	Fees are collected, and make some contribution to the protected area/forest division and its environs	2			
	Fees are collected and make a substantial contribution to the protected area/forest division and its environs	3			
29. Fines If fines (e.g. poaching fines) are applied, do they help protected area management? Inputs/Process	There are no fines, or fines are theoretically applied but are seldom or never collected	0			

	Fines are collected, but make no direct contribution to the protected area/forest division or its environs	1			
	Fines are collected, and make some contribution to the protected area/forest division and its environs	2			
	Fines are collected and make a substantial contribution to the protected area/forest division and its environs	3			
Bhutan METT +: The term "protected area or its environs" can include incentive schemes such as payments to informers of poachers					
30. Condition of biodiversity and ecological values What is the condition of the important biodiversity values of the protected area/ forest division as compared to when it was first designated? Outcomes	Many biodiversity and ecological values are being severely degraded	0			
	Some biodiversity and ecological values are being severely degraded	1			
	Some biodiversity and ecological values are being partially degraded but the most important values have not been significantly impacted	2			
	Biodiversity and ecological values are predominantly intact	3			
Additional Points: Condition of values					
30a: Condition of biodiversity values	The assessment of the condition of biodiversity and ecological values is based on research and/ or monitoring	1			

30b: Condition of biodiversity values	Specific management programs are being implemented to address threats to biodiversity and ecological values	1			
30c: Condition of biodiversity values	Activities to maintain key biodiversity and ecological values are a routine part of protected area/forest division management	1			
Bhutan METT + questions					

31. Condition of cultural values What is the condition of the important cultural values of the protected area/ forest division as compared to when it was first designated? Outcomes	Many cultural values are being severely degraded	0			
	Some cultural values are being severely degraded	1			
	Some cultural values are being partially degraded but the most important values have not been significantly impacted	2			
	Cultural values are predominantly intact	3			
32. Access How accessible is the protected area/forest division? Planning / Process	Staff are unable to move around the protected area/forest division and thus many of the protected area/ forest division is inaccessible throughout the year	0			
	There are significant restrictions on the ability of staff to move around the protected area/forest division throughout the year (e.g. in the rainy season) and thus much of the protected area/ forest division (e.g. over 50 % of the area) is inaccessible some or all of the year	1			
	Staff are able to move relatively easily around the protected area / forest division and thus most of the protected area/forest division is accessible, although some areas (e.g. less than 50 % of the area) remain inaccessible some or all of the year	2			
	Staff are able to move easily around the whole protected area/ forest division and the majority of the protected area / forest division is fully accessible	3			
33. Neighboring protected areas/forest division Is there co-operation with adjoining protected areas/ forest division (national and international)? Process	There is no contact between managers of adjoining protected areas/ forest division on issues which impact protected area/forest division management effectiveness	0			

	There is limited contact between managers of adjoining protected areas/forest division but little co-operation on issues which impact protected area/ forest division management effectiveness	1			
	There is contact between managers of adjoining protected areas/ forest division and some cooperation on protected area/ forest division management effectiveness	2			
	There is regular contact between managers of adjoining protected areas/forest division and full cooperation on ensuring management effectiveness	3			
34. Is the protected area/ forest division being consciously managed to adapt to climate change? Planning	There have been no efforts to consider	0			
	Some initial thought has taken place about likely impacts of climate change, but this has yet to be translated into management plans	1			
	Limited plans have been drawn up about how to adapt management to predicted climate change, which may or may not be being implemented	2			
	Detailed plans have been drawn up about how to adapt management to predicted climate change, and these are already being implemented	3			
35. Is the protected area/ forest division being consciously managed to prevent carbon loss and to encourage further carbon capture? Process	Carbon storage and carbon dioxide capture has not been considered in management of the protected area/forest division		0		
	Carbon storage and carbon dioxide capture has been considered in general terms, but has not yet been significantly reflected in management		1		
	There are active measures in place to reduce carbon loss from the protected area/forest division, but no conscious measures to increase carbon dioxide capture	2			
	There are active measures in place both to reduce carbon loss from the protected area/ forest division and to increase carbon dioxide capture		3		

Protected Area / Forest Division Outcome Baseline: Assessment Sheet 5	
For this assessment to be completed a list of core indicators needs to be developed. Once indicators have been agreed then the form below should be completed for each indicator from each protected area / forest division thus providing a summary of the baseline data available. An initial list of indicators was developed in the METT workshops [1].	
Indicator	
Baseline data	Summary of data (e.g. number of species, vegetation cover etc)
Date: 2018-2021	
Data: 2015-2018	
Data: 2010-2015	
Data: 2000-2009	
Data: Pre-2000	
Data in preparation	
Data collection planned	
No data collection	
Additional notes	
[1] See: Wildlife Conservation Division and Equilibrium Research (2015). Management Effectiveness of Protected Areas in Bhutan: A training session and initial assessment of five protected areas. Thimphu, Bhutan and Bristol, UK	

Annexure I					
The guidance provided below should be considered when filling in the threat assessment (Assessment Sheet 1). The guidance has been developed to describe threat levels specific to Bhutan and will help ensure equivalence across the assessments of all protected areas in the country. (Threats assessed as of high significance can be assessed in more detail using Assessment Sheet 2). Where specific numbers are provided (as in human wildlife conflict) the indicator should be assessed against actual monitoring data, if available, or expert opinion if not. Generally, if expert opinion indicates a high threat a management action suggested in Assessment Sheet 2 would likely be to develop monitoring.					
Threat (question number)	**Indicators**	**High**	**Medium**	**Low**	**Assessment methods/ Guide Note**
Livestock farming and grazing (2.3)	Evidence of degradation	Grazing is causing major degradation, e.g. loss/reduction of species covering over more than 25% of the FD.	Grazing is causing minor degradation, e.g. loss/reduction of species covering between 11-24% of the FD.	Grazing is causing minor degradation, e.g. loss/reduction of species covering over less than 10% of the FD.	Assessment Method (uniform for all IKI landscape DFOs). % area impacted by presence of livestock to the total DFO area
		And/or	And/or	And/or	
		Negative impact such as absence of natural regeneration, invasion by invasive species and impact of migratory cattle/ sedentary ranching (herding in one location) are prevalent.	Some evidence of negative impact such as absence of natural regeneration, invasion by invasive species and some evidence impact of migratory cattle/sedentary ranching (herding in one location) are prevalent.	No evidence of negative impacts such as absence of natural regeneration, invasion by invasive species and no evidence of impact of migratory cattle/sedentary ranching (herding in one location) are prevalent.	
Extraction of minerals, quarries, etc (3.2)	Evidence of impact including potential threat	2 or more mines inside the protected area and no proper guidelines for mining operations	1 mine inside the protected area with no proper guidelines for mining operations	Mining takes place, but is managed under strict mining guidelines	Measure in % in relation to the total area of the respective DFOs
		And/or			
		Mines in core zone			

		And/or Open cast mines			

Road construction (4.1)	Evidence of impact of highway (Road) building	Evidence of major impacts on habitats and species through road building, widening and spill-over extends to over 15 metres width either side of the road/beyond the right of way in over 50% of road construction in the park.	Evidence of major impacts on habitats and species through road building, widening and spill-over extends to over 15 metres width either side of the road beyond the right of way in less than 50% of the park.	Evidence of major impacts on habitats and species through road building, widening and spill-over extends to less than 15 metres width either side of the road beyond the right of way in over 25% of the park	Consider GC and Farm roads for assessment, rather than just Highway
		And/or	And/or		
		No evidence of restoration; thus, the road construction has led to fragmentation of park/habitat.	Limited evidence of restoration; thus, the road construction has led to fragmentation of park/ habitat.		
		And/or	And/or		
		=The road construction cuts through the entire park including the core zone. There is negative impact on steams/ rivers used by wildlife, regulations related to noise control not followed.	The road construction cuts through some parts of the park (excluding the core zone which if impacted is seen as high threat) and there is negative impact on steams/rivers used by wildlife, regulations related to noise control followed but not effective		
Power Transmission Lines (4.2)	Evidence of Impact Forest fire caused by faulty transmission lines Frequency of unnatural fires	Over 2 forest fires within the last 5 years caused by faulty transmission lines	1-2 forest fires within the last 5 years caused by faulty transmission lines	There is some evidence of impacts on habitats and species in the immediate area of the transmission lines	

		And/or	And/or		
		There is major evidence of impacts on habitats and species in the immediate area of the transmission lines	There is evidence of impacts on habitats and species in the immediate area of the transmission lines		

Human Wildlife Conflicts (5.1a)	Number of conflicts Protected species killed Human life lost/ serious, life changing injury	Within the last 5 years:	Within the last 5 years:	Within the last 5 years:	
		Any deaths or suspected deaths of tiger, snow leopard or elephant	Any deaths or suspected deaths of 5 or more species (other than tiger, snow leopard or elephant which are considered as high threat) listed in the Forest and Nature Conservation Act	Less than 5 deaths or suspected deaths of species (other than tiger, snow leopard or elephant which are considered as high threat) listed in the Forest and Nature Conservation Act	No need to consider natural deaths for this assessment
		And/or	And/or	And/or	
		Any recorded deaths or life changing injury (e.g. loss of limbs which impacts livelihoods)	Records of 5 or more injuries (not life changing)	Less than 5 records of injuries (not life changing)	
		And/or	And/or	And/or	
		50 or more livestock depredation annually	25-50	less than 25	by number for Yak/cattle/ goat/sheep & horse, and by number of cases for poultry
		Loss of 50% of annual crops at a household level	Loss of 25-49% of annual crops at a household level	Loss of less than 25% of annual crops at a household level	
		And/or	And/or	And/or	
		Complete destruction of permanent infrastructure	Major damage to permanent infrastructure	Minor damage to permanent and temporary infrastructure	

Wildlife Poaching (5.1 b)	Number of wild animals lost (schedule I and II of fauna) Number of poachers arrested Number of poaching evidences (camps, traps, snares)	Evidence of poaching of at more than one, Schedule I(Fauna) and >25 of schedule II listed fauna and flora.	Evidence of poaching of at least one totally protected wild fauna and 15-24 of schedule II listed fauna and flora of schedule I and II.	No evidence of poaching of schedule list I fauna and less than 15 numbers of poaching of schedule list II of both flora and fauna.	Based on the data maintained in FIRMS, SMART Patrol and records of wildlife poaching and fines realised with DFO
		And/or	And/or	And/or	
		15 + poachers arrested	6 – 10 poachers arrested	<5 poachers arrested	
		And/or	And/or	And/or	
		50 + poaching evidences (camps, traps, snares)	11 – 30 poaching evidences (camps, traps, snares)	<10 poaching evidences (camps, traps, snares)	
NWFP Collection (5.2 a,b,c)	Evidence of species at serious risk	Widespread (over 50% of the area of the species collected) show evidence of any of the below:	Widespread (between 25- 49% of the area of the species collected) show evidence of any of the below:	Some concern about species and/or habitat decline	
		- Whole plant uprooting	- Whole plant uprooting	And/or	
		- Thriving market/demand and absence of management plan/ regulations	- Thriving market/demand and absence of management plan/ regulations	Unreliable data on species ecology available	
		- No reliable data on resilience of species	- No reliable data on resilience of species		

Illegal Timber Felling (5.3)	Evidence of degradation	Evidence of major impacts on habitats and species through illegal forest operation has impacted up to 10% of the park area over last 5 years	Evidence of major impacts on habitats and species through illegal forest operation has impacted up to between 5 -9% of the park area over last 5 years	Evidence of major impacts on habitats and species through illegal forest operation has impacted less than 5% of the park area over 5 last years	Based on the offence cases registered and illegal timber felling site areas.

