CONSERVATION MANAGEMENT PLAN

BIOLOGICAL CORRIDOR 08

(CONNECTING WCNP-JSWNP)

1st July 2022 – 30th June 2032

Department of Forests and Park Services
Ministry of Agriculture and Forests
Royal Government of Bhutan

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"Conservation for mutual benefits of people and wildlife under the horizon of Gross National Happiness"

Divisional Forest Office(s) of Bumthang and Wangdue
Department of Forests and Park Services
Ministry of Agriculture and Forests

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Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
BUMTHANG FOREST DIVISION
Bumthang: Bhutan

Royal Government Endorsement and Approval

For Biological Corridor 08 Management Plan 1st July 2022 – 30th June 2032

"In accordance with and as per the provisions of the Forest and Nature Conservation Act of Bhutan, 1995"

Submitted for Approval

Chief Forestry Officer
Bumthang Forest Division

Chief Forestry Officer
Wangdue Forest Division

Forwarded for Approval

Chief Forestry Officer
Nature Conservation Division

Recommended for Approval

DIRECTOR
Department of Forests and Park Services

Approved by

SECRETARY
Ministry of Agriculture and Forests

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Sonam Jamtsho, Chendibji Forest Management Unit, Bumthang Forest Division
Tshering Norbu, Chendibji Forest Management Unit, Bumthang Forest Division
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Jigme Norbu, Chamkhar Range, Bumthang Forest Division
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Pankey Dukpa
Chief Forestry Officer
Bumthang Forest Division

Executive summary

Bhutan has inherited rich ecosystems and wildlife due to enlightened leadership of our monarchs. Conservation efforts in Bhutan has gained its local popularity and international appreciation and increasingly is looked upon as a model for conservation by other nations. Impetus of Bhutan's protected areas was reinforced when all of them were interconnected with biological corridors. Biological Corridors was first established in 1999 to provide landscape connectivity amongst the various protected areas and it was declared as the "Gift to the Earth from the people of Bhutan" by Her Majesty the Queen Mother Ashi Dorji Wangmo Wangchuck. Hence the biological corridors became as an integral part of the protected area system of Bhutan, contributing immensely towards conservation of species through populations and gene flow. About 3011 Km^2 from country's total geographical area of 38,394 Km^2 was delineated into eight Biological Corridors (BCs) spreading across the country. Biological corridors across the conservation landscape are also expected to support plant and animal movement, including dispersal movement and shift of species' geographic range in response to climate change. In the face of climate change and habitat fragmentation associated anthropogenic pressure a need to manage the wildlife beyond national parks and wildlife sanctuaries has always been of an equal significance.

Biological Corridor 08 with an area of 558.6 Km^2 is the largest among the eight BCs in the country and home for several flora and fauna given a wide altitudinal range and forest types. It was delineated primarily for conservation of tiger, takin, red panda and musk deer. Strategically located in central part of Bhutan, BC 08 plays significant ecological functions in the Bhutan Biological Conservation Complex (B2C2). It connects Wangchuck Centennial National Park (WCNP) in the north and Jigme Singye Wangchuck National Park (JSWNP) in the south by three distinct strands that traverses across the administrative jurisdiction of Wangdue Phodrang and Bumthang Dzongkhags. BC 08's connectivity with JSWNP, which shares its southeastern boundary with Royal Manas National Park (RMNP) in the tropics, therefore, is expected to facilitate the movement of fauna and shift or dispersal of flora in response to changing pattern of climate.

BC 08 is endowed with rich diversity of flora that is distributed across warm broadleaf through alpine scrub. A total of 297 species of plants are recorded from the forest of BC 08, which comprises of 10 species of conifer evergreen trees, 30 species of broadleaf evergreen trees, 68 species of deciduous trees, 27 evergreen shrub species and 11 deciduous shrub species. The recent survey recorded at least 23 mammal species out of which four are endangered (tiger, wild dog, red panda and musk deer), three vulnerable species (takin, clouded leopard and sambar deer), and three near threatened species (Asiatic golden cat, marbled cat and Himalayan serow). Total number of avifauna species recorded was 264 species out of which four are globally threatened (Himalayan vulture, satyr tragopan, ward's trogon and yellow-rumped honeyguide).

Climate change, if not taken into account seriously as one important constituent in planning the landscape conservation, then the plan certainly is incomplete because Bhutan is not an exception from global effect of climate change being located between two populous countries in the world. Given the fact that farmers in BC 08 are closely related to nature in terms of resources use and interactions their perceptions on climate change pattern, severity, and impacts were drawn to help develop practical and realistic management plan. About 96% of

respondents from Trongsa and about 55% of respondents from Wangdue Phodrang reported increase in temperature that directly affected fluctuation in flowering and budding, and agriculture crops besides migratory avifauna. They observed birds of lower elevation shifted in their area of higher elevation. Fluctuation in plant phenology pattern were also vastly observed by 93% of farmers from Trongsa while 33.7% of respondents from Wangdue division area noticed lesser amount of snow fall within a longer duration of winter season.

BC 08 as a reservoir of forest resources provides space for more than 7900 people (8.9 per household) residing in and around it under Wangdue Phodrang and Trongsa Dzongkhags. A total area of 447.87 Km^2 falls under Wangdue Phodrang Dzongkhag across 10 Gewogs while 110.73 Km^2 falls under two gewogs of Trongsa Dzongkhag. There are 423 households in and around BC 08 under Trongsa Dzongkhag, and 466 households in and around BC 08 under Wangdue Phodrang Dzongkhag. While people are benefited from the forest of BC 08 either directly or indirectly they are also adversely affected due to overlapping resource use with wild animals. Broadleaf forest, which was reported for highest occupancy rate of tiger and wild dog compared with other forests, was appeared to be exploited extensively by people and associated cattle. Thus, tiger and wild dog pose a major threat to cattle and retaliatory killing by herdsmen is not unexpected. While cattle supplement the natural prey species for big felids and canids inter-species food competition with wild ungulates appeared to be a threat. Grazing and poaching are also potential threats for wildlife in BC 08.

In view of above potential threats, a SWOT matrix was framed encompassing different arenas such as social, ecological, and management effectiveness for crafting and planning management interventions. The proposed management activities are expected to contribute biodiversity conservation and meet development aspirations of people living in and around BC 08.

Table of Contents

Acronyms and abbreviations

B2C2	Bhutan Biological Conservation Complex
BC	Biological Corridor
BFD	Bumthang Forest Division
CF	Community Forests
DoFPS	Department of Forests and Park Services
FMU	Forest Management Unit
FNCRR	Forest and nature Conservation Rules
GPS	Global Positioning System
HWC	Human Wildlife Conflict
IUCN	International Union for Conservation of Nature
JSWNP	Jigme Singye Wangchuck National Park
LFMP	Local Forest Management Plan
MoAF	Ministry of Agriculture and Forests
NCD	Nature Conservation Division
NWFPs	Non-Wood Forest Products
OP	Operational Plan
RBA	Rapid Biodiversity Assessment
RMNP	Royal Manas National Park
SAC	Species Accumulation Curve
SRF	State Reserved Forests
WCNP	Wangchuck Centennial National Park
WFD	Wangdue Forest Division

Glossary of Bhutanese Terms

Chiwog	Administrative jurisdiction under the Gewog
Dzongkhag	District
Gewog	Administrative Block under the District
Gup	Head of the Block
Tshogpa	Community leader

CHAPTER I

INTRODUCTION

1.1 Background of Biological corridors in Bhutan

Wildlife corridors across the conservation landscape support plant and animal movement, including dispersal movement and shift of species' geographic range in response to climate change (Beier & Noss, 1998). Biological Corridor were established in 1999 as an integral part of the protected area system forming the Bhutan Biological Conservation Complex (B2C2) landscape. The BCs were established in the effort to conserve species, populations and to ensure gene flow, and was declared as the "Gift to the Earth from the people of Bhutan" by Her Majesty the Queen Mother Ashi Dorji Wangmo Wangchuck. About 3011 km^2 from country's total geographical area of 38,394 km^2 (NSB, 2019) was delineated into eight BCs spreading across the country. On 4th July 2007, an executive order, wherein Rules on BC management as an addendum to FNCR 2006 was issued by the Ministry of Agriculture and Forests to enhance corridor conservation modalities. However, none of these eight BCs have been able to operationalize due to sheer paucity of financial resources and inadequate human resource in the last two decades.

In the face of climate change and habitat fragmentation with the pace of development and increasing human population, a need to manage the wildlife beyond national parks and wildlife sanctuaries has always been a priority of the Department of Forests and Park Services.

1.2 Brief function of the Biological Corridors

The main function of the biological corridors is to provide connectivity to the different habitats while:

a) Providing a secured migratory habitat to facilitate movement (dispersal or migration) of species,
b) Preventing inbreeding of species which may otherwise lead to local extinction and,
c) Providing a supplementary feeding habitat for animals.

1.3 Brief information of BC 08

BC 08, with an area of 558.6 Km^2 is one of the largest among the eight BCs in the country and home for several flora and fauna given a wide altitudinal range and forest types. Strategically located in central part of Bhutan, BC 08 plays significant ecological functions in the Bhutan Biological Conservation Complex. BC 08's connectivity with JSWNP, which shares its

southeastern boundary with Royal Manas National Park (RMNP) in the tropics, is expected to facilitate the movement of fauna and shift or dispersal of flora in response to changing pattern of climate. This corridor 08 was delineated primarily for five species of tiger, takin, blue sheep, red panda and musk deer. Besides ecological benefit to wildlife, BC 08 also provides space and it is a reservoir of forest resources for more than 7900 people (Gewog, 2018) residing in and around it from Wangdue Phodrang and Trongsa Dzongkhags. It also connects Wangchuck Centennial National Park (WCNP) in the north and Jigme Singye Wangchuck National Park (JSWNP) in the south by three distinct strands that traverses across the administrative jurisdiction of Wangdue Phodrang and Bumthang Dzongkhags. A total area of 447.87 Km^2 falls under Wangdue Phodrang Dzongkhag across 10 Gewogs of Phobji, Gangtey, Bjena, Dangchu, Sephu, Kazhi, Nyisho and Athang, while 110.73 Km^2 falls under Trongsa Dzongkhag comprising Tangsibji and Nubi Gewogs. There are 423 households under Trongsa Dzongkhag, and 466 households under Wangdue Phodrang Dzongkhag (Gewog, 2018) residing in and around BC 08 and depending on respires from BC 08. On average, about 8.9 people per household are benefited from various natural resources in BC 08.

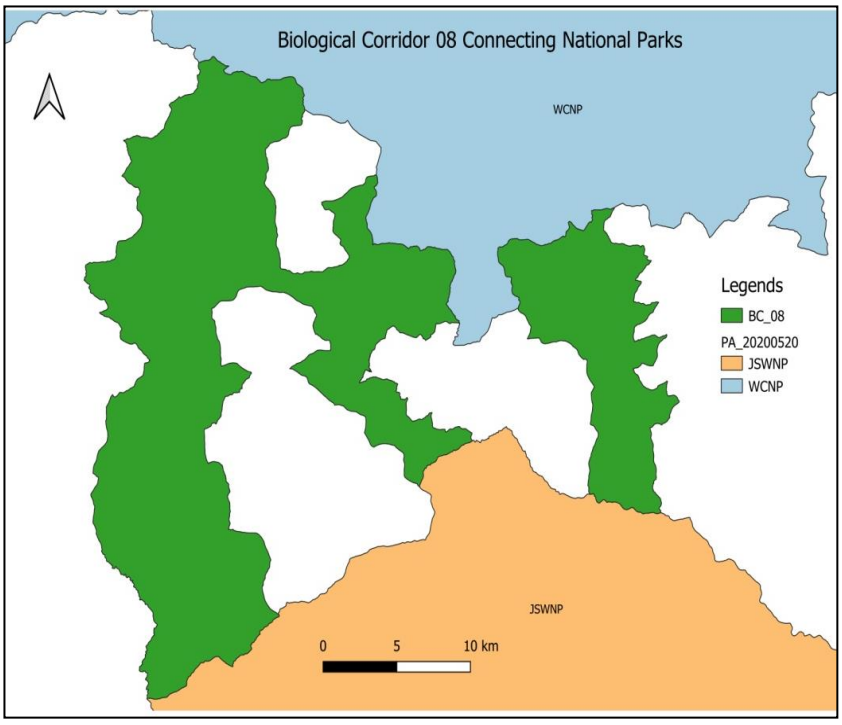

Figure 1: Biological Corridor 08 and interconnected Protected Areas

1.4 Legislation

This management plan draws its legal mandates from the *Forest and Nature Conservation Act (1995)* and the subsequent *Forest and Nature Conservation Rules and Regulations (2017)*. By default, the management of BC 08 shall be determined by subsequent changes in any of these

above mentioned legislations. Furthermore, mandates and functions for the BC 08 will also be drawn as per relevant sections of the Land Act of Bhutan (2008).

1.5 Vision, Mission, Goal and Objective of the Management Plan

Vision: *"A structurally functional corridor for wildlife movement and genetic dispersal between the protected areas of Bhutan".*

Mission: *"To secure functional habitat contiguity between the two protected areas of JDNP and JSWNP through enhanced climate smart management of biodiversity and engagement of communities".*

Goal: *To contribute towards participatory landscape conservation and ensure the functionality of BC 08 in pursuit of achieving the above stated mission and vision.*

Objective: *To provide baseline information and guidance in implementing the proposed activities through the time frame of 10 year management plan period***.**

1.6 Scope of the plan

Envisaged to scientifically manage the BC 08, a wide range of pertinent activities were proposed in the plan and therefore strongly urge for total implementation. Limiting to rely on government funding support will definitely lead to failure of implementation. Therefore, two concerned agencies - Wangdue and Bumthang Forest Divisions must explore for external funding support. This plan was very much aligned with the 12th Five Year Plan of Department of Forest and Park Services. Thus, proposed activities were intertwined to strike the balance between biodiversity conservation significance and development aspirations of people living in and around the BC 08. This 10 (ten) year plan shall come into force with effect from 1st July 2022 and expires on 30th June 2032. Significantly, this plan will require annual Operational Plan (OP) wherein detailed management prescription need to be drawn from this plan..

CHAPTER II

CURRENT STATUS

2.1 Physical feature

2.1.1 Boundary description

BC 08 emerges from the south at a Global Position System (GPS) coordinate of 27°19'31.14"N and 90° 5'30.06"E in the rift valley of Khebeythang Chhu at the north-west of Lomtshokha village of Athang Gewog under Wangdue Phodrang Dzongkhag thus sharing the boundary with JSWNP. From this point, it shares the boundary with JSWNP and follows Khebeythang Chhu reversely towards south-east till the diversion point of two entities at 27°22'31.49"N and 90°10'55.01"E south of Khebeythang Study Center. From there, the boundary runs towards north and makes a zig and takes north-east and runs across the ridge of Shoba village under Athang Gewog. Then it ascends above Gangphey village and hits the boundaries of Phobji and Athang Gewogs at 27°24'45.89"N and 90°10'27.84"E and follows Phobji-Athang Gewog boundary and hits tri-junction (boundaries) of Phobji, Athang and Gangtey Gewogs at 27°25'26.37"N and 90° 9'37.93"E. From there, it takes east and makes a zig towards north at 27°25'34.24"N and 90° 8'50.82"E, which is 4013 meter above sea level. Then it continues leaning toward north and hits Gangtey-Gogona feeder road at 27°26'51.92"N and 90° 8'52.47"E. From here, the boundary follows the ridgeline towards north and forms zig in a direction of west and after a short distance it again makes zig at 27°27'54.93"N and 90° 8'1.51"E and descends through the thick forest towards further north. Then it makes a zig at 27°29'8.55"N and 90° 7'51.78"E towards north-east and descends further down the valley of Sangtana village at 27°29'19.96"N and 90° 8'19.51"E. Then it ascends along the ridgeline following north-east and reaches an elevation of 3613 m at 27°30'18.69"N and 90° 8'43.34"E. Thereafter, the boundary descends towards the valley of Bara village at 27°30'36.63"N and 90° 9'25.17"E and then ascends along a small ridgeline and makes a zig at 27°31'9.27"N and 90° 9'47.82"E towards north-east. After a few kilometers it hits Gangtey-Dangchu Gewog boundary and follows it till another zig is formed at 27°31'24.08"N and 90° 8'33.56"E where herder's camp is located. From here, it descends through forests forming mild bends along and hits the east-west national highway at 27°32'52.17"N and 90° 8'18.27"E. Then it passes by the side of a hamlet below the highway and tends to hit Dhangchu river at 27°33'27.83"N and 90° 8'9.28"E. Hereafter, it runs towards the opposite direction of Dahngchu river and makes a zig at 27°34'16.19"N and 90°10'9.98"E and ascends towards Ridha in a direction of east and reaches elevation of 3665 m at 27°33'31.91"N and 90°12'16.92"E. At this point, it makes a zig towards south-west and runs along the ridgeline till it hits highway just

behind Pelela (towards Sephu) and makes a zig below the road at 27°31'57.98"N and 90°13'2.32"E. From there, the boundary ascends and follows another ridgeline in a direction of south-west and forms a zig at 27°31'18.60"N and 90°11'21.93"E, and then follows ridgeline in south-east thus sharing the Sephu-Gangtey Gewog boundary, Sephu-Phobji Gewog boundary and Sephu-Tangsibji Gewog boundary further. And thereafter, it hits the JSWNP boundary at 27°27'4.79"N and 90°16'42.90"E and shares the boundary with JSWNP in a direction of north-east and reaches Senchenkarm at 27°28'43.79"N and 90°18'53.18"E. From there, it runs along a small ridgeline in a direction of north and makes a zig towards north-west and runs above Brogena village with a zig at 27°29'45.79"N and 90°17'13.59"E and then ascends along a gorge in a direction of west and then makes zig at 27°29'38.52"N and 90°16'11.01"E. From there on, it descends along a creek above Rukubji village and makes zig at 27°30'16.72"N and 90°16'12.07"E and runs towards west forming four mild bends along a ridgeline of Rukubji village and then descends towards the stream (Longtoey chhu) at 27°30'43.56"N and 90°15'48.54"E. From here, it follows the Longtoey chhu in a opposite direction and forms a zig at 27°31'1.04"N and 90°14'53.15"E and runs towards west across open grassland into the forest above Longmed village. Then it makes zig at 27°30'48.00"N and 90°14'14.16"E and descends along a small stream adjoining to the village and hits Longtoey chhu below east-west national highway and follows the gorge. And it hits highway at 27°31'43.81"N and 90°14'40.15"E and ascends following a ridgeline towards north and reaches ridge top of 3780 m at 27°32'50.34"N and 27°32'50.34"N where from it descends to the valley of Tsendenpokto. Then it ascends along a ridgeline and makes a zig on the ridge top at 27°32'54.72"N and 90°17'23.60"E to descends in a direction of Busa village and hit the boundary of WCNP at 27°32'55.68"N and 90°18'21.84"E. From here, it runs towards the north sharing the boundary with WCNP and hits the junction of Dangchu and Sephu Gewog boundary and thereafter follows the Sephu-Dangchu Gewog boundary line and later diverts from WCNP at 27°38'18.37"N and 90°14'54.33"E and descends south-west along the valley adjacent to Dangchu Gewog Center. At 27°37'16.60"N and 90°12'41.77"E it makes a zig and ascends towards east and reaches mountain top at 27°35'17.54"N and 90°13'49.15"E far above Gangchukha village. From there, it descends towards south-west and hits Dangchu river at 27°34'57.96"N and 90°10'59.27"E and follows in a opposite direction of Dangchu river and hits the confluence and further follows a ridgeline and reaches the ridgetop (3800 m) at 27°39'10.47"N and 90°10'23.58"E. From there, it follows the

east and descends towards the valley of Dangchu river which is a trijunction of Kazhi, Dangchu and Sephu Gewog boundary. Hereafter, it follows WCNP boundary inside Kazhi Gewog and diverts at 27°42'15.54"N and 90° 7'38.06"E (4666 m) and ascends along a ridgeline in a direction of south and then descends in a direction of creek, again ascends further south and descends to reach another valley and hits Dongkobji village. From there, it follows the farm road bypassing Baeyul village and hits the Kazhi and Nyisho Gewog boundary at 27°34'11.34"N and 90° 3'6.34"E. Then it forms a zig and ascends in a direction of south-east, traverses above Sill village at 27°33'47.13"N and 90° 3'44.62"E, and descends to intersect farm road of Lull village of Nyisho and hits Razawog quarry and Dangchu river. From there, it follows Nyisho-Bjena Gewog boundary along Dangchu river and makes zig at 27°30'23.63"N and 90° 4'5.30"E to ascends towards south and intersects east-west highway and runs further south till it hits the trijunction of Bjena, Gangtey and Athang Gewogs at 27°25'45.46"N and 90° 3'19.22"E. From there it descends along the creek in a direction of south and complete the loop thus comprising 447.87 Km^2 of BC 08 under Wangdue Division.

The boundary of BC 08 under Bumthang Division starts from the trijunction of Sephu, Nubi and Tansgibji Gewogs at 27°31'37.41"N and 90°23'27.98" on the ridge at the east of Sethang village under Sephu Gewog. Then it follows along the boundary line of Sephu-Nubi Gewog towards north-east and makes a zig at 27°35'36.91"N and 90°19'56.18"E and runs along the boundary line of WCNP in the east inside Nubi Gewog. At the 27°37'4.86"N and 90°24'44.03"E (3406 m) on the ridge above Simphu Goenpa it forms a zig and descends in a direction of south evading Simphu village on the left and hits creek (Chedhey chhu) and follows downstream till it forms a zig at 27°35'10.73"N and 90°26'15.24"E. Then it ascends along a valley in the south-west of Daba village and reaches the ridge top above Chela Goenpa, where from it descends along a ridgeline towards south evading Chela Lhakhang on the left, traverses further north and intersects Chela farm road and hits creek below the agriculture field and follows further east. Then it makes zig at 27°33'41.29"N and 90°26'32.92"E and ascends along a ridgeline of Drenshing village (evaded) and forms zig at 27°32'48.88"N and 90°25'34.76"E and descends southward and hits creek running towards east between Denshing and Pythang (inside BC 08), joins Mangdechhu and makes zig to ascends south-west intersecting Nubi Gewog road and further ascends to reach a ridge top (3045 m) at 27°31'19.30"N and 90°25'30.39"E. From there, it descends southward along a ridgeline evading Bjepam village on the left and hits creek and

follows it downstream and forms a zig at 27°30'54.40"N and 90°26'54.46"E. Then it ascends south, traverses across broadleaf forest east and hits gorge, where from it ascends along the undulating ridgeline towards south-west and hits Nubi-Tangsibji Gewog boundary line and further runs south-west along it and makes zig at 27°29'12.75"N and 90°26'11.76"E. Thereafter, it descends along a ridgeline above Tsheringmo Drupchhu and hits creek/bridge/highway and runs along a creek further south till it hits Nikachhu, which is the boundary line of JSWNP. And it runs opposite to Nikachu in a direction of north-west thus sharing the JSWNP boundary line and makes zig at 27°26'48.30"N and 90°23'43.47"E to ascend along a ridgeline in the north intersecting Chendebji FMU road and completes a loop thus establishing a total area of 110.73 Km^2 under Bumthang Division.