Legal Timber Felling (5.3a)	Evidence of Degradation	Evidence of major impacts on habitats and species through illegal forest operation has impacted up to 10% of the park area over last 5 years	Evidence of major impacts on habitats and species through illegal forest operation has impacted up to between 5-9% of the park area over last 5 years	Evidence of major impacts on habitats and species through illegal forest operation has impacted up to less than 5% of the park area over last 10 years	Based on areas of forest degraded due to legal timber logging in different management regimes, leased areas, and developmental activities
Unmanaged ecotourism (6.1a)	Evidence of impact	No ecotourism plan for the protected area	Ecotourism plan exists for the protected area but there are no proper facilities for tourists and/or control over where tourists travel (e.g. in core areas)	Ecotourism Plan exists but is not effectively implemented or monitored	
		and			
		No proper facilities or control over tourist travelling in the designated conservation areas (e.g. in core zones)			
Forest Fires (7.1)	Evidence of degradation	Evidence of major impacts on habitats and species through unnatural fire occurrences (arson, accident etc) fire has impacted > 10% of the park area over the last 5 years.	Evidence of major impacts on habitats and species through unnatural fire occurrences (arson, accident etc) fire has impacted up 5-10% of the park area over the last five years.	Evidence of major impacts on habitats and species through unnatural fire occurrences – (arson, accident etc) fire has impacted less than 5% of the park area over the last five years.	Consider fire burnt time/ duration in the assessment
				Impacts to consider include:	
		Impacts to consider include:	Impacts to consider include:	· Fires burn for several days and response time is long	
		· Fires burn for several days and response time is long	· Fires burn for several days and response time is long	· No. of fires in the same locality	
		· No. of fires in the same locality	· No. of fires in the same locality		

Hydro Power (7.2)	Evidence of Impact Loss of habitat of water birds	Evidence of some impacts on habitats including:	Evidence of impacts on habitats including one or few of the following	Minor impacts of road construction and some evidence of mitigation/ restoration despite EIA and Environmentally Friendly Road Construction Guidelines reportedly being followed	
		· Designated conservation areas		And/or	
		· Endangered species	Only limited evidence of restoration/mitigation	Presence of interventions in place but unclear if these are functional	
		· Flight path.			
		·Exceeding 50 meters on either sides of transmission lines	EMP and Environmentally Friendly Road Construction Guidelines are being followed in some but not all sites		
		· No evidence of mitigation/ restoration			
		· EMP prescriptions not followed/complied	Presence of fish migratory ladders (Related interventions- proposed) but not properly designed &functional		
			Habitat restoration Programmes in place but not functional		

Solid Waste (9.4)	Evidence of Impact Enforcement/ compliance of rules	Major presence of non-biodegradable waste	Presence of non-biodegradable waste but being collected	There is no evidence of impacts on habitats	
		And/or	And/or	And/or	
		Evidence of deaths caused by consumption of wastes by wildlife	Some evidence of deaths caused by consumption of wastes by wildlife	Compliance of rules adequately	
		And/or	And/or		
		Spillage of waste into rivers/ streams	Some evidence of spillage of waste into rivers/streams		
		And/or	And/or		
		No enforcement/compliance of rules	Some level of enforcement/ compliance of rules		

Annexure III. Participants of Stakeholder Consultation

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Annexure IV. Checklist of Biodiversity

I. Flora species (RBA survey)

Sl No	Species	Family	Lifeform
1	*Abies densa*	Pinaceae	Evergreen tree
2	*Acer campbellii*	Sapindaceae	Deciduous tree
3	*Acer palmatum*	Sapindaceae	Deciduous tree
4	*Acer sterculiaceum*	Sapindaceae	Deciduous tree
5	*Achyranthes aspera*	Amaranthaceae	Perennial herb
6	*Achyrospermum wallichianum*	Lamiaceae	Annual herb
7	*Aconogonon molle*	Polygonaceae	Deciduous shrub
8	*Acrocarpus fraxinifolius*	Fabaceae	Deciduous shrub
9	*Acronychia pedunculata*	Rutaceae	Deciduous shrub
10	*Actinodaphne obovata*	Lauraceae	Deciduous shrub
11	*Adiantum incisum*	Pteridaceae	Fern
12	*Aeschynanthus sp*	Gesneriaceae	Epiphyte
13	*Agapetes serpens*	Ericaceae	Epiphyte
14	*Ageratina adenophora*	Asteraceae	Perennial herb
15	*Ageratum conyzoides*	Asteraceae	Annual herb
16	*Aglaia sp*	Meliaceae	Deciduous shrub
17	*Ailanthus grandis*	Simaroubaceae	Deciduous shrub
18	*Ainsliaea aptera*	Asteraceae	Perennial herb
19	*Alangium chinense*	Cornaceae	Deciduous shrub
20	*Albizia chinensis*	Fabaceae	Evergreen shrub
21	*Albizia gumli*	Fabaceae	Deciduous shrub
22	*Albizia lebbeck*	Fabaceae	Deciduous shrub
23	*Albizia procera*	Fabaceae	Deciduous shrub
24	*Albizia sp*	Fabaceae	Deciduous shrub
25	*Alchornea mollis*	Euphorbiaceae	Annual herb
26	*Alnus nepalensis*	Betulaceae	Deciduous shrub
27	*Alstonia scholaris*	Apocynaceae	Deciduous shrub
28	*Alternanthera pugens*	Amaranthaceae	Perennial herb

29	*Amaranthus sp*	Amaranthaceae	Annual herb
30	*Amoora wallichi*	Meliaceae	Deciduous shrub
31	*Anaphylis sp*	Asteraceae	Perennial herb
32	*Anisomeles indica*	Lamiaceae	Perennial herb
33	*Aphanamaxis polystachya*	Euphorbiaceae	Evergreen shrub
34	*Aporosa octandra*	Phyllanthaceae	Deciduous shrub
35	*Ardisia macrocarpa*	Primulaceae	Deciduous shrub/herb
36	*Arisaema sp*	Araceae	Perennial herb
37	*Artemisia myriantha*	Asteraceae	Deciduous shrub
38	*Artemisia sp*	Asteraceae	Deciduous shrub
39	*Arthraxon hispidus*	Poaceae	Annual herb
40	*Arundinaria graminifolia*	Poaceae	Perennial herb
41	*Asplenium nidus*	Aspleniaceae	Fern
42	*Asplenium platyneuron*	Aspleniaceae	Fern
43	*Asplenium sp*	Aspleniaceae	Fern
44	*Asystasia gangetica*	Acanthaceae	Perennial herb
45	*Axonopus sp*	Poaceae	Perennial herb
46	*Bauhinia purpurea*	Fabaceae	Deciduous shrub
47	*Begonia annulata*	Begoniaceae	Perennial herb
48	*Begonia nepalensis*	Begoniaceae	Perennial herb
49	*Begonia palmata*	Begoniaceae	Perennial herb
50	*Beilschmiedia dalzellii*	Lauraceae	Deciduous shrub
51	*Beilschmiedia gammieana*	Lauraceae	Evergreen shrub
52	*Beilschmiedia roxburghiana*	Lauraceae	Deciduous shrub
53	*Beilschmiedia sp*	Lauraceae	Evergreen shrub
54	*Berberis asiatica*	Berberidaceae	Evergreen shrub
55	*Betula alnoides*	Betulaceae	Evergreen shrub
56	*Betula utilis*	Betulaceae	Deciduous shrub
57	*Bidens pilosa*	Asteraceae	Annual herb
58	*Bischofia javanica*	Euphorbiaceae	Deciduous shrub
59	*Blechnum orientale*	Blechnaceae	Fern
60	*Boehmeria platanifolia*	Urticaceae	Deciduous tree
61	*Boehmeria sp*	Urticaceae	Deciduous shrub
62	*Bombax ceiba*	Malvaceae	Deciduous shrub
63	*Borinda grossa*	Poaceae	Perennial shrub
64	*Brassaiopsis hispida*	Araliaceae	Deciduous shrub
65	*Brassaiopsis mitis*	Araliaceae	Deciduous shrub
66	*Bridelia retusa*	Phyllanthaceae	Deciduous shrub
67	*Brugmansia arborea*	Solanaceae	Evergreen shrub

68	*Brugmansia suaveolens*	Solanaceae	Perennial shrub
69	*Bulbophyllum reptens*	Orchidaceae	Epiphyte
70	*Bulbophyllum sp*	Orchidaceae	Epiphyte
71	*Cajanas molle*	Fabaceae	Perennial herb
72	*Calanthe sylvatica*	Orchidaceae	Perennial herb
73	*Callicarpa arborea*	Lamiaceae	Evergreen shrub
74	*Capparis acutifolia*	Capparaceae	Evergreen shrub
75	*Carex sp*	Cyperaceae	Perennial herb
76	*Careya arborea*	Lecythidaceae	Evergreen shrub
77	*Casearia glomerata*	Salicaceae	Evergreen shrub
78	*Cassia fistula*	Fabaceae	Evergreen tree
79	*Castanopsis hystrix*	Fagaceae	Deciduous tree
80	*Castanopsis indica*	Fagaceae	Deciduous tree
81	*Castanopsis sp*	Fagaceae	Evergreen tree
82	*Castanopsis tribuloides*	Fagaceae	Evergreen tree
83	*Catunaregam spinosa*	Rubiaceae	Evergreen shrub
84	*Celtis tetrandra*	Ulmaceae	Deciduous shrub
85	*Cephalostychum sp*	Poaceae	Perennial herb
86	*Ceratostylis himalaica*	Orchidaceae	Epiphyte
87	*Cheilocostus speciosus*	Costaceae	Perennial herb
88	*Chenopodium sp*	Amaranthaceae	Annual herb
89	*Chierostylis sp*	Orchidaceae	Perennial herb
90	*Chimonobambusa callosa*	Poaceae	Bamboo
91	*Choerospondias axillaris*	Anacardiaceae	Deciduous shrub
92	*Chromolaena odoratum*	Asteraceae	Evergreen shrub
93	*Chukrasia tabularis*	Meliaceae	Evergreen tree
94	*Cinnamomum bejolghota*	Lauraceae	Deciduous shrub
95	*Cinnamomum glaucescens*	Lauraceae	Deciduous shrub
96	*Cinnamomum grandiflorum*	Lauraceae	Deciduous shrub
97	*Cinnamomum sp*	Lauraceae	Deciduous shrub
98	*Cinnamomum zeylinicum*	Lauraceae	Deciduous shrub
99	*Cinnamomun impressinervium*	Lauraceae	Deciduous shrub
100	*Cirsium sp*	Asteraceae	Perennial herb
101	*Cleidion spiciflorum*	Euphorbiaceae	Evergreen tree
102	*Clematis smilacifolia*	Ranunculaceae	Perennial woody vine
103	*Clerodendron sp*	Lamiaceae	Perennial shrub
104	*Clerodendrum infortunatum*	Lamiaceae	Deciduous shrub
105	*Clerodendrum japonicum*	Lamiaceae	Deciduous shrub
106	*Clinopodium umbrosum*	Lamiaceae	Perennial herb

107	*Clitonia sp*	Uvulariaceae	Perennial herb
108	*Coelogyne ovalis*	Orchidaceae	Epiphyte
109	*Coelogyne sp*	Orchidaceae	Epiphyte
110	*Colocasia sp*	Araceae	Tuberous herb
111	*Commelina benghalensis*	Commelinaceae	Perennial herb
112	*Commelina sp*	Commelinaceae	Perennial herb
113	*Conyza floribunda*	Asteraceae	Annual herb
114	*Coriaria nepalensis*	Coriariaceae	Deciduous tree
115	*Cornus capitata*	Cornaceae	Evergreen shrub
116	*Corydalis sp*	Papaveraceae	Perennial herb
117	*Corylus ferox*	Betulaceae	Evergreen tree
118	*Cotoneaster microphyllus*	Rosaceae	Perennial shrub
119	*Crateva religiosa*	Capparaceae	Evergreen tree
120	*Croton caudatus*	Euphorbiaceae	Evergreen tree
121	*Croton tiglium*	Euphorbiaceae	Evergreen shrub
122	*Cryptocarya bhutanica*	Lauraceae	Evergreen shrub
123	*Cryptocarya sp*	Lauraceae	Evergreen shrub
124	*Cyathea spinulosa*	Cyatheaceae	Evergreen tree
125	*Cyathula prostrata*	Amaranthaceae	Perennial herb
126	*Cyclea bicristata*	Menispermaceae	Perennial woody vine
127	*Cymbidium sp*	Orchidaceae	Epiphyte
128	*Cynanchum laeve*	Asclepiadaceae	Perennial herb
129	*Cynoglossum furcatum*	Boraginaceae	Perennial herb
130	*Cyperus lucida*	Cyperaceae	Deciduous tree
131	*Cythea spinulosa*	Cyatheaceae	Fern
132	*Daphne bholua*	Thymelaeaceae	Perennial shrub
133	*Debregeasia longifolia*	Urticaceae	Evergreen shrub
134	*Dellenia indica*	Anacardiaceae	Evergreen tree
135	*Dendrobium candidum*	Orchidaceae	Epiphyte
136	*Dendrobium densiflora*	Orchidaceae	Epiphyte
137	*Dendrobium hookeri*	Orchidaceae	Epiphyte
138	*Dendrobium nobile*	Orchidaceae	Epiphyte
139	*Dendrobium sp*	Orchidaceae	Epiphyte
140	*Dendrobuim jenkensii*	Orchidaceae	Epiphyte
141	*Dendrocalamus hamiltonii*	Poaceae	Bamboo
142	*Dendrocnide sinuata*	Urticaceae	Evergreen tree
143	*Desmodium elegans*	Fabaceae	Evergreen tree
144	*Desmodium triflorum*	Fabaceae	Perennial shrub
145	*Digitaria sp*	Poaceae	Annual herb

146	*Dioscorea bulbifera*	Dioscoreaceae	Climbing vine
147	*Diplazium esculentum*	Athyriaceae	Fern
148	*Diplazium maxima*	Athyriaceae	Fern
149	*Diplazium pycnocarpon*	Athyriaceae	Fern
150	*Diplazium sp*	Athyriaceae	Fern
151	*Diploknema butyracea*	Sapotaceae	Evergreen tree
152	*Diplopterys cabrerana*	Malpighiaceae	Evergreen shrub
153	*Discorea pentaphylla*	Dioscoreaceae	Climbing vine
154	*Discorea* sp	Orchidaceae	Epiphyte
155	*Docynia indica*	Rosaceae	Deciduous shrub
156	*Dracaena* sp	Asparagaceae	Evergreen shrub
157	*Drepanostachyum falcatum*	Grammianae	Perennial herb
158	*Drimycarpus racemosus*	Achariaceae	Evergreen shrub
159	*Drymaria cordata*	Caryophyllaceae	Annual herb
160	*Drynaria propinqua*	Orchidaceae	Epiphyte
161	*Drynaria quercifolia*	Polypodiaceae	Fern
162	*Dryopsis clarkei*	Dryopteridaceae	Perennial herb
163	*Dryopteris filixmas*	Dryopteridaceae	Fern
164	*Dryopteris* sp	Dryopteridaceae	Fern
165	*Dryopteris wallichiana*	Dryopteridaceae	Fern
166	*Drypetes longifolia*	Putranjivaceae	Evergreen shrub
167	*Drypetes* sp	Putranjivaceae	Evergreen tree
168	*Duabanga grandiflora*	Lythraceae	Evergreen tree
169	*Duchesnia indica*	Rosaceae	Perennial herb
170	*Duhaldea cappa*	Asteraceae	Perennial shrub
171	*Echinocarpus dasycarpus*	Sapindaceae	Evergreen shrub
172	*Ehretia acuminata*	Boraginaceae	Evergreen shrub
173	*Elaeagnus* sp	Elaeagnaceae	Evergreen shrub
174	*Elaeocarpus brunnania*	Elaeocarpaceae	Evergreen shrub
175	*Elaeocarpus* sp	Elaeocarpaceae	Evergreen tree
176	*Elatostema obtusum*	Urticaceae	Perennial herb
177	*Eleusine indica*	Poaceae	Annual herb
178	*Endospermum chinensis*	Euphorbiaceae	Deciduous tree
179	*Engelhardia spicata*	Juglandaceae	Deciduous shrub
180	*Equisetum arvense*	Equisetaceae	Perennial herb
181	*Erianthus integrifolia*	Poaceae	Evergreen shrub
182	*Erigeron* sp	Asteraceae	Perennial herb/shrub
183	*Eriobotrya* sp	Rosaceae	Evergreen shrub
184	*Erythina stricta*	Fabaceae	Deciduous shrub

185	*Erythrina arborescens*	Fabaceae	Deciduous shrub
186	*Escythanthus* sp	Orchidaceae	Epiphyte
187	*Etsholtzia* sp	Lamiaceae	Perennial herb
188	*Euonymus tingens*	Celastraceae	Deciduous shrub
189	*Eurya acuminata*	Pentaphylacaceae	Evergreen shrub
190	*Eurya cerasifolia*	Pentaphylacaceae	Evergreen shrub
191	*Eurya* sp	Pentaphylacaceae	Evergreen shrub
192	*Exbucklandia populnea*	Hamamelidaceae	Evergreen tree
193	*Ficus auriculata*	Moraceae	Evergreen shrub
194	*Ficus neriifolia*	Moraceae	Evergreen shrub
195	*Ficus roxburghii*	Moraceae	Evergreen shrub
196	*Ficus semicordata*	Moraceae	Evergreen shrub
197	*Ficus* sp	Moraceae	Evergreen tree
198	*Flueggea virosa*	Phyllanthaceae	Evergreen tree
199	*Fragaria nubicola*	Rosaceae	Perennial herb
200	*Galingsoga parviflora*	Asteraceae	Annual herb
201	*Galium* sp	Rubiaceae	Annual herb
202	*Gamblea ciliata*	Myrtaceae	Evergreen tree
203	*Garuga pinnata*	Burseraceae	Evergreen tree
204	*Gaultheria fragrantissima*	Ericaceae	Evergreen shrub
205	*Geranium nepalense*	Geraniaceae	Perennial herb
206	*Geranium* sp	Geraniaceae	Perennial herb or shrub
207	*Girardinia diversifolia*	Urticaceae	Perennial herb
208	*Glochidion* sp	Phyllanthaceae	Evergreen tree
209	*Glycosmis cymosa*	Rutaceae	Deciduous shrub
210	*Gmelina arborea*	Lamiaceae	Evergreen tree
211	*Goniothalamus sesquipedalis*	Annonaceae	Evergreen tree
212	*Goodyera velutina*	Orchidaceae	Perennial herb
213	*Grewia asiatica*	Malvaceae	Deciduous tree
214	*Grewia* sp	Malvaceae	Deciduous tree
215	*Gynocardia odorata*	Euphorbiaceae	Evergreen tree
216	*Hedera nepalensis*	Araliaceae	Perennial shrub
217	*Hedera* sp	Araliaceae	Evergreen shrub
218	*Hedychium gardnerianum*	Zingiberaceae	Perennial herb
219	*Hedychium* sp	Orchidaceae	Epiphyte
220	*Hedyotis scandens*	Rubiaceae	Climbing vine
221	*Helicia nilagirica*	Proteaceae	Evergreen tree
222	*Hemifragma fragrantissma*	Saxifragaceae	Perennial herb
223	*Heynea trijuga*	Meliaceae	Evergreen tree