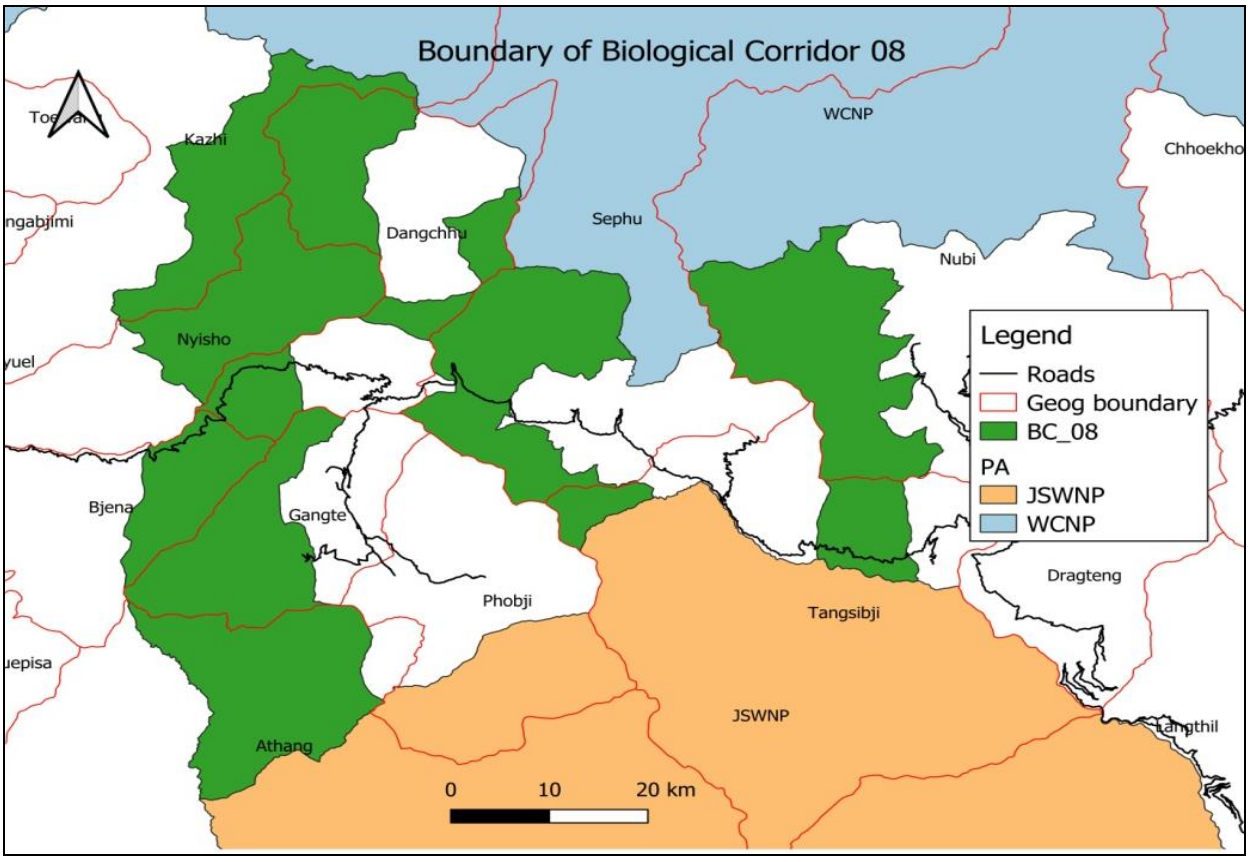

Figure 2: BC 08 boundary map across 10 Gewogs and three national parks

2.1.2 Water bodies

Water is a very crucial component for wildlife just as it is important for humans. In terrestrial ecosystem, linkage between forests and water creates a mosaic benefiting the wildlife by creating suitable habitats. Given the healthy forest ecosystem, drainage and water in BC 08 is not something to worry about as much as other terrestrial protected areas in some part of thevBC 08 has good drainage that includes both perennial and seasonal water for the wildlife (Fig.3) irrespective of forest types. In some areas, due to geomorphological reason, the higher ridges and uplands are deprived of water. According to the observation we made during the ecological survey, it was noted that large bodied wild animals that require relatively more amount of water apparently travelled a longer distance for fulfillment of their water requirement.

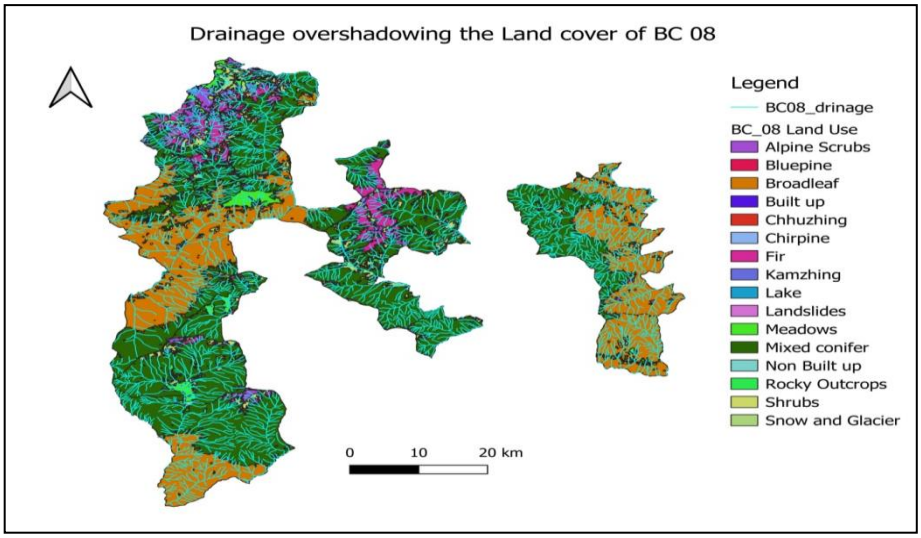

Figure 3: Water bodies distribution in various forest types

2.1.3 Elevation, Aspect and Slopes

Elevation in Biological Corridor 08 ranges from 1700 meters above sea level (masl) to about 4580 masl. Both the lowest (1700 masl) and highest (4830 masl) elevation points are in Wangdue Phodrang Dzongkhag. Slope of BC 08 vastly varies from 0 to 60 degrees and above. Regarding the aspect, about 55% of the total area faces north, north-west and south-west.

2.2. Biological features

The biological features vastly included in this section are based on forest types, plants and animals dwelling in BC 08 conservation landscape spread across two Dzongkhags.

2.2.1. Vegetation and forest types

BC 08 landscape has large forest coverage with more than 99% of its total area (558.6 $Km^{2)}$ including shrubs and alpine scrubs. Snow glacier and other geomorphological features like built up (settlements, roads, transmission line). The rocky areas form 0.30% of the total area of BC 08 (Fig. 7).

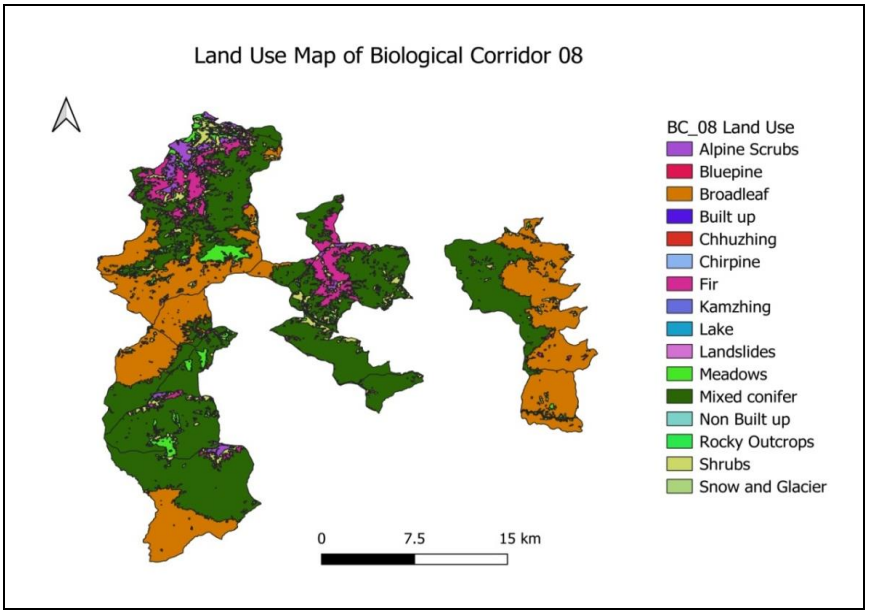

Figure 4: Figure 4: Land cover of Biological Corridor 08

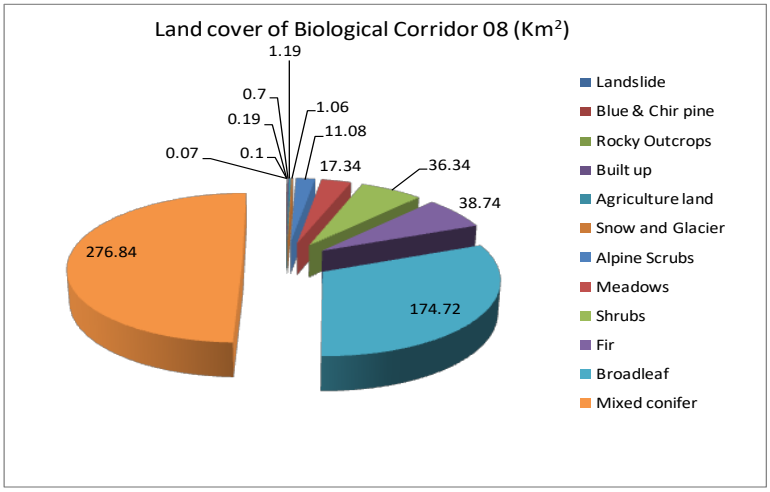

Figure 5: Proportion of land cover types in BC 08

The vegetation of BC 08 was classified into various forest types in order to give better picture about it and forming heterogeneous habitats for wildlife. The classifications of the forest types

were based on the ordination of Rapid Biodiversity Assessment (RBA%) of the entire tree and shrub species in each Gewog and also on the cluster dendrogram arbitrarily marked at 50% similarity threshold (refer fig. 8 for detail as shown below). Three types of forests in the Biological Corridor 08 chiefly included Hemlock and Fir forest, Cool broad-leaved forest and Evergreen oak forest respectively.