224	*Houttinya cordata*	Saururaceae	Perennial herb
225	*Hovenia dulcis*	Rhamnaceae	Evergreen tree
226	*Hovenia* sp	Rhamnaceae	Evergreen tree
227	*Hoya polyneura*	Moraceae	Tuberous herb
228	*Hydrangea fabrifuja*	Hydrangeaceae	Evergreen shrub
229	*Hydrangea* sp	Hydrangeaceae	Perennial herb or shrub
230	*Hydrocotyle* sp	Araliaceae	Perennial herb
231	*Hypericum* sp	Hypericaceae	Perennial herb or shrub
232	*Ichinocarpus desicarpus*	Apocynaceae	Deciduous shrub
233	*Ilex intricata*	Aquifoliaceae	Perennial shrub
234	*Ilex sp*	Aquifoliaceae	Evergreen tree
235	*Ilex dipyrena*	Aquifoliaceae	Evergreen tree
236	*Impatiens parviflora*	Balsaminaceae	Annual herb
237	*Impatiens* sp	Balsaminaceae	Annual herb
238	*Indigofera dosua*	Fabaceae	Deciduous shrub
239	*Indigofera* sp	Fabaceae	Deciduous shrub
240	*Ipomea batata*	Convolvulaceae	Perennial herb
241	*Itea macrophylla*	Grossulariaceae	Evergreen tree
242	*Juglans regia*	Juglandaceae	Deciduous tree
243	*Juniperus recurva*	Cupressaceae	Evergreen tree
244	*Lagerstroemia parvifolia*	Lythraceae	Deciduous tree
245	*Lannea coromandelica*	Anacardiaceae	Evergreen tree
246	*Lantana camara*	Verbenaceae	Perennial herb or shrub
247	*Lecanthus peduncularis*	Urticaceae	Perennial herb
248	*Leea indica*	Leeaceae	Evergreen shrub
249	*Lepisorus sp.*	Araliaceae	Climber
250	*Lindera cubeba*	Lauraceae	Evergreen tree
251	*Linea peervifolia*	Euphorbiaceae	Evergreen shrub
252	*Lithocarpus elegans*	Fagaceae	Evergreen tree
253	*Litsea glutinosa*	Lauraceae	Evergreen tree
254	*Litsea* sp	Lauraceae	Evergreen tree
255	*Lobelia erectiuscula*	Campanulaceae	Perennial shrub
256	*Lycodium* sp	Smilacaceae	Climber
257	*Lycopodium clavatum*	Araceae	Herb
258	*Lyonia ovalifolia*	Ericaceae	Evergreen tree
259	*Lyonia villosa*	Ericaceae	Evergreen tree
260	*Macaranga denticulata*	Euphorbiaceae	Evergreen tree
261	*Macaranga peltata*	Euphorbiaceae	Evergreen tree
262	*Macaranga pustulata*	Euphorbiaceae	Evergreen tree

263	*Macaranga* sp	Euphorbiaceae	Evergreen tree
264	*Macropanax leschenaultii*	Araliaceae	Evergreen tree
265	*Maesa chisia*	Maesaceae	Evergreen tree
266	*Maesa macrophylla*	Maesaceae	Evergreen tree
267	*Magnolia campbellii*	Magnoliaceae	Evergreen tree
268	*Magnolia cathcartii*	Magnoliaceae	Evergreen tree
269	*Magnolia hodgsonii*	Magnoliaceae	Evergreen tree
270	*Magnolia* sp	Magnoliaceae	Evergreen tree
271	*Mallotus philippensis*	Euphorbiaceae	Evergreen tree
272	*Mangifera sylvatica*	Anacardiaceae	Evergreen tree
273	*Melastoma normale*	Melastomataceae	Evergreen shrub
274	*Melastoma* sp	Melastomataceae	Evergreen shrub
275	*Melia azedarach*	Meliaceae	Deciduous tree
276	*Melica uniflora*	Poaceae	Perennial herb
277	*Meliosma dillenifolia*	Sapindaceae	Evergreen tree
278	*Mentha* sp	Lamiaceae	Perennial herb
279	*Michelia champaca*	Magnoliaceae	Evergreen tree
280	*Michelia doltsopa*	Magnoliaceae	Evergreen tree
281	*Michelia velutina*	Magnoliaceae	Evergreen tree
282	*Microlepia setosa*	Dennstaedtiaceae	Fern
283	*Mikania micrantha*	Asteraceae	Perennial herb
284	*Mitrephora harai*	Annonaceae	Evergreen shrub
285	*Molineria capitulata*	Asteraceae	Perennial herb
286	*Monachosorum henryi*	Dennstaedtiaceae	Fern
287	*Monstera tarrazuensis*	Orchidaceae	Epiphyte
288	*Morus macroura*	Moraceae	Deciduous tree
289	*Mucuna* sp	Fabaceae	Perennial herb
290	*Murraya koenigii*	Rutaceae	Evergreen tree
291	*Murraya paniculata*	Rutaceae	Evergreen tree
292	*Myrica esculenta*	Myricaceae	Evergreen tree
293	*Myrsine seguinii*	Primulaceae	Evergreen shrub
294	*Myrsine semiserrata*	Primulaceae	Evergreen shrub
295	*Neolitsea sericea*	Lauraceae	Evergreen tree
296	*Neolitsea* sp	Lauraceae	Evergreen tree
297	*Nephrolepsis cordifolia*	Lomariopsidaceae	Fern
298	*Nyssa javanica*	Nyssaceae	Evergreen tree
299	*Nyssa* sp	Nyssaceae	Evergreen tree
300	*Oberonia spp*	Orchidaceae	Epiphyte
301	*Ocimum basilicum*	Lamiaceae	Annual herb

302	*Ophiopogon* sp	Asparagaceae	Perennial herb
303	*Oplismenus hirtellus*	Poaceae	Perennial herb
304	*Oroxylum indicum*	Bignoniaceae	Deciduous tree
305	*Osbeckia stellata*	Melastomataceae	Perennial herb
306	*Ostodes paniculata*	Orchidaceae	Evergreen tree
307	*Otichilius lanceolatus*	Orchidaceae	Epiphyte
308	*Oxalis corniculata*	Oxalidaceae	Annual herb
309	*Pandanus* sp	Pandanaceae	Evergreen shrub
310	*Parassaforus confertiflora*	Meliaceae	Evergreen tree
311	*Paris polyphylla*	Trilliaceae	Perennial herb
312	*Parmelia* sp	Orchidaceae	Epiphyte
313	*Pelea* sp	Malvaceae	Perennial herb
314	*Pentapanex racemosus*	Araliaceae	Evergreen tree
315	*Peperomia* sp	Pteridaceae	Epiphyte
316	*Peperomia tetraphylla*	Selaginellaceae	Fern
317	*Peranema aspidioides*	Dennstaedtiaceae	Fern
318	*Persea clarkeana*	Lauraceae	Evergreen tree
319	*Persea duthiei*	Lauraceae	Evergreen tree
320	*Persea fructifera*	Lauraceae	Evergreen tree
321	*Persea fruticosa*	Lauraceae	Evergreen tree
322	*Persea* sp	Lauraceae	Evergreen tree
323	*Persicaria* sp	Polygonaceae	Perennial herb
324	*Phanera vahlii*	Fabaceae	Evergreen tree
325	*Phlogancathus thyrsiformis*	Rubiaceae	Evergreen tree
326	*Phoebe attenuata*	Lauraceae	Evergreen tree
327	*Phoebe lanceolata*	Lauraceae	Evergreen tree
328	*Phoenix rupicola*	Arecaceae	Evergreen tree
329	*Phyllanthus tenellus*	Phyllanthaceae	Deciduous shrub
330	*Pieris formosa*	Ericaceae	Evergreen shrub
331	*Pilea bracteosa*	Urticaceae	Perennial herb
332	*Pinus roxburghii*	Pinaceae	Evergreen tree
333	*Pinus wallichiana*	Pinaceae	Evergreen tree
334	*Piper betleoides*	Piperaceae	Perennial herb
335	*Piper longum*	Dennstaedtiaceae	Perennial herb
336	*Piper pedicellatum*	Piperaceae	Perennial herb
337	*Piper sp*	Piperaceae	Perennial herb
338	*Plagiogyria* sp	Dennstaedtiaceae	Fern
339	*Plantago erosa*	Plantaginaceae	Perennial herb
340	*Plantago* sp	Plantaginaceae	Perennial herb

341	*Pogostemon benghalensis*	Lamiaceae	Evergreen shrub
342	*Pogostemon* sp	Lamiaceae	Evergreen shrub
343	*Polyalthia simiarum*	Annonaceae	Evergreen tree
344	*Polystichum* sp	Dryopteridaceae	Fern
345	*Polystichum sterophyllum*	Dryopteridaceae	Fern
346	*Potentilla peduncularis*	Rosaceae	Perennial herb
347	*Potentilla* sp	Rosaceae	Perennial herb
348	*Pothos chinensis*	Aspleniaceae	Fern
349	*Pouzolzia* sp	Urticaceae	Perennial herb
350	*Pouzolzia hirta*	Urticaceae	Perennial herb
351	*Pouzolzia sanguinea*	Urticaceae	Perennial herb
352	*Premna barbata*	Lamiaceae	Evergreen tree
353	*Primula braccata*	Primulaceae	Perennial herb
354	*Primula denticulata*	Primulaceae	Perennial herb
355	*Prunus cerasoides*	Rosaceae	Deciduous tree
356	*Prunus* sp	Rosaceae	Deciduous tree
357	*Psilanthus bengalensis*	Rubiaceae	Deciduous shrub
358	*Pteridium aquilinum*	Pteridaceae	Fern
359	*Pteris scabbringens*	Pteridaceae	Fern
360	*Pteris biaurita*	Pteridaceae	Fern
361	*Pteris* sp	Pteridaceae	Fern
362	*Pteris wallichiana*	Pteridaceae	Fern
363	*Pterospermum acerifolium*	Sterculiaceae	Evergreen tree
364	*Pyrrosia hecteractis*	Parmeliaceae	Lichen
365	*Pyrrosia* sp	Piperaceae	Herb
366	*Pyrularia edulis*	Santalaceae	Evergreen tree
367	*Quercus glauca*	Fagaceae	Evergreen tree
368	*Quercus griffithii*	Fagaceae	Deciduous tree
369	*Quercus lamellosa*	Fagaceae	Evergreen tree
370	*Quercus lanata*	Fagaceae	Evergreen tree
371	*Quercus semecarpifolia*	Fagaceae	Evergreen tree
372	*Quercus* sp	Fagaceae	Evergreen tree
373	*Rabdosia* sp	Lamiaceae	Perennial herb
374	*Rhaphidophora decursiva*	Piperaceae	Climber
375	*Rhaphidophora* sp	Araceae	Herb
376	*Rhobus* sp	Fabaceae	Perennial herb
377	*Rhododendron arboreum*	Ericaceae	Evergreen tree
378	*Rhododendron barbatum*	Ericaceae	Evergreen tree
379	*Rhododendron falconeri*	Ericaceae	Evergreen tree

380	*Rhododendron grande*	Ericaceae	Evergreen tree
381	*Rhododendron hodgsonii*	Ericaceae	Evergreen tree
382	*Rhododendron kesangiae*	Ericaceae	Evergreen tree
383	*Rhododendron lanatum*	Ericaceae	Evergreen tree
384	*Rhododendron* sp	Ericaceae	Evergreen tree
385	*Rhododendron triflorum*	Ericaceae	Evergreen shrub
386	*Rhus chinensis*	Anacardiaceae	Deciduous tree
387	*Rhus hookeri*	Anacardiaceae	Deciduous tree
388	*Rhus* sp	Anacardiaceae	Deciduous tree
389	*Ricinus communis*	Euphorbiaceae	Evergreen shrub
390	*Robus microphylla*	Rubiaceae	Perennial herb
391	*Robus* sp (Pan Kara)	Rosaceae	Perennial herb
392	*Rubia cordifolia*	Rosaceae	Perennial herb
393	*Rubia sikkimensis*	Rosaceae	Perennial herb
394	*Rubia* sp	Rosaceae	Perennial herb
395	*Rubus biflorus*	Rosaceae	Evergreen shrub
396	*Rubus calycinus*	Rosaceae	Perennial herb
397	*Rubus ellipticus*	Rosaceae	Evergreen shrub
398	*Rubus microphylla*	Rosaceae	Perennial herb
399	*Rubus* sp	Rosaceae	Evergreen shrub
400	*Rumex nepalensis*	Polygonaceae	Perennial herb
401	*Salvia sclarea*	Lamiaceae	Biannual herb
402	*Sambucus* sp	Adoxaceae	Perennial herb
403	*Sanicula elata*	Apiaceae	Perennial herb
404	*Sapindus rarak*	Sapindaceae	Deciduous tree
405	*Sapium insigne*	Euphorbiaceae	Deciduous tree
406	*Saurauia armata*	Actinidiaceae	Deciduous shrub
407	*Saurauia napaulensis*	Actinidiaceae	Deciduous tree
408	*Schefflera impressa*	Polypodiaceae	Fern
409	*Schefflera pubscense*	Araliaceae	Evergreen shrub
410	*Schefflera* sp	Araceae	Herb
411	*Schima khasiana*	Theaceae	Evergreen tree
412	*Schima wallichii*	Theaceae	Evergreen tree
413	*Selaginella involvens*	Selaginellaceae	Fern
414	*Selaginella monospermum*	Selaginellaceae	Fern
415	*Selaginella* sp	Selaginellaceae	Fern
416	*Selinum wallichainum*	Apiaceae	Perennial herb
417	*Shorea robusta*	Dipterocarpaceae	Evergreen tree
418	*Sida acuminata*	Malvaceae	Deciduous shrub

419	*Sida acuta*	Malvaceae	Annual herb
420	*Sloanea dasycarpa*	Elaeocarpaceae	Evergreen tree
421	*Sloanea tomentosa*	Elaeocarpaceae	Evergreen tree
422	*Smilax minutiflora*	Smilacaceae	Perennial herb
423	*Smilax munita*	Smilacaceae	Evergreen shrub
424	*Smilax perfoliata*	Smilacaceae	Perennial herb
425	*Smilax zeylanica*	Smilacaceae	Evergreen shrub
426	*Solanum erianthum*	Solanaceae	Deciduous shrub
427	*Solanum viarum*	Solanaceae	Annual herb
428	*Sorbus thebitica*	Rosaceae	Deciduous tree
429	*Spermacoce alata*	Rubiaceae	Perennial herb
430	*Spindus rarak*	Sapindaceae	Evergreen shrub
431	*Stellaria sp*	Caryophyllaceae	Perennial herb
432	*Stephania sp*	Menispermaceae	Perennial herb
433	*Sterculia lanceifolia*	Malvaceae	Deciduous shrub
434	*Sterculia villosa*	Malvaceae	Evergreen tree
435	*Stereospermum chilonoides*	Bignoniaceae	Evergreen shrub
436	*Strobilanthes intrigofolia*	Acanthaceae	Perennial herb
437	*Strobilanthes* sp	Acanthaceae	Perennial herb
438	*Styrax serrulatus*	Styracaceae	Evergreen tree
439	*Symplocos dryophila*	Symplocaceae	Evergreen tree
440	*Symplocos glomerata*	Symplocaceae	Evergreen tree
441	*Symplocos lucida*	Symplocaceae	Evergreen tree
442	*Symplocos* sp	Symplocaceae	Evergreen tree
443	*Synotis tetrantha*	Compositae	Perennial herb
444	*Syzygium cumini*	Myrtaceae	Evergreen tree
445	*Syzygium formosum*	Myrtaceae	Evergreen tree
446	*Syzygium* sp	Myrtaceae	Evergreen tree
447	*Syzygium tetragonum*	Myrtaceae	Deciduous shrub
448	*Tabernaemontana divaricata*	Apocynaceae	Evergreen tree
449	*Talauma hodgsonii*	Magnoliaceae	Evergreen tree
450	*Tectona grandis*	Lamiaceae	Evergreen tree
451	*Terminalia bellirica*	Combretaceae	Evergreen tree
452	*Terminalia myriocarpa*	Combretaceae	Evergreen tree
453	*Terminalia nudiflora*	Combretaceae	Evergreen tree
454	*Terminalia tomentosa*	Combretaceae	Evergreen tree
455	*Tetradium fraxinifolium*	Rutaceae	Evergreen tree
456	*Trameles nudiflora*	Tetramelaceae	Evergreen shrub
457	*Tetrasigma serrulatum*	Vitaceae	Perennial herb

458	*Tetrastigma* sp	Vitaceae	Perennial herb
459	*Teucrium grandifolium*	Lamiaceae	Perennial herb
460	*Thelypteris procera*	Thelypteridaceae	Fern
461	*Thelypteris* sp	Thelypteridaceae	Fern
462	*Thunbergia coccinea*	Smilacaceae	Climber
463	*Thysanolaena latifolia*	Poaceae	Evergreen shrub
464	*Tinospora cordifolia*	Menispermaceae	Climber
465	*Toddalia asiatica*	Rutaceae	Evergreen tree
466	*Toona ciliata*	Meliaceae	Evergreen tree
467	*Trewia nudiflora*	Euphorbiaceae	Evergreen tree
468	*Trifolium repens*	Fabaceae	Perennial herb
469	*Tripterospermum volubile*	Gentianaceae	Perennial herb
470	*Tsodon* sp	Asclepiadaceae	Perennial herb
471	*Tsuga dumosa*	Pinaceae	Evergreen shrub
472	*Urena lobata*	Malvaceae	Perennial herb
473	*Urtica dioca*	Urticaceae	Evergreen shrub
474	*Urtica* sp	Urticaceae	Perennial herb
475	*Vernolia volkameriifolia*	Asteraceae	Evergreen shrub
476	*Viburnum cylindricum*	Adoxaceae	Evergreen shrub
477	*Viburnum erubescens*	Adoxaceae	Deciduous shrub
478	*Viola betonicifolia*	Violaceae	Perennial herb
479	*Viola bhutanica*	Violaceae	Perennial herb
480	*Viola biflora*	Violaceae	Perennial herb
481	*Viola hookeri*	Violaceae	Perennial herb
482	*Viola diffusa*	Violaceae	Perennial herb
483	*Vitex negundo*	Lamiaceae	Evergreen shrub
484	*Wallichia oblongifolia*	Arecaceae	Evergreen tree
485	*Walsura pinnata*	Meliaceae	Evergreen tree
486	*Walsura robusta*	Meliaceae	Evergreen tree
487	*Wendlandia sp*	Rubiaceae	Deciduous shrub
488	*Wrightia arborea*	Apocynaceae	Evergreen shrub
489	*Yushania microphylla*	Poaceae	Perennial herb
490	*Yushinia* sp	Rosaceae	Bamboo

Beside this list, species such as Paphiopedilum fairrieanum are also found within the Division. The species recorded above are inclusive of RBA data only.

II. Checklist of mammals

Sl. No.	Common name	Scientific name	Family
1	*Himalayan Red Panda*	*Ailurus fulgens*	Ailuridae
2	*Himalayan Serow*	*Capricornis sumatraensis*	Bovidae
3	*Goral*	*Naemorhedus goral*	Bovidae
4	*Gaur*	*Bos gaurus*	Bovidae
5	*Dhole / Asiatic Wild Dog*	*Cuon alpinus*	Canidae
6	*Assamese Macaque*	*Macaca assamensis*	Cercopithecidae
7	*Rhesus Macaque*	*Macaca mulatta*	Cercopithecidae
8	*Grey Langur*	*Semnopithecus entellus*	Cercopithecidae
9	*Barking Deer*	*Muntiacus muntjac*	Cervidae
10	*Sambar*	*Rusa unicolor*	Cervidae
11	*Spotted Deer / Cheetal*	*Axis axis*	Cervidae
12	*Asian Elephant*	*Elephas maximus*	Elephantidae
13	*Asian Golden Cat*	*Catopuma temminckii*	Felidae
14	*Marbled Cat*	*Pardofelis marmorata*	Felidae
15	*Leopard Cat*	*Prionailurus bengalensis*	Felidae
16	*Tiger*	*Panthera tigris*	Felidae
17	*Clouded Leopard*	*Neofelis nebulosa*	Felidae
18	*Common Leopard*	*Panthera pardus*	Felidae
19	*Snow Leopard*	*Panthera uncia*	Felidae
20	*Crab-eating Mongoose*	*Herpestes urva*	Herpestidae
21	*Common Mongoose*	*Hepestes edwardsii*	Herpestidae
22	*Himalayan Crestless Porcupine*	*Hystrix brachyura*	Hystricidae
23	*Asiatic Brush-tailed Porcupine*	*Atherurus macrourus*	Hystricidae
24	*Indian Crested Porcupine*	*Hystrix indica*	Hystricidae
25	*Blacknapped Hare*	*Lepus nigricollis*	Leporidae
26	*Hispid Hare*	*Caprolagus hispidus*	Leporidae
27	*Chinese Pangolin*	*Manis pentadactyla*	Manidae
28	*Himalayan Musk Deer*	*Moschus leucogaster*	Moschidae
29	*Rat*	*Rattus* sp.	Muridae
30	*Sikkim Rat*	*Rattus andamanensis*	Muridae
31	*Yellow-throated Marten*	*Martes flavigula*	Mustelidae
32	*Weasel*	*Mustela kathiah*	Mustelidae
33	*Small-toothed Ferred Badger*	*Melogale moschata*	Mustelidae
34	*Himalayan Weasel*	*Mustela sibirica*	Mustelidae
35	*Common Otter*	*Lutra lutra*	Mustelidae
36	*Spotted Linsang*	*Prionodon pardicolor*	Prionodontidae
37	*Indian Palm Squirrel*	*Funambulus palmarum*	Sciuridae

38	*Black Giant Squirrel*	*Ratufa bicolor*	Sciuridae
39	*Bhutan Giant Flying Squirrel*	*Petaurista nobilis*	Sciuridae
40	*Red Giant Flying Squirrel*	*Petaurista peraurista*	Sciuridae
41	*Pallas Squirrel / Red-bellied Squirrel*	*Callosciurus erythraeus*	Sciuridae
42	*Hoary-bellied Squirrel*	*Callosciurus pygerythrus*	Sciuridae
43	*Wild Pig*	*Sus scrofa*	Suidae
44	*Himalayan Black Bear*	*Ursus thibetanus*	Ursidae
45	*Bat*	NA	Varies by species (Chiroptera)
46	*Himalayan Palm Civet*	*Paguma larvata*	Viverridae
47	*Common Palm Civet*	*Paradoxurus musangus*	Viverridae
48	*Large Indian Civet*	*Viverra zibetha*	Viverridae
49	*Black Panther*	*Panthera pardus*	Felidae