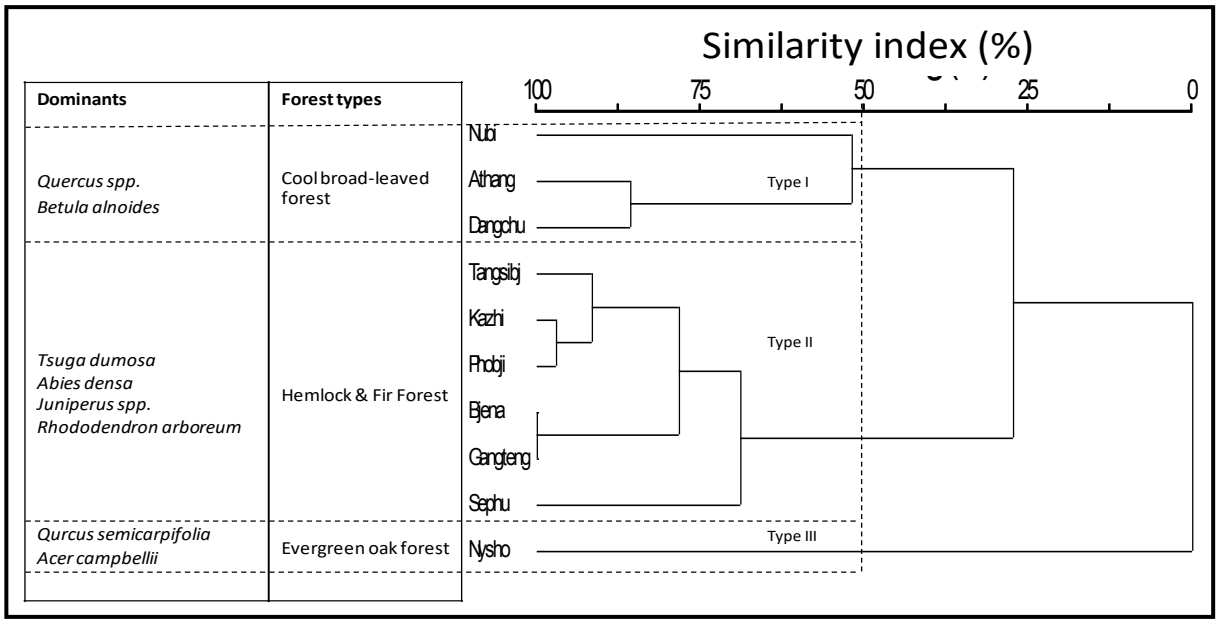

Figure 6: RBA% data and the species in each plot deploy the distance matrix for sequential clustering to 17 Gewog level as depicted in the dendrogram

2.2.2 Floral diversity

Endowed with wide altitudinal range BC 08 was reported for rich diversity of flora that were distributed across warm broadleaf through alpine scrub. During the survey that was conducted between May to June 2019, we recorded at least 297 species of plants (Appendix I). Out of these many plant species, there were 10 species of conifer evergreen trees; 30 species of broadleaf evergreen trees; 68 species of deciduous trees; 27 evergreen shrub species and 11 deciduous shrub species. Rest of the list included herbaceous plants, bamboo, and orchids.

Floral species composition of BC 08 includes five live forms such as ever green conifer tree, deciduous tree, evergreen tree, ever green shrubs, and deciduous shrubs. The overall life-form composition appeared to be considerable proportion of evergreen conifer trees with 50.51 %, evergreen trees 28.47%, deciduous trees 19.99%, evergreen shrub 0.93 % and deciduous shrub 0.11 % for 17 Gewogs (refer Table 1for details).

Phobji Gewog forest was predominantly composed of evergreen conifer trees with more than 93% while Athang and Dangchu Gewogs forests hosted relatively more deciduous trees that were composed of *Prunus* species, *Betula alnoides, Betuala utilities, Acer species, Juglans regia, Alnus nepalensis, Sorbus insignia,* etc. Nubi and Nyisho Gewogs were dominated by evergreen tree that largely included various *Rhododendron* species, *Symplocos* species, *Quercus lamellosa, Quercus lanata, Quercus semicarpifolia, Quercus glauca, Lyonia ovalifolia, Persea species*, etc. While deciduous shrubs were barely recorded across all 10 Gewogs while evergreen shrubs were recorded in warmer region from the forests of Nyisho and Sephu Gewogs.

Table 1: Gewog-wise life form composition derived from the sum of RBA

Geogs	Evergreen Conifer Tree	Deciduous Tree	Evergreen Tree	Evergreen Shrub	Deciduous Shrub
Nubi	2.40	15.52	82.09	0.00	0.00
Tangsibji	57.53	9.19	33.28	0.00	0.00
Athang	0.00	60.70	39.30	0.00	0.00
Bjena	90.26	0.58	9.16	0.00	0.00
Dangchu	8.48	54.34	36.91	0.00	0.26
Gangteng	84.36	8.14	7.50	0.00	0.00
Kazhi	72.35	8.01	19.64	0.00	0.00
Nysho	27.26	0.71	69.71	2.31	0.00
Phobji	93.30	1.70	5.00	0.00	0.00
Sephu	75.90	14.46	9.31	0.52	0.25

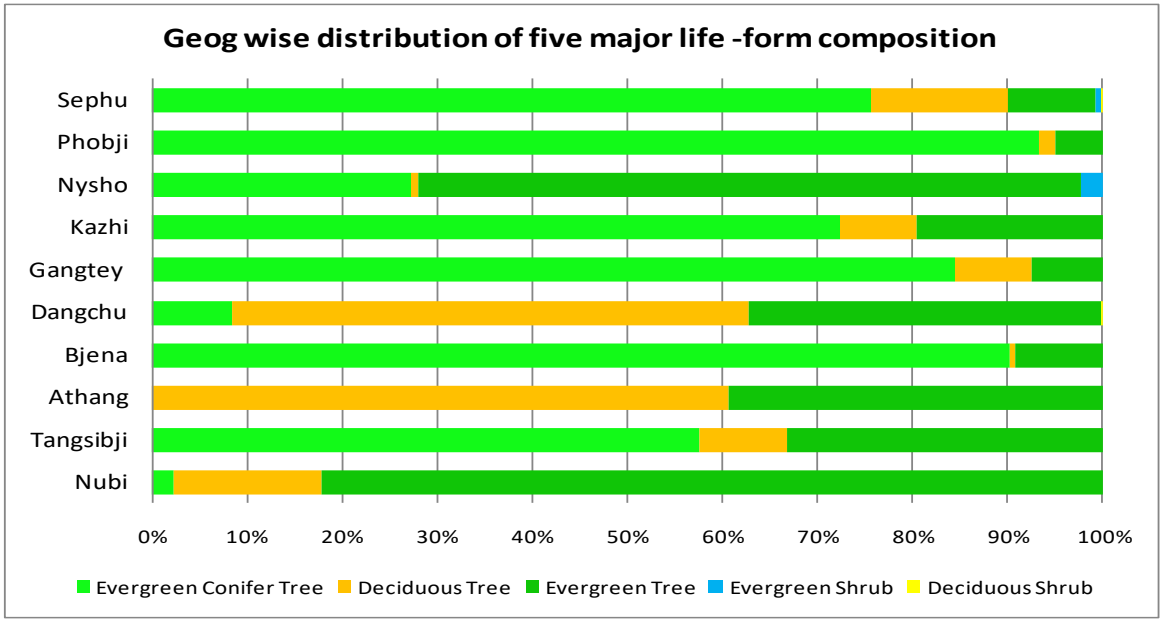

Figure 7: Gewog-wise distribution pattern of five major life-form compositions

2.2.3 Faunal diversity

Faunal diversity information presented in this management plan is exclusively on mammals and avifauna that were collated from the camera trap and sign survey conducted from May - July in 2019. An assessment of information from the camera trap and sign surveys confirmed the presence of a total of 23 mammal species

Not even a single image of common leopard was captured from the area under both the divisions for unknown reason during the survey that was carried out in the summer. Mammal species of conservation significance in the Biological Corridor 08 are as shown in the table below with IUCN status.

Table 2: Species of conservation significance in Biological Corridor 08

Sl No.	Common name	Scientific name	IUCN status	Image captured (June -August 2019)
1	Tiger	*Panthera tigris*	Endangered	Both the divisions
2	Dhole (wild dog)	*Cuon alpinus*	Endangered	Both the divisions
3	Red panda	*Ailurus fulgens*	Endangered	Wangdue division
4	Himalayan musk deer	*Moschus chrysogaster*	Endangered	Both the divisions
5	Clouded leopard	*Neofelis nebulosa*	Vulnerable	Bumthang division
6	Takin	*Budorcas taxicolor whitei*	Vulnerable	Bumthang division
7	Sambar deer	*Rusa unicolor*	Vulnerable	Both the divisions
8	Asiatic golden cat	*Catopuma temminckii*	Near threatened	Both the divisions
9	Marbled cat	*Pardofelis marmorata*	Near threatened	Wangdue division
10	Himalayan serow	*Capricornis thar*	Near threatened	Both the divisions

A total of 264 bird species, including four near threatened species like Himalayan vulture, satyr tragopan, Ward's trogon and yellow-rumped honey guide were recorded during the survey carried out in June and July 2019 across two divisions in BC 08. The highest number of species recorded was in Wangdue division as presented in table below (detail bird list in annexure ii).

Table 3: Total bird species recorded under respective territorial division

Sl.#	**Division**	**Total species**
1	Wangdue	189
2	Bumthang	118

At least four near threatened (NT) bird species were recorded during the short span of survey time. The survey might have overlooked other avifauna species including the species of conservation significance due to weather condition in summer despite time and effort dedicated by the survey team. Table 4 shows the details of significant avifauna recorded across two divisions in the Biological Corridor.

Table 4: Birds of conservation significance in BC 08

Common name	IUCN status	Name of place recorded	Habitat/forest type
Himalayan Vulture	Near threatened	Wangdue division	Mixed conifer, meadows and cool broad-leaved forest.
Satyr Tragopan	Near threatened	Both the divisions	Mixed conifer, Alpine Scrub, Cool broad-leaved forest and Meadows
Ward's Trogon	Near threatened	Wangdue division	Cool broad-leaved forest
Yellow-rumped Honeyguide	Near threatened	Wangdue division	Cool broad-leaved forest

Generally, diversity of bird species was rich in cool broad-leaved forest. There was a significant difference in bird diversity between cool broad-leaved forest and alpine scrub in the Biological Corridor. However, there was insignificant difference between mixed conifer and cool broad-leaved forest in terms of diversity of bird species. On contrary, bird abundance (individual counts) was higher in mixed conifer forest than the cool broad-leaved forest during the time of survey. A potential reason for lesser abundance of bird in cool broadleaf is due to denser canopy and thick undergrowth compared to conifer forests.

2.2.3 (i) Mammal diversity in BC 08 under Wangdue Forest Divison

Out of 23 umber of mammal species recorded in BC 08, 20 mammal species were confirmed from the administrative jurisdiction of Wangdue Forest Division. These confirmed species were tiger, marbled cat, wild dog, Asiatic golden cat, Himalayan black bear, musk deer, red panda, wild pig, barking deer, sambar deer, goral, serow, porcupine, orange bellied

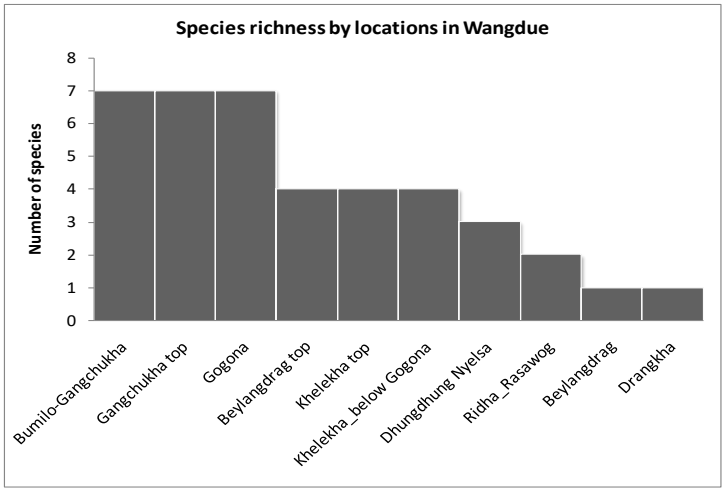

Figure 8: Figure 8: Species richness by locations in Wangdue Division

squirrel, yellow throated martin, red fox, leopard cat, weasel sp., rat and mice.

Bumilo, Gangchukha-top, and Gogona areas appeared to have a rich species composition with a record of 7 species uniformly. Both in Bumilo and Gangchukha areas appeared to be mammal hotspot. Though sambar deer, a preferred prey of tiger in Bumilo and Ganchukha, was not captured during the survey period, a presence of cattle and yak seemed to supplement the biomass requirement of tiger. In Dhungdhung Nyelsa and Beylangdra areas, a good number of sambar deer's images were captured while musk deer was captured from Gogona area only. Beylangdra, which appeared to be poor in species composition, was reported for presence of Himalayan black bear.

In mixed conifer forest, a highest number of mammal species such as muntjac, sambar, serow, Himalayan black bear, wild pig, and cattle were reported compare with fir and cool broadleaf forests (fig. 11). In alpine and blue pine forests, mammals' evidences were not found during the survey period in summer. A potential reason could be because least sample were collected from relatively smaller areas of alpine and blue pine forests compared to other habitats.

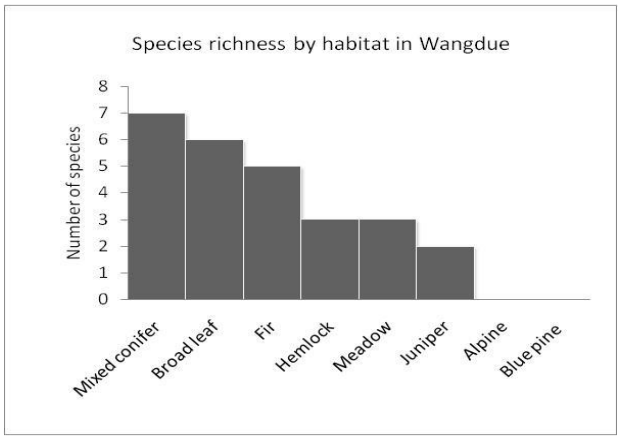

Figure 9: Species richness by habitats in Wangdue Division

Out of 15 wild mammals, barking deer's occupancy rate was 80% (0.8 fractions of 10 transects) followed by wild pig with 60% (0.6 fraction) as presented. Sambar and tiger's occupancy rates varied with 30% and 20% respectively while it is 10% for wild dog. Significant occupancy rate of cattle with 40% appeared to contribute in food requirement of top predators like tiger and wild dog. Occupancy rate of terrestrial avifauna with 40% is very promising to ensure the food requirement of Asiatic golden cat and marbled cat in Wangdue division.

The chart below (Fig.12) reveals that there was no habitat overlap between tiger and muntjac, which is abundant in Wangdue division. Tiger's habitat largely overlapped with wild pig (100%) followed by yak and sambar with 50% uniformly and local breed cattle with 25%. Wild dog overlapped its habitat with local cattle (25%), musk deer (100%) and wild pig (100%) while

Asiatic golden cat's habitat overlap appeared to be 100% with muntjac, terrestrial birds (mostly pheasants) and wild pig.

We found that there was no habitat overlap between two top predators like tiger and wild dog (Fig. 21) while habitat overlap amongst tiger Himalayan black bear and Asiatic golden cat was evident.

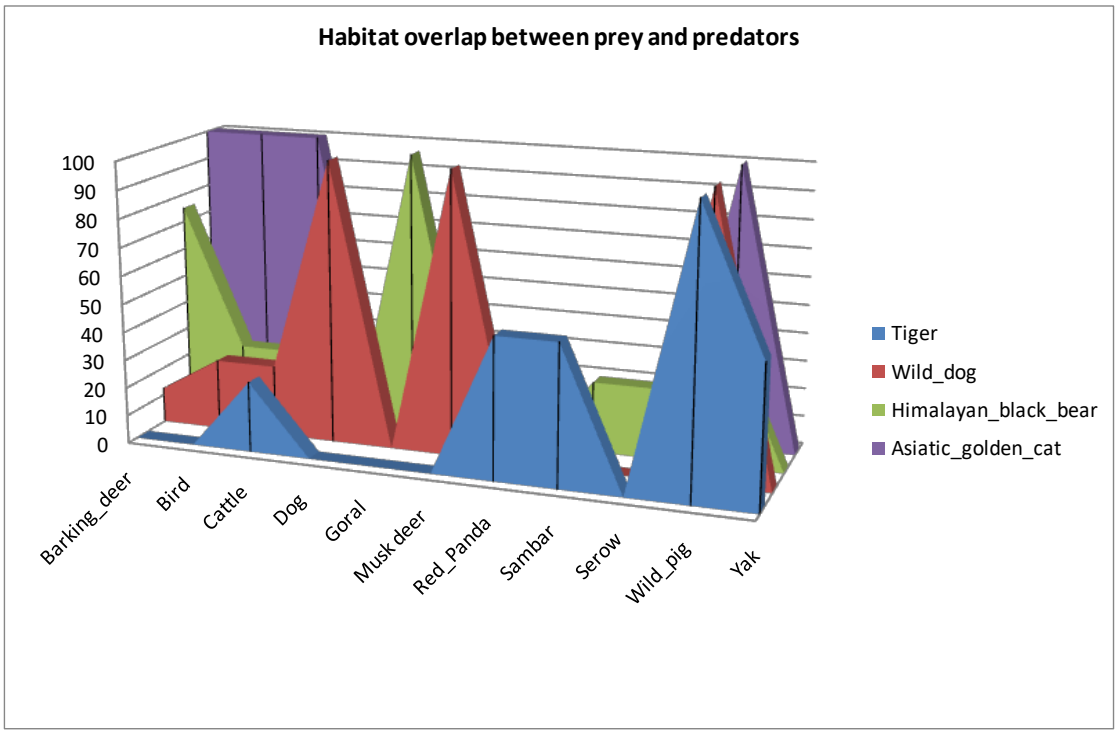

Figure 10: Figure 10: Habitat overlaps between prey and predators in Wangdue Division

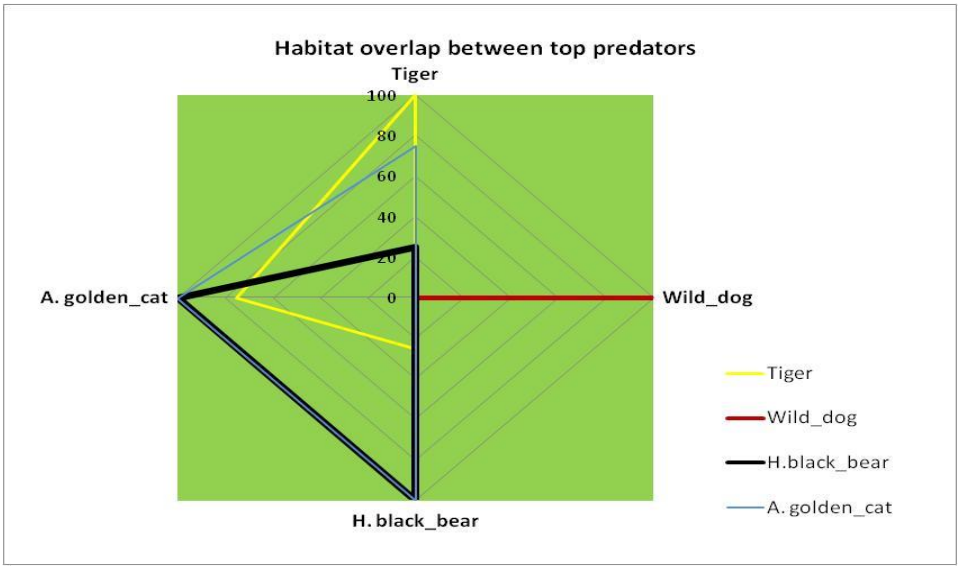

Figure 11: Habitat overlaps between top predators in Wangdue Division

2.2.3 (ii) Mammal diversity in BC 08 in Trongsa under Bumthang Forest Division

A total number of 20 mammal species were recorded through camera traps and this include from big mammals such as tiger, Himalayan black bear, Asiatic golden cat, clouded leopard, leopard cat, wild dog, barking deer, sambar, Himalayan serow, goral, musk deer, horse, local cattle, Assamese macaque, Himalayan yellow- throated marten, civet, wild pig, rodents like porcupine to small mammals like squirrel, mice and rats. Drangichu appeared to be rich in mammal species composition relatively with a record of 13 species (Fig. 14).

While presence of tiger was confirmed, in contrary, absence of sambar deer was something alarming according to the camera trap result from some places. Broadleaf forests in Trongsa appeared to host a significant number of tigers compared to other forest types. Meadow and blue pine habitats were reported for richer species composition than mixed conifer and alpine scrub habitats relatively. Mixed conifer and broad leaf forests were found occupied by mammals with 20% uniformly followed by alpine scrub.

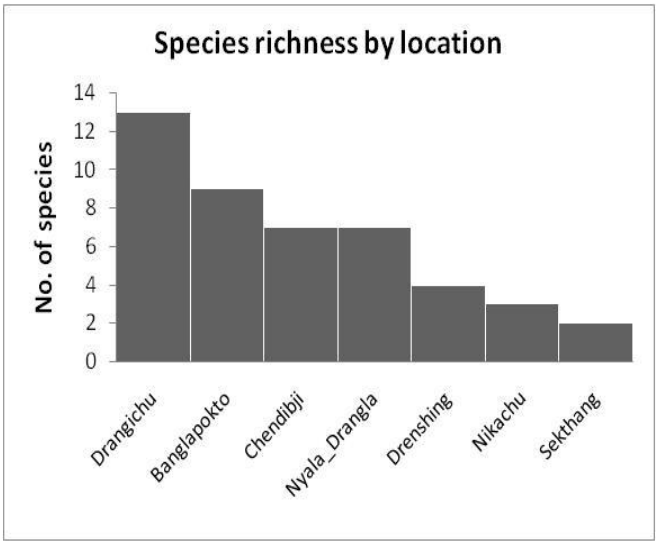

Figure 12: Species composition by location

Tiger, which is an apex predator, was observed to overlap habitats with most of the ungulate species (Fig. 15). Its habitat overlap was significant with large-bodied ungulates like cattle (40%), horse (50%), serow (25%) and wild pig (42.9%). On the flip side, tiger appeared to not overlap habitats with sambar, goral and smaller rodents. Its habitat separation from sambar deer was something beyond the domain of conventional ecological reasons. Wild dog appeared to overlap its habitat with several ungulates compared with tiger; significantly high with 66.7% while clouded leopard's habitat overlap with goral, barking deer, cattle, and wild pig were very uniform with 100%.