III. Checklist of Birds

Sl No	Species	Scientific name	Family
1	*Aberrant Bush Warbler*	*Horornis flavolivaceus*	Cettiidae
2	*Alexandrine Parakeet*	*Psittacula eupatria*	Psittaculidae
3	*Ashy Bulbul*	*Hemixos flavala*	Pycnonotidae
4	*Ashy Drongo*	*Dicrurus leucophaeus*	Dicruridae
5	*Black Bulbul*	*Hypsipetes leucocephalus*	Pycnonotidae
6	*Black Drongo*	*Dicrurus macrocercus*	Dicruridae
7	*Black Eagle*	*Ictinaetus malaiensis*	Accipitridae
8	*Black-backed Wagtail*	*Motacilla alba*	Motacillidae
9	*Black-billed Magpie*	*Pica hudsonia*	Corvidae
10	*Black-chinned Yuhina*	*Yuhina nigrimenta*	Zosteropidae
11	*Black-crested Bulbul*	*Rubigula flaviventris*	Pycnonotidae
12	*Black-hooded Oriole*	*Oriolus xanthornus*	Oriolidae
13	*Blood Pheasant*	*Ithaginis cruentus*	Phasianidae
14	*Blue Rock Thrush*	*Monticola solitarius*	Muscicapidae
15	*Blue Whistling Thrush*	*Myophonus caeruleus*	Muscicapidae
16	*Blue-bearded Bee-eater*	*Nyctyornis athertoni*	Meropidae
17	*Blue-capped Rock Thrush*	*Monticola cinclorhyncha*	Muscicapidae
18	*Blue-throated Barbet*	*Psilopogon asiaticus*	Megalaimidae
19	*Brown Dipper*	*Cinclus pallasii*	Cinclidae
20	*Brown Shrike*	*Lanius cristatus*	Laniidae
21	*Brownish-flanked Bush Warbler*	*Horornis fortipes*	Cettiidae
22	*Cattle Egret*	*Bubulcus ibis*	Ardeidae

23	*Chesnut-crowned Warbler*	*Seicercus castaniceps*	Phylloscopidae
24	*Chestnut-headed Tesia*	*Tesia castaneocoronata*	Timaliidae
25	*Coal Tit*	*Periparus ater*	Paridae
26	*Common Green Magpie*	*Cissa chinensis*	Corvidae
27	*Common Hawk Cuckoo*	*Hierococcyx varius*	Cuculidae
28	*Common Hoopoe*	*Upupa epops*	Upupidae
29	*Common Kingfisher*	*Alcedo atthis*	Alcedinidae
30	*Crested Kingfisher*	*Megaceryle lugubris*	Alcedinidae
31	*Crested Serpent Eagle*	*Spilornis cheela*	Accipitridae
32	*Crimson Sunbird*	*Aethopyga siparaja*	Nectariniidae
33	*Crimson-breasted Woodpecker*	*Dryobates cathpharius*	Picidae
34	*Darjeeling Woodpecker*	*Dendrocopos darjellensis*	Picidae
35	*Dusky Warbler*	*Phylloscopus fuscatus*	Phylloscopidae
36	*Emerald Dove*	*Chalcophaps indica*	Columbidae
37	*Eurasian Tree Sparrow*	*Passer montanus*	Certhiidae
38	*Eurasian Treecreeper*	*Certhia familiaris*	Passeridae
39	*Fire-capped Tit*	*Cephalopyrus flammiceps*	Certhiidae
40	*Fulvous-chested Jungle Flycatcher*	*Rhinomyias olivacea*	Paridae
41	*Golden-throated Barbet*	*Psilopogon franklinii*	Muscicapidae
42	*Great Barbet*	*Psilopogon virens*	Megalaimidae
43	*Great Commorant*	*Phalacrocorax carbo*	Megalaimidae
44	*Great Hornbill*	*Buceros bicornis*	Phalacrocoracidae
45	*Greater Yellownape*	*Chrysophlegma flavinucha*	Bucerotidae
46	*Green-backed Tit*	*Parus monticolus*	Picidae
47	*Grey Treepie*	*Dendrocitta formosae*	Paridae
48	*Grey-backed Shrike*	*Lanius tephronotus*	Corvidae
49	*Grey-crested Tit*	*Lophophanes dichrous*	Laniidae
50	*Grey-headed Woodpecker*	*Picus canus*	Paridae
51	*Grey-winged Blackbird*	*Turdus boulboul*	Picidae
52	*Hill Partridge*	*Arborophila torqueola*	Turdidae
53	*Himalayan Monal*	*Lophophorus impejanus*	Phasianidae
54	*Hoary-throated Barwing*	*Actinodura nipalensis*	Phasianidae
55	*Ijima's Leaf Warbler*	*Phylloscopus ijimae*	Leiothrichidae
56	*Indian Roller*	*Coracias benghalensis*	Phylloscopidae
57	*Jungle Babbler*	*Turdoides striata*	Coraciidae
58	*Jungle Myna*	*Acridotheres fuscus*	Leiothrichidae
59	*Kalij Pheasant*	*Lophura leucomelanos*	Sturnidae
60	*Large Hawk-Cuckoo*	*Hierococcyx sparverioides*	Phasianidae
61	*Little Forktail*	*Enicurus scouleri*	Cuculidae

62	*Little Pied Flycatcher*	*Ficedula westermanni*	Muscicapidae
63	Little Spiderhunter	*Arachnothera longirostra*	Muscicapidae
64	Long-tailed Sibia	*Heterophasia pica*	Nectariniidae
65	Mountain Bulbul	*Iole frontalis*	Leiothrichidae
66	Mrs. Gould's Sunbird	*Aethopyga gouldiae*	Pycnonotidae
67	Nepal Fulvetta	*Alcippe nipalensis*	Nectariniidae
68	Orange Minivet	*Pericrocotus flammeus*	Aegithalidae
69	Orange-bellied Leafbird	*Chloropsis hardwickii*	Campephagidae
70	Oriental Magpie Robin	*Copsychus saularis*	Chloropseidae
71	Oriental Turtle Dove	*Streptopelia orientalis*	Muscicapidae
72	Plum-head Parakeet	*Psittacula cyanocephala*	Columbidae
73	Plumbeous Water Redstart	*Phoenicurus fuliginosus*	Psittaculidae
74	Red Junglefowl	*Gallus gallus*	Muscicapidae
75	Red-vented Bulbul	*Pycnonotus cafer*	Phasianidae
76	Red-whiskered Bulbul	*Pycnonotus jocosus*	Pycnonotidae
77	Rufous Sibia	*Heterophasia capistrata*	Pycnonotidae
78	Rufous Treepie	*Dendrocitta vagabunda*	Leiothrichidae
79	Rufous Woodpecker	*Celeus brachyurus*	Corvidae
80	Rufous-bellied Eagle	*Lophotriorchis kienerii*	Picidae
81	Rufous-necked Hornbill	*Aceros nipalensis*	Accipitridae
82	Rufous-necked Laughingthrush	*Garrulax ruficollis*	Bucerotidae
83	Rusty-capped Fulvetta	*Alcippe dubia*	Leiothrichidae
84	Rusty-Cheeked Scimitar Babbler	*Pomatorhinus erythrogenys*	Aegithalidae
85	Rusty-flanked Treecreeper	*Certhia nipalensis*	Timaliidae
86	Rusty-fronted Barwing	*Actinodura egertoni*	Certhiidae
87	Satyr Tragopan	*Tragopan satyra*	Leiothrichidae
88	Scarlet Minivet	*Pericrocotus speciosus*	Phasianidae
89	Slaty-backed Forktail	*Enicurus schistaceus*	Campephagidae
90	Slaty-blue Flycatcher	*Ficedula tricolor*	Muscicapidae
91	Spotted Dove	*Spilopelia chinensis*	Muscicapidae
92	Spotted Forktail	*Enicurus maculatus*	Columbidae
93	Spotted Nutcrackers	*Nucifraga caryocatactes*	Muscicapidae
94	Steppe Eagle	*Aquila nipalensis*	Corvidae
95	Streaked Laughingthrush	*Trochalopteron lineatum*	Accipitridae
96	Streaked Spidrhunter	*Arachnothera magna*	Leiothrichidae
97	Striated Bulbul	*Pycnonotus striatus*	Nectariniidae
98	Striated Laughingthrush	*Grammatoptila striata*	Pycnonotidae
99	Stripe-throated Yuhina	*Yuhina gularis*	Leiothrichidae
100	Sultan Tit	*Melanochlora sultanea*	Zosteropidae

101	Tree Pipit	*Anthus trivialis*	Paridae
102	Verditer Flycatcher	*Eumyias thalassinus*	Motacillidae
103	White capped Redstart	*Phoenicurus leucocephalus*	Muscicapidae
104	White-bellied Heron	*Ardea insignis*	Muscicapidae
105	White-bellied Yuhina	*Yuhina zantholeuca*	Ardeidae
106	White-capped Redstart	*Phoenicurus leucocephalus*	Zosteropidae
107	White-capped Water Redstart	*Chaimarrornis leucocephalus*	Muscicapidae
108	White-crested Laughingthrush	*Garrulax leucolophus*	Leiothrichidae
109	White-hooded Babbler	*Gampsorhynchus rufulus*	Leiothrichidae
110	White-throated Fantail	*Rhipidura albicollis*	Rhipiduridae
111	White-throated Laughingthrush	*Garrulax albogularis*	Leiothrichidae
112	Wreathed Hornbill	*Rhyticeros undulatus*	Bucerotidae
113	Yellow-billed Blue Magpie	*Urocissa flavirostris*	Corvidae
114	Yellow-billed Magpie Blue	*Urocissa flavirostris*	Corvidae
115	Yellow-browed Tit	*Sylviparus modestus*	Paridae