All 4 top predators such as tiger, wild dog, clouded leopard and Asiatic golden cat appeared to overlap their habitats except between clouded leopard and tiger (Fig. 16). Clouded leopard

overlapped its habitats with Himalayan black bear, wild dog, and Asiatic golden cat uniformly (100%). Tiger's widest range of habitat overlap was with

Asiatic golden cat (50%) followed by Himalayan black bear (37.5%), and wild dog (33.3%).

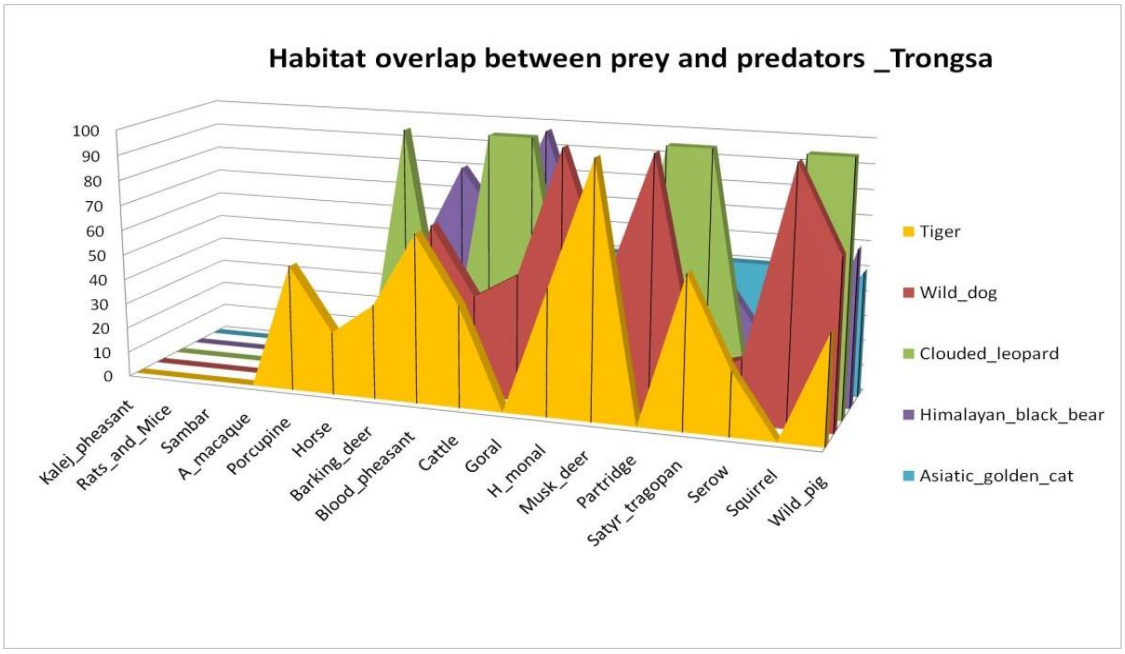

Figure 13: Habitat overlaps between prey and predators in Bumthang Division

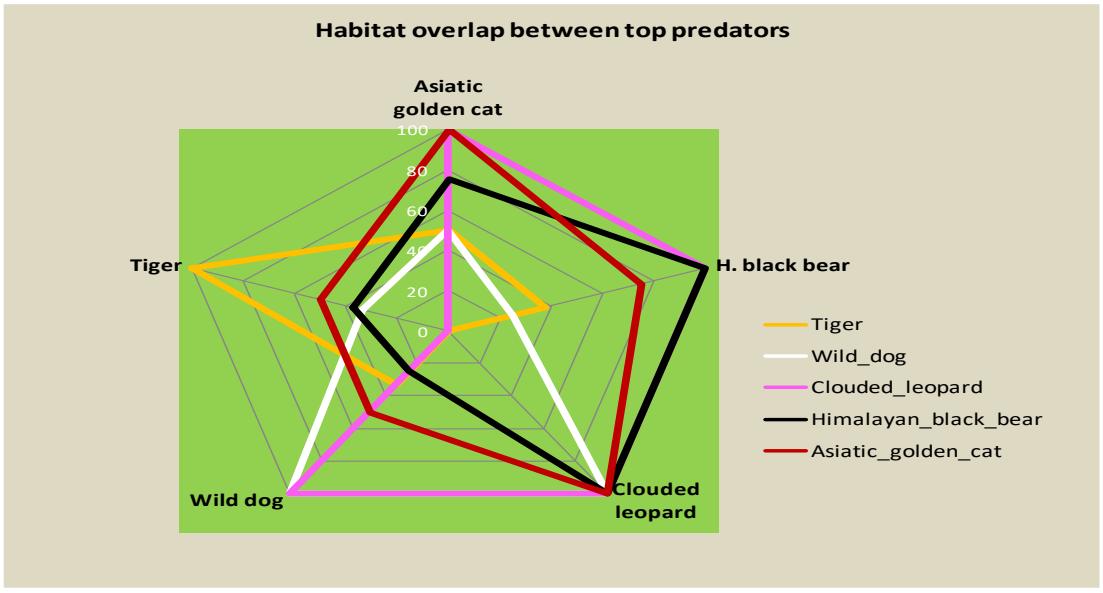

Figure 14: Habitat overlaps between top predators in Bumthang Division

2.2.3 (iii) Avifauna in BC 08 under Wangdue Forest Division

Mixed conifer forest was found occupied expansively compared to other habitats in BC 08 under Wangdue division. Meadow with about 800 individual counts, was the least occupied habitat by the birds while mixed conifer forests was reported for highest with 1400 individual birds (fig. 17). Apparently, one of the potential ecological reasons for lesser individual bird record in meadow could be largely due to open scrub that contains poor cover to preempt the birds of prey, and lesser amount of under-storey food for them to feed. Cool broad-leaved forest, though overshadowed in individual counts by mixed conifer, was rich in bird diversity (120 species) while alpine scrub was inhabited by at about 65 species of birds.

Out of 17 transects that was walked in Wangdue Division, transects in Gogona and Sephu together had relative abundance of 1100 birds (individual birds) and transect in Dangchu area was found with a record of least number of individual counts during the survey (fig. 18).

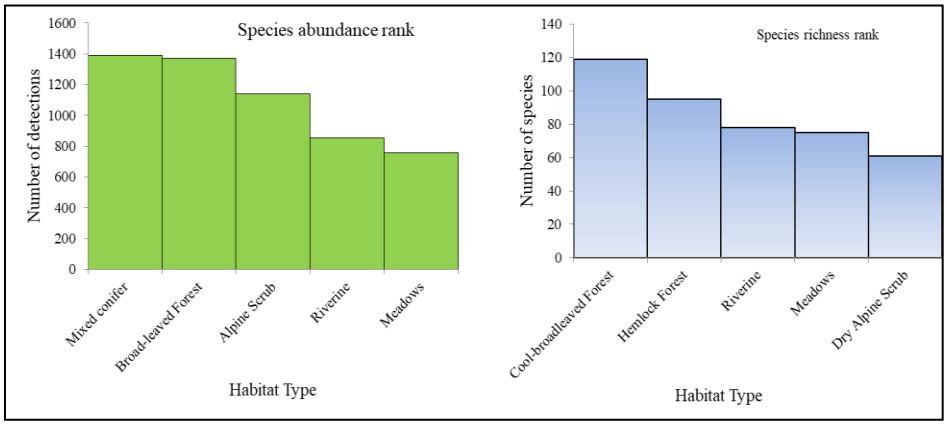

Figure 15: Species abundance and richness by habitats in Wangdue Division

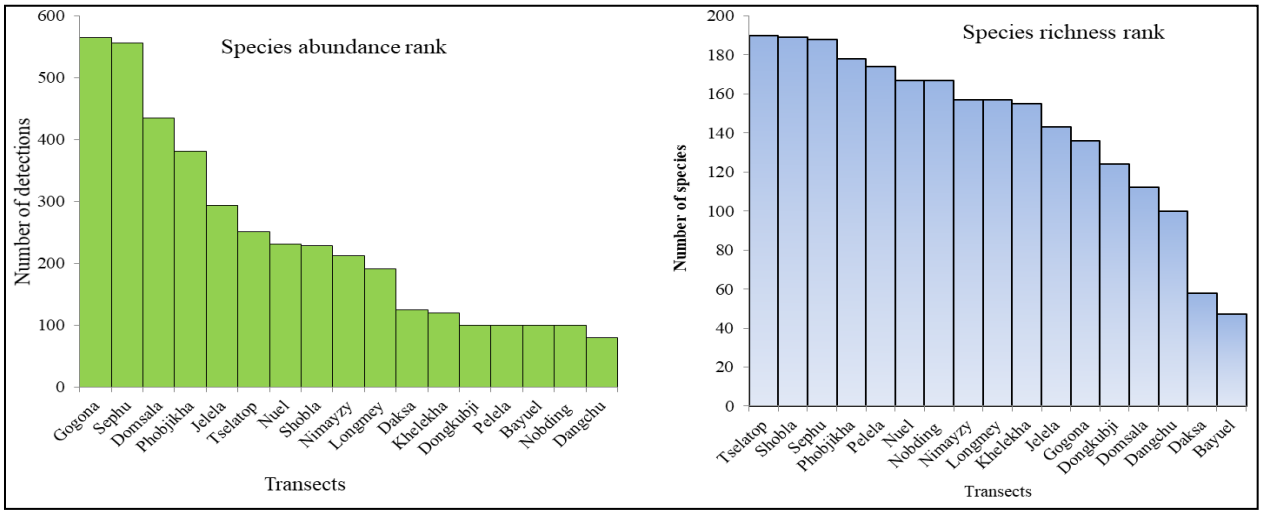

Figure 16: Species abundance and richness by locations in Wangdue Division

Tshela top, Shobla and Sephu transects were reported for a richer species composition of avifauna. Potential reason could be that these areas were composed of mixed conifer forests largely adorned with spruce, hemlock, and fir associated with rhododendron and bamboo undergrowth, thus forming good cover and feeding areas. Daksa and Bayuel areas were observed with a record of least number of bird species because of dominant meadow and broadleaved habitats that appeared to be least preferred arboreal birds apparently.

.2.3 (iv) Avifauna in BC 08 in Trongsa Dzongkhag under Bumthang Forest Division

Bird habitats were classified into mixed conifer, broadleaf, meadow, alpine scrub, and Blue pine forest, agriculture land and hydro-project area. Survey covered largely mixed conifer followed by cool broad-leaved forest. In case of Trongsa, both species richness and abundance were observed relatively high in mixed conifer habitat followed by cool broad-leaved forest. Potential ecological reason could be due to good cover formed by trees and undergrowth such as rhododendron and bamboo. Bird species was detected almost uniformly in meadows, agricultural land, and hydro-project area which were all under anthropogenic influences.