IV. Checklist of Fishes

Sl. No	Species	Family	Conservation Status
1	*Amblyceps apangi*	Amblycipitidae	Least Concern
2	*Anguilla bengalensis*	Anguillidae	Near Threatened
3	*Batasio fasciolatus*	Bagridae	Least Concern
4	*Olyra praestigiosa*	Bagridae	Data Deficit
5	*Xenentodon cancila*	Belonidae	Least Concern
6	*Channa gachua*	Channidae	Least Concern
7	*Channa melanostigma*	Channidae	Data Deficit
8	*Channa punctata*	Channidae	Least Concern
9	*Lepidocephalichthys guntea*	Cobitidae	Least Concern
10	*Neoeucirrhichthys maydelli*	Cobitidae	Least Concern
11	Schizothorax progastus	Cyprinidae	Least Concern
12	*Tor putitora*	Cyprinidae	Endangered
13	*Bangana dero*	Cyprinidae	Least Concern
14	*Labeo dyocheilus*	Cyprinidae	Least Concern
15	*Devario aequipinnatus*	Cyprinidae	Least Concern
16	*Danio rerio*	Cyprinidae	Least Concern
17	*Barilius barna*	Cyprinidae	Least Concern
18	*Barilius bendelisis*	Cyprinidae	Least Concern
19	*Barilius vagra*	Cyprinidae	Least Concern
20	Garra annandalei	Cyprinidae	Least Concern
21	*Garra gotyla*	Cyprinidae	Least Concern
22	*Garra lissorhynchus*	Cyprinidae	Least Concern
23	*Neolissochilus hexagonolepis*	Cyprinidae	Near Threatened

24	*Devario assamensis*	Cyprinidae	Vulnerable
25	*Schizothorax richardsonii*	Cyprinidae	Vulnerable
26	Hypophthalmichthys molitrix	Cyprinidae	Near Threatened
27	Aspidoparia jaya	Cyprinidae	Least Concern
28	*Barilius shacra*	Cyprinidae	Least Concern
29	Danio assamila	Cyprinidae	Least Concern
30	*Devario assamensis*	Cyprinidae	Least Concern
31	Ctenopharyngodon idella	Cyprinidae	Least Concern
32	Cyprinus carpio	Cyprinidae	Vulnerable
33	*Neolissochilus hexasticus*	Cyprinidae	Near Threatened
34	Oreichthys crenuchoides	Cyprinidae	Data Deficit
35	Pethia conchonius	Cyprinidae	Least Concern
36	Pethia ticto	Cyprinidae	Least Concern
37	Puntius sophore	Cyprinidae	Least Concern
38	Semiplotus semiplotus	Cyprinidae	Data Deficit
39	Cirrhinus cirrhosus	Cyprinidae	Introduced
40	Catla catla	Cyprinidae	Introduced
41	Labeo rohita	Cyprinidae	Introduced
42	Crossocheilus latius	Cyprinidae	Least Concern
43	Garra lamta	Cyprinidae	Least Concern
44	Garra quadratirostris	Cyprinidae	Least Concern
45	*Glossogobius giuris*	Gobiidae	Least Concern
46	*Mastacembelus armatus*	Mastacembelidae	Least Concern
47	*Badis badis*	Nandidae	Least Concern
48	*Badis dibruensis*	Nandidae	Data Deficit
49	*Paracanthocobitis abutwebi*	Nemacheilidae	Least Concern
50	Schistura beavani	Nemacheilidae	Least Concern
51	Schistura multifasciata	Nemacheilidae	Least Concern
52	*Aborichthys elongatus*	Nemacheilidae	Least Concern

53	*Psilorhynchus balitora*	Psilorhynchidae	Least Concern
54	*Salmo trutta*	Salmonidae	Introduced
55	*Pterocryptis barakensis*	Siluridae	endangered
56	*Glyptothorax striatus*	Sisoridae	Near Threatened
57	*Gagata cenia*	Sisoridae	Least Concern
58	*Glyptothorax botius*	Sisoridae	Least Concern
59	*Glyptothorax cavia*	Sisoridae	Least Concern
60	*Glyptothorax panda*	Sisoridae	Data Deficit

V. Checklist of Butterflies

Sl. No	Scientific Name	Common Name	Family
1	*Aeromachus pygmaeus*	Pygmy Scrub Hopper	Hesperiidae
2	*Bibasis sena*	Orange-tailed Awl	Hesperiidae
3	*Borbo cinnara*	Formosan Swift	Hesperiidae
4	*Cephrenes trichopepla*	Yellow Palm Dart	Hesperiidae
5	*Epargyreus clasus*	Silver-Spotted Skipper	Hesperiidae
6	*Euphyes vestris*	Dun Skipper	Hesperiidae
7	*Euthalia lubentina*	The Gaudy Baron	Hesperiidae
8	*Halpe zema*	The Zema Banded Ace	Hesperiidae
9	*Hasora chromus*	Common Banded Awl	Hesperiidae
10	*Iambrix salsala*	Chestnut Bob	Hesperiidae
11	*Notocrypta curvifascia*	The Restricted Demon	Hesperiidae
12	*Ochus subvittatus*	Tiger Hopper	Hesperiidae
13	*Odontoptilum angulata*	Chestnut Angle	Hesperiidae
14	*Odontoptilum angulata*	Oriental Chestnut Angle	Hesperiidae
15	*Oriens goloides*	Ceylon Dartlet	Hesperiidae
16	*Parnara bada*	Ceylon Swift	Hesperiidae
17	*Polytremis eltola*	Yellow Spot Swift	Hesperiidae
18	*Potanthus sita*		Hesperiidae
19	*Pseudocoladenia dan*	Fulvous Pied Flat	Hesperiidae
20	*Seseria dohertyi*	Himalayan White Flat	Hesperiidae
21	*Seseria sambara*	Sikkim White Flat	Hesperiidae
22	*Spialia galba*	Indian Grizzled Skipper	Hesperiidae
23	*Suastus gremius*	Indian Palm Bob	Hesperiidae
24	*Tagaides japetus*	Common Snow Flat	Hesperiidae
25	*Tagiades litigiosa*	Water Snow Flat	Hesperiidae
26	*Tagiades menaka*	Spotted Snow Flat	Hesperiidae
27	*Tagiades menaka*	Spotted Snow Flat	Hesperiidae

28	*Unkana ambasa*	Hoary Palmfly	Hesperiidae
29	*Acytolepis puspa*	Common Hedge Blue	Lycaenidae
30	*AnThene emolus*	Common Ciliate Blue	Lycaenidae
31	*AnThene lycaenina*	Pointed Ciliate Blue	Lycaenidae
32	*Arhopala birmana*	Burmese Bush Blue	Lycaenidae
33	*Arhopala centaurus*	Centaur Oakblue	Lycaenidae
34	*Arhopala eumolphus*	Green Oakblue	Lycaenidae
35	*Castalius rosimon*	Common Pierrot	Lycaenidae
36	*Cheritra freja*	Common Imperial	Lycaenidae
37	*Chliaria othona*	Orchid Tit	Lycaenidae
38	*Curetis acuta Moore*	Angled Sunbeam	Lycaenidae
39	*Freyeria putli*	Black-spotted Grass Jewel	Lycaenidae
40	*Heliophorus moorei*	Azure Sapphire	Lycaenidae
41	*Horaga viola Moore*	Brown Onyx	Lycaenidae
42	*Hypolycaena erylus*	Common Tit	Lycaenidae
43	*Jamides alecto*	Metallic Cerulean	Lycaenidae
44	*Jamides bochus*	Dark Cerulean	Lycaenidae
45	*Jamides celeno*	Common Cerulean	Lycaenidae
46	*Lampides boeticus*	Pea Blue	Lycaenidae
47	*Loxura atymnus*	Yamfly	Lycaenidae
48	*NeopiThecops zalmora*	Quaker	Lycaenidae
49	*Niphanda cymbia*	Pointed Pierrot	Lycaenidae
50	*Poritia hewitsoni*	Common Gem	Lycaenidae
51	*Prosotas dubiosa*	Tailless Line Blue	Lycaenidae
52	*Prosotas nora*	Common Line Blue	Lycaenidae
53	*Pseudozizeeria maha*	Pale Grass Blue	Lycaenidae
54	*Rachana jalindra*	Banded Royal	Lycaenidae
55	*Rapala pheremita*	Copper Flash	Lycaenidae
56	*Spalgis epius*	Apefly	Lycaenidae
57	*Surendra vivarna*	Acacia Blue	Lycaenidae
58	*Tarucus extricatus*	Rounded Pierrot	Lycaenidae
59	*Ticherra acte*	Blue Imperial	Lycaenidae
60	*Zeltus amasa*	Fluffy Tit	Lycaenidae
61	*Zizina otis*	Lesser Grass Blue	Lycaenidae
62	*Acraea issoria*	Himalayan Yellow Coster	Nymphalidae
63	*Aglais cashmiriensis*	Indian Tortoiseshell	Nymphalidae
64	*Argyreus hyperbius*	Indian Fritillary	Nymphalidae
65	*Athyma jina*	Bhutan Sergeant	Nymphalidae
66	*Athyma nefte*	Colour Sergeant	Nymphalidae

67	*Athyma perius perius*	Oriental Common Sergeant	Nymphalidae
68	*Athyma zeroca*	Small Staff Sergeant	Nymphalidae
69	*Cethosia biblis*	Red Lacewing	Nymphalidae
70	*Charaxes bernardus*	Tawny Rajah	Nymphalidae
71	*Cirrochroa aoris Doubleday*	Large Yeoman	Nymphalidae
72	*Cyrestis thyodamas*	Common Map	Nymphalidae
73	*Danaus chrysippus*	Plain Tiger	Nymphalidae
74	*Danaus genutia*	Common Tiger	Nymphalidae
75	*Discophora sondaica*	Common Duffer	Nymphalidae
76	*Doleschallia bisaltide*	Autumn Leaf	Nymphalidae
77	*Elymnias hypermnestra*	Common Palmfly	Nymphalidae
78	*Euploea mulciber Cramer*	Striped Blue Crow	Nymphalidae
79	*Euploea radamanthus*	Magpie Crow	Nymphalidae
80	*Euripus nytelius*	Courtesan	Nymphalidae
81	*Euthalia phemius*	White-edged Blue Baron	Nymphalidae
82	*Graphium sarpedon*	Common Bluebottle	Nymphalidae
83	*Ideopsis vulgaris*	Blue Glassy Tiger	Nymphalidae
84	*Junonia iphita*	Chocolate Pansy	Nymphalidae
85	*Junonia lemonias*	Lemon Pansy	Nymphalidae
86	*Junonia orithya*	Blue Pansy	Nymphalidae
87	*Kallima inachus*	Orange Oakleaf	Nymphalidae
88	*Kamilla horsfieldii*	Blue Oakleaf	Nymphalidae
89	*Lethe confuse*	Banded Treebrown	Nymphalidae
90	*Lethe europa Fabricius*	Bamboo Tree Brown	Nymphalidae
91	*Libythea myrrha*	Club Beak	Nymphalidae
92	*Melanitis leda*	Common Evening Brown	Nymphalidae
93	*Mimathyma ambica*	Indian Purple Emperor	Nymphalidae
94	*Moduza procris*	Commander	Nymphalidae
95	*Mycalesis perseus*	Common Bush Brown	Nymphalidae
96	*Mycalesis visala*	Long-brand Bushbrown	Nymphalidae
97	*Neptis clinia Moore*	Clear Sailer	Nymphalidae
98	*Neptis hylas*	Common Sailor	Nymphalidae
99	*Neptis mahendra Moore*	Himalayan Sailer	Nymphalidae
100	*Nymphalis polychloros*	Large Tortoiseshell	Nymphalidae
101	*Orsotriaena medus*	Dark Grass-Brown	Nymphalidae
102	*Pantoporia hordonia*	Common Lascar	Nymphalidae
103	*Parantica aglea Stoll*	Glassy Tiger	Nymphalidae
104	*Polyura athamas Drury*	Common Nawab	Nymphalidae
105	*Polyura eudamippus*	Great Nawab	Nymphalidae

106	*Pseudergolis wedah*	Tabby	Nymphalidae
107	*Sephisa chandra*	Eastern Courtier	Nymphalidae
108	*Thaumantis diores*	Jungle Glory	Nymphalidae
109	*Tirumala septentrionis*	Dark Blue Tiger	Nymphalidae
110	*Vanessa indica*	Indian Red Admiral	Nymphalidae
111	*Vindula erota*	Common Cruiser	Nymphalidae
112	*Ypthima baldus*	Common Five Ring	Nymphalidae
113	*Ypthima huebneri*	Common Fourring	Nymphalidae
145	*Athyma jina*	Bhutan Sergeant	Nymphalidae
146	*Athyma perius perius*	Oriental Common Sergeant	Nymphalidae
147	*Neptis hylas*	Common Sailor	Nymphalidae
148	*Ypthima baldus*	Common Five Ring	Nymphalidae
149	*Mycalesis perseus*	Common Bush Brown	Nymphalidae
150	*Nymphalis polychloros*	Large Tortoiseshell	Nymphalidae
151	*Junonia orithya*	Blue Pansy	Nymphalidae
152	*Lethe confuse*	Banded Treebrown	Nymphalidae
153	*Cirrochroa aoris*	Large Yeoman	Nymphalidae
154	*Pantoporia hordonia*	Common Lascar	Nymphalidae
155	*Polyura athamas*	Common Nawab	Nymphalidae
156	*Euthalia phemius*	White-edged Blue Baron	Nymphalidae
157	*Charaxes bernardus*	Tawny Rajah	Nymphalidae
158	*Tirumala septentrionis*	Dark Blue Tiger	Nymphalidae
159	*Polyura eudamippus*	Great Nawab	Nymphalidae
160	*Mimathyma ambica*	Indian Purple Emperor	Nymphalidae
161	*Argyreus hyperbius*	Indian Fritillary	Nymphalidae
162	*Aglais cashmiriensis*	Indian Tortoiseshell	Nymphalidae
163	*Acraea issoria*	Himalayan Yellow Coster	Nymphalidae
164	*Vindula erota*	Common Cruiser	Nymphalidae
165	*Pseudergolis wedah*	Tabby	Nymphalidae
166	*Danaus genutia*	Common Tiger	Nymphalidae
167	*Junonia iphita*	Chocolate Pansy	Nymphalidae
168	*Cethosia biblis*	Red Lacewing	Nymphalidae
169	*Kallima inachus*	Orange Oakleaf	Nymphalidae
170	*Sephisa chandra*	Eastern Courtier	Nymphalidae
171	*Cyrestis thyodamas*	Common Map	Nymphalidae
172	*Doleschallia bisaltide*	Autumn Leaf	Nymphalidae
173	*Melanitis leda*	Common Evening Brown	Nymphalidae
174	*Ypthima huebneri*	Common Fourring	Nymphalidae
175	*Junonia lemonias*	Lemon Pansy	Nymphalidae

114	*Graphium agamemnon*	Tailed Jay	Papilionidae
115	*Graphium antiphates*	Five-bar Swordtail	Papilionidae
116	*Graphium doson*	Common Jay	Papilionidae
117	*Graphium macareus*	Lesser Zebra	Papilionidae
118	*Graphium sarpedon*	Common Bottle Blue	Papilionidae
119	*Pachliopta aristolochiae*	Common Rose	Papilionidae
120	*Papilio alcmenor*	Red-breasted Mormon	Papilionidae
121	*Papilio bianor*	Common Peacock	Papilionidae
122	*Papilio clytia*	Common Mime	Papilionidae
123	*Papilio demoleus*	Lime Butterfly	Papilionidae
124	*Papilio helenus*	Red Helen	Papilionidae
125	*Papilio nephelus*	Yellow Helen	Papilionidae
126	*Papilio paris*	Paris Peacock	Papilionidae
127	*Papilio polytes Linnaeus*	Common Mormon	Papilionidae
128	*Troides aeacus*	Golden Birdwing	Papilionidae
129	*Catopsilia pomona*	Common Emigrant	Pieridae
130	*Cepora nadina*	Lesser Gull	Pieridae
131	*Cepora nerissa*	Common Gull	Pieridae
132	*Delias agostina Hewitson*	Yellow Jezebel	Pieridae
133	*Delias descombesi*	Redspot Jezebel	Pieridae
134	*Delias hyparete*	Painted Jezebel	Pieridae
135	*Delias pasithoe*	Red-base Jezebel	Pieridae
136	*Eurema blanda*	Three-spot Grass Yellow	Pieridae
137	*Eurema hecabe*	Common Grass Yellow	Pieridae
138	*Hebomoia glaucippe*	Great Orange-tip	Pieridae
139	*Ixias marianne*	White Orange-tip	Pieridae
140	*Ixias pyrene*	Yellow Orange-tip	Pieridae
141	*Pieris brassicae*	Large White	Pieridae
142	*Pieris canidia*	Indian Cabbage White	Pieridae
143	*Abisara neophron*	Tailed Judy	Riodinidae
144	*Zemeros flegyas*	Common Punchinello	Riodinidae
145	Bhutanitis lidderdalii	Bhutan Glory	Papilionidae

VI. Checklist of Herpetofauna

Sl No.	Common Name	Scientific Name	Family	Class
1	Himalayan Newt	*Tylototriton verrucosus*	Salamandridae	Amphibian
2	Cricket Frog	*Minervarya* sp	Dicroglossidae	Amphibian
3	Bush frog	*Roachestes* sp	Rhacophoridae	Amphibian
4	Indian tree frog	Polypedates maculatus	Rhacophoridae	Amphibian

5	Bull Frog	*Hiplobatrachus litoralis*	Dicroglossidae	Amphibian
6	Nepal flying frog	*Zhangixalus smaragdinus*	Rhacophoridae	Amphibian
7	Common Asian Toad	*Duttaphrynus melanostictus*	Bufonidae	Amphibian
8	Asian torrent frog	*Amolops* sp	Ranidae	Amphibian
9	Tree frog	*Polypedates* sp	Rhacophoridae	Amphibian
10	Bangladesh Skittering Frog	*Euphlyctis adolfi*	Dicroglossidae	Amphibian
11	Otai's Japalura	*Japalura otai*	Agamidae	Amphibian
12	Long-tongued frog	*Hylarana leptoglossa*	Ranidae	Amphibian
13	Asian Common Toad	*Duttaphrynus melanostictus*	Bufonidae	Amphibian
14	Stuart's Toad	*Duttaphrynus stuarti*	Bufonidae	Amphibian
15	Asian Bullfrog	*Hoplobatrachus tigerinus*	Dicroglossidae	Amphibian
16	Red-necked Keelback	*Rhabdophis subminiatus*	Colubridae	Reptiles
17	Naja kouthia	*Monocled Cobra*	Elapidae	Reptiles
18	Copper-headed Trinket	*Coelognathus radiatus*	Colubridae	Reptiles
19	Variegated Tree Dragon	*Japalura variegata*	Agamidae	Reptiles
20	Orange-collared Keelback	*Rhabdophis himalayanus*	Colubridae	Reptiles
21	Mountain Pit Viper	*Ovophis monticola*	Viperidae	Reptiles
22	Banded Krait	*Bungarus fasciatus*	Elapidae	Reptiles
23	King cobra	*Ophiophagus hannah*	Elapidae	Reptiles
24	Burmese Python	*Python bivittatus*	Pythonidae	Reptiles
25	Short-nose Vine Snake	*Ahaetulla prasina*	Colubridae	Reptiles
26	Oriental Garden Lizard	*Calotes versicolor*	Agamidae	Reptiles
27	Himalayan Keelback	*Amphiesma platyceps*	Colubridae	Reptiles
28	Flat-backed Mountain Lizard	*Japalura planidorsata*	Agamidae	Reptiles
29	Cantor's kukri snake	*Oligodon cyclurus*	Colubridae	Reptiles
30	Common Krait	*Bungarus caeruleus*	Elapidae	Reptiles
31	Walls sindh krait	*Bungarus sindanus walli*	Elapidae	Reptiles
32	Tokay gecko	*Gekko gecko*	Gekkonidae	Reptiles
33	Beauty Rat Snake	*Orthriophis* sp	Colubridae	Reptiles
34	Green Pit Viper	*Trimeresurus albolabris*	Viperidae	Reptiles
35	Tawny Cat Snake	*Boiga ochracea*	Colubridae	Reptiles
36	Buff striped keelback	*Amphiesma stolatum*	Colubridae	Reptiles
37	Bengal Monitor Lizard	Varanus bengalensis	Varanidae	Reptiles
38	Asian Water Monitor	Varanus salvator	Varanidae	Reptiles
39	Paradise Tree Snake	*Chrysopelea paradisi*	Colubridae	Reptiles
40	Bungarus niger	*Bungarus niger*	Elapidae	Reptiles
41	Buff-striped Keelback	*Amphiesma stolatum*	Colubridae	Reptiles
42	Lesser Black Krait	*Bungarus lividus*	Elapidae	Reptiles

VII. Checklist of Coccinellids

Sl. No	Species	Subfamily
1	*Calvia sykesii* (Crotch, 1874)	Coccinellinae
2	*Chielomenes sexmaculatus* (Fabricius, 1781)	
3	*Coccinella septumpunctata* Linnaeus, 1758	
4	*Coccinella transversalis* Fabricius, 1781	
5	*Harmonia eucharis* (Mulsant, 1850)	
6	*Micraspis discolor* (Fabricius, 1798)	
7	*Oenopia kirbyi* (Mulsant, 1850)	
8	*Oenopia mimica* Weise, 1902	
9	*Oenopia sauzeti* Mulsant, 1866	
10	*Oenopia sexareata* (Mulsant, 1853)	
11	*Propylea dissecta* (Mulsant, 1846)	
12	*Aiolocaria hexapilota* (Hope, 1831)	
13	*Rodolia cardinalis* (Mulsant, 1850)	Ortaliinae
14	*Cryptogonus kapuri* Ghorpade, 1974	Scymninae
15	*Cryptogonus quadriguttatus* (Weise, 1895)	
16	*Henosepilachna vigintioctopunctata* (Fabricius, 1775)	Epilachninae