Drenshing, Chendebji and Drangichu areas was adorned with abundant birds with 1000 individuals in total and least individuals recorded was from Chongsebelow. Drangichu and Drenshing areas were reported for a maximum record of 53 species while a least number of species recorded was from Chongsebelow. Adit I, Adit II, Chendebji, Banglapokto with a record of 40 bird species. These areas during the survey were observed under high anthropogenic influence on the habitats and closer to Trongsa-Wangdue national highways.

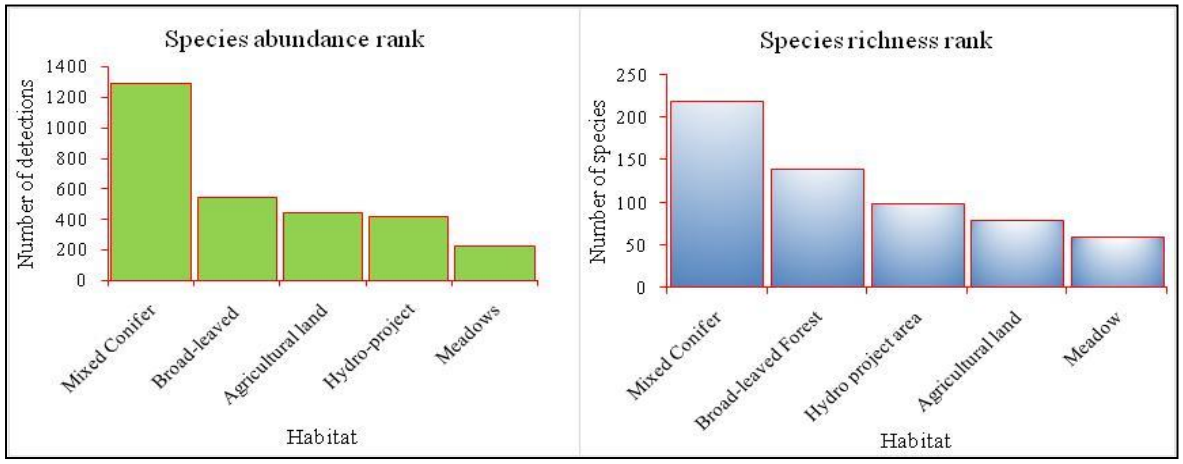

Figure 17: Species abundance and richness by habitats in Bumthang Division

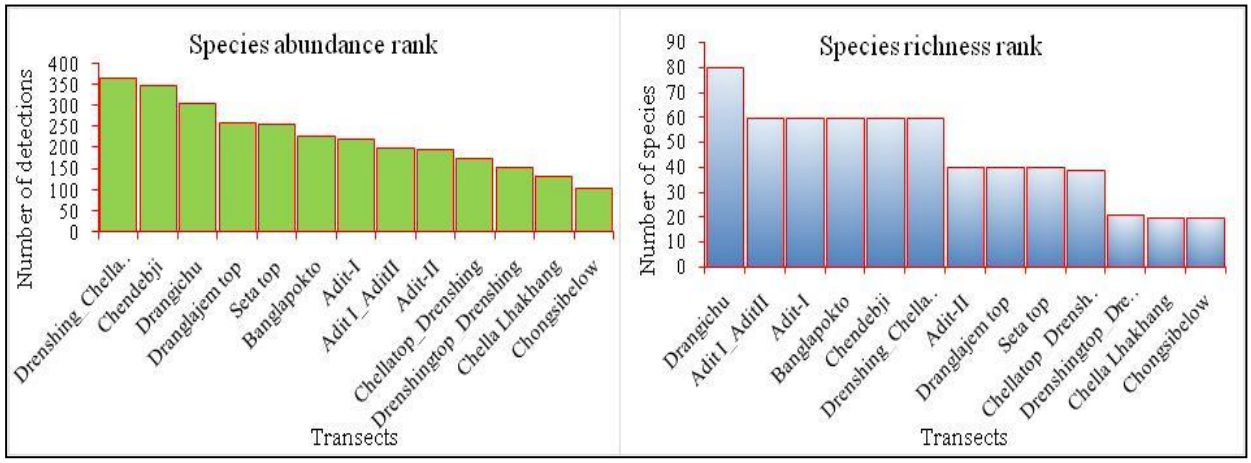

Figure 18: Species abundance and richness by locations in Bumthang Division

Species accumulation curve (SAC) deduced that Wangdue collected 93 (20-20) lists while Bumthang collected 47 lists. A significant difference of species detection level across two divisions was indicated by the curve (fig. 21). A gradually flattening curve line in case of Wangdue division indicates maximum effort was applied but deems certain effort to detect a few more bird species in the future. In case of Bumthang, the curve line warrants significant additional effort in the future to add the bird lists.

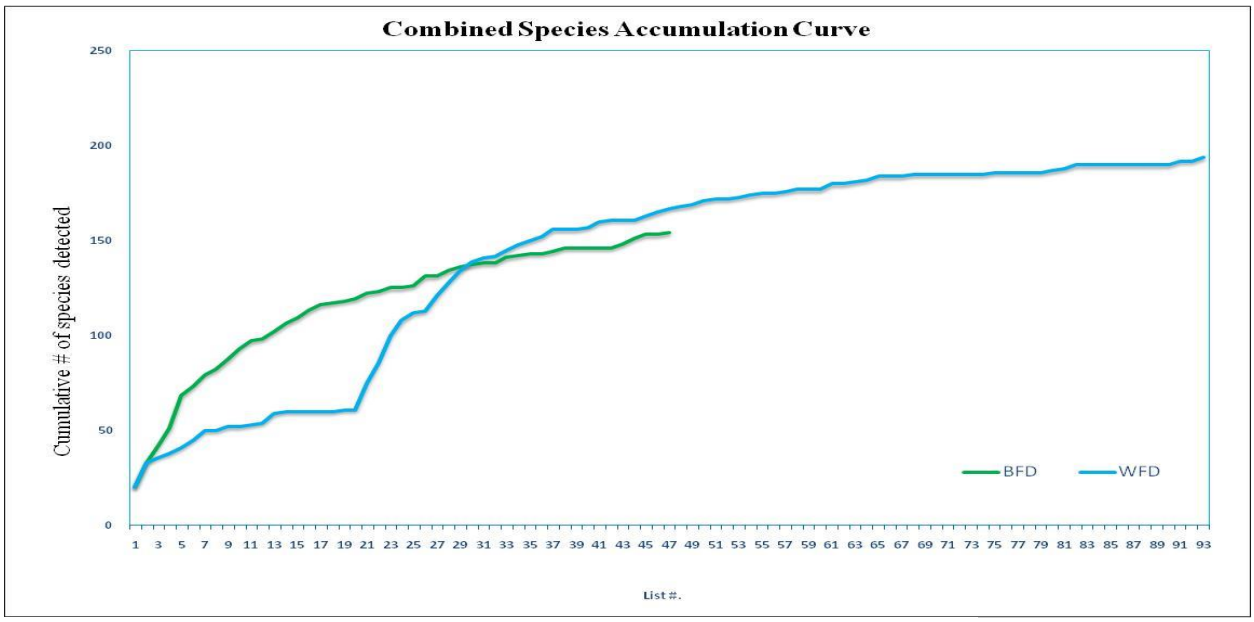

Figure 19: Relative Species Accumulation Curve (SAC) of avifauna ion BC

2.3 Socio-economic characteristics

Agriculture and livestock farming practices are integral components of socio-economic characteristic of the farmers in rural areas. Some households in BC 08 were found engaged in private entrepreneurship or small scale business. Almost all the villages were reported for having government employees including military personnel that attributes in forming a diverse composition of socio-economic characteristic. Dependence on forest resources was unavoidable, and farmers living in and around biological corridor were reported to utilize timber, firewood, and non-wood forest products. For instance, Cordyceps and *Paris polyphylla* appeared to contribute significantly for the livelihood of people in BC 08.

2.3.1 Livelihoods of people

About 70% of the respondents (n=89) under Wangdue division reported that agriculture crop cultivation in their own land was a main source of livelihood composition and therefore a top priority. For less than 5% respondents, agriculture farming was secondary while more than 15% respondents reported Cordyceps and weaving yathra were main livelihood sources. At least, 10% respondents asserted that livestock farming was their integral component of livelihood composition. Farmers under this Dzongkhag division never went out for casual labor and therefore it was not a part of their livelihood composition.

For the farmers of Trongsa too, agriculture farming was integral part of livelihood composition. About 40% of the respondents (n=109) ranked agriculture farming as top priority while for 14% respondents it was a secondary. At least 20% respondents asserted that livestock farming was their top priority while it was tertiary for about 17% respondents. Unlike farmers of Wangdue Phodrang, at least 7% respondents asserted that main source of livelihood was casual labor for farmers of Trongsa.

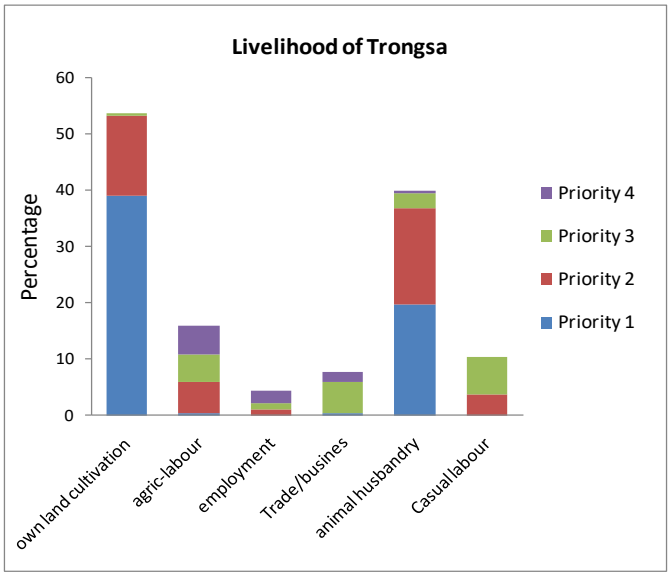

Figure 20: Livelihood of farmers of Trongsa

2.3.2 Agriculture farming

Most commonly cultivated cereal crops across two divisions were found to be paddy and maize in the lower elevation while wheat was found largely in highland. Maize was barely cultivated while rice as a staple food was vastly cultivated by for farmers of Trongsa. Wheat and barley were grown across two Dzongkhags and used to brew local beverage and as a feed for cattle. Farmers also cultivated potato as cash crop while radish and turnips were grown both for consumption and to feed the cattle. Increasing chili cultivation was largely known for consumption and commercial purpose. Tseri or shifting cultivation was not reported in the biological corridor. Therefore, local extinction of some agriculture crop variety was reported by people for a discontinued shifting cultivation practice over the last two decades.

2.3.3 Livestock farming

Livestock farming was reported as one of the key components of agriculture and, thus being a main source of livelihood for subsistence of farmers in this biological corridor. Farmers across two Dzongkhags were reported for rearing various types of livestock for food (butter and cheese), draught power, means of fertilizers, raw materials for cloths, and transportation. As a result, livestock farming appeared to forms an integral part of rural poverty reduction strategies (RNR statistics, 2015). Largely, farmers reared traditional cattle breed across thus forming 52% of livestock composition in general. Farmers of Wangdue Phodrang reared huge number of local cattle compared to farmers of Trongsa. The reason for rearing the local cattle was reported for rugged terrain that is very difficult to adapt by the improved breed.

Farmers from Trongsa were seen to take pace in rearing Brown Swiss and Jersey breed due to warm climatic condition. Thus, improved breed appeared to attribute 25% of livestock composition across two Dzongkhags. Yak and mithun breeds were reported for diminishing year after year in Wangdue Phodrang Dzongkhag due to rising alternative livelihood sources. In the highland, brown Swiss cattle were reported for taking a faster pace to replace local cattle. Some farmers from Wangdue Phodrang reared caprine (sheep) for wool production and was largely used for weaving yathra (fig. 22).

Table 5: Livestock composition (number of heads) across BC 08

Division	Traditional cattle	Improved breed	Mithun breed	Yak	Equine	Caprine
Wangdue	613	76	26	476	32	121
Bumthang	324	457	5	0	9	0

2.3.4 Food security

Food grain self-sufficiency was worrisome for the farmers across two Dzongkhags in the biological corridor. Almost 99% respondents from Wangdue Phodrang and 84% from Trongsa reported for purchase of food grains. Only less than 1% respondents from Wangdue Phodrang and 16% respondents from Trongsa reported for self-sufficient grain production from their own land. Where rice was not grown for unfavorable climatic conditions in places like Phobji, Gangtey and Sephu they were compelled to purchase it.

Food security was also determined from the perspective of vegetable, cheese and butter self-sufficiency for a household. In this regard, 90% respondents from Wangdue Phodrang reported that they largely produce vegetables from their own garden for home consumption and same was the case with butter and cheese production. Purchase of cheese and butter are reported by about 30% respondents from Wangdue Phodrang.

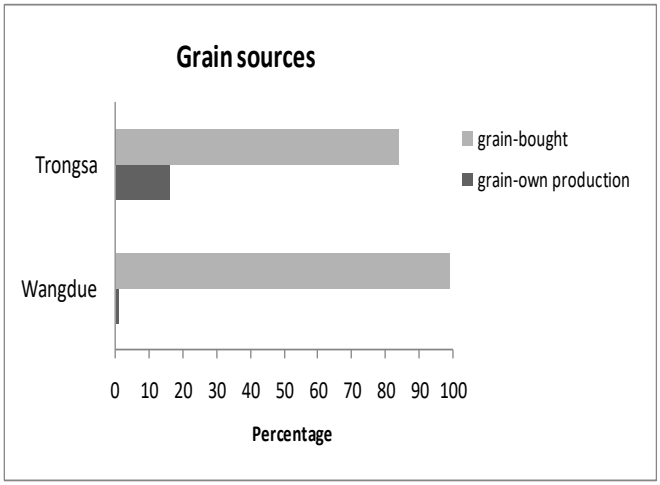

Figure 21: Food grain sources for farmers of BC 08

In case of farmers of Trongsa, they produced sufficient vegetables for their home consumption according to about 95% respondents while primary source of vegetable were forest and shops for at least 5% respondents. About 65% respondents reported that that their secondary source of vegetable was shop. More than 65% respondents from Trongsa reported for self-sufficient butter and cheese production while more than 8% respondents said that they purchased from other farmers in the village.

2.3.5 Cash income sources

Cash income sources of the farmers in BC 08 varied from labor for agriculture, sale of forest products, sale of livestock products, casual labor, business, weaving, salary of employee, and house rent. Out of these many sources, in case of Wangdue Phodrang farmers, sale of agriculture products was predominant income source for 55% respondents. For about 30% respondent's

livestock product was secondary cash income source, and forest products that vastly included Cordycep was reported as primary income source for more than 15% respondents from Sephu and Dangchu Gewogs. The agriculture labor and casual labor were absolutely insignificant income sources for this segment of people. Overall, agriculture products was a main source of cash income followed by livestock products, which include butter, cheese and milk, and forest products for the farmers of Wangdue Phodrang.

Farmers of Trongsa generated cash income predominantly from agriculture and livestock products as well. More than 48% respondents reported agriculture products as primary cash income source while about 26% asserted it as secondary income source. More than 39% respondents reported livestock as primary and secondary income source. In general, livestock product (basically a sale of butter and cheese) is inarguably a vital cash income source according to assertion made by 79% respondents followed by agriculture products and casual labor with 74% and 22% respectively in case of farmers of Trongsa. Non-Wood Forest Products (NWFPs) was tertiary cash income source according to less than 1% respondents from Trongsa. Only 2% respondents from Trongsa reported forest products as one of the cash income sources.

2.3.6 Farmers' perception on climate change pattern, severity, and impacts

Climate change, if not considered as one important aspect in planning the landscape conservation, the plan seems incomplete because Bhutan is not an exception of such a global effect. Considering the fact that farmers in BC 08 are closely related to nature in terms of resources use and interactions their perceptions on climate change pattern, severity, and impacts were drawn as to help develop practical and realistic management plan for BC 08. In general, 91% of farmers heard the term "Climate change" and 9% respondents reported that they never ever heard the term climate change. But most of them noticed changing pattern of climate in their respective villages. At least 2% of respondents from

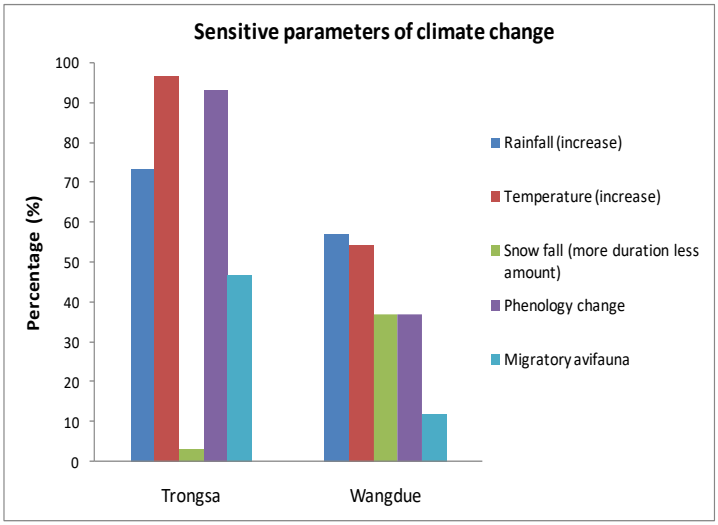

Figure 22: Indicators of climate change

Wangdue Phodrang reported that they 'Do not know' about the changing pattern of climate thus far.

Most sensitive parameters of the changing pattern of climate reported by farmers was annual temperature followed by rainfall, phenology and migratory avifauna. About 96% of respondents from Trongsa and about 55% of respondents from Wangdue Phodrang reported increase in temperature that directly affected fluctuation in flowering and budding, and agriculture crops besides migratory avifauna. Most of the respondents reported to have observed birds of lower elevation shifted in their area of higher elevation. For instances, prominent birds are Common myna and Wedge-tailed pigeon. Fluctuation in the season of plant phenology pattern was vastly observed by 93% of farmers from Trongsa while 33.7% of farmers noticed lesser amount of snow fall within a longer duration of winter season in Wangdue division.

In order to determine the severity of climate change pattern, some variables taken into consideration were drought, flood, landslide, hailstorm, wind, early rain, delay rain, prolonged rain, scanty rain, diseases, and pests (UNDP, 2016). Farmers across BC 08 landscape underwent through various climatic conditions. For instance, farmers from Trongsa experienced unconventional hailstorm, belated rainfall, and pest and diseases that destroyed agriculture crops. In case of Wangdue Phodrang farmers, they experienced maximum hailstorm and prolonged rain. In general, hailstorm and prolonged rain followed by diseases and pest according to the farmers were very severe in the last five years. Relatively, a segment of farmers from Trongsa experienced severe climatic changing patterns compared with farmers of Wangdue Phodrang.

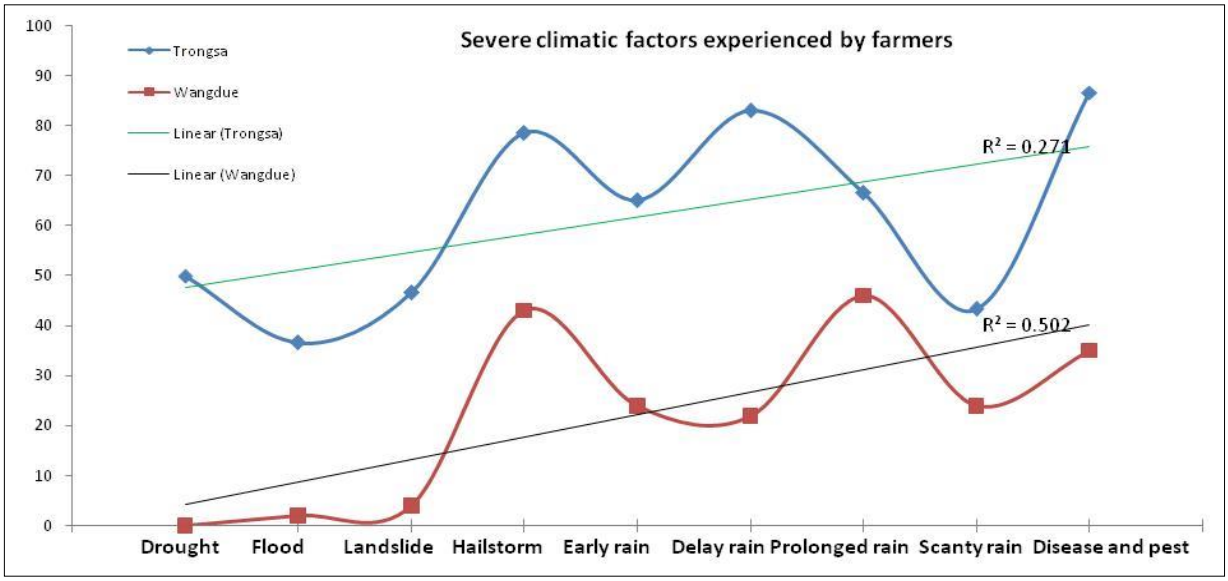

Figure 23: Severe climatic factors experienced by farmers in BC

2.3.7 Determining the climate change adaptation measures

Agriculture and livestock farming practices were taken into consideration significantly to determine the preemptive adaptation measures. About 46% of the respondents reported a change in agriculture cropping pattern over the last five years. In the higher elevation, where farmers vastly cultivate wheat and barley, were reported to switch over vegetable cultivation such as chili, cabbage, broccoli, and asparagus foreseeing the market to generate income. Seeds of these vegetable were supplied and promoted by the agriculture extension office. To overcome the pest and diseases outbreak for agriculture crops some farmers in Trongsa switched over horticulture and cultivation of asparagus and mushrooms. For the farmers of Gangtey and Sephu Gewogs, who barely cultivate agriculture crops, climate adaptation measures were of minor concern for this segment of farmers.

A change in cropping pattern in response to changing climate was also reported by more than 50% farmers in BC 08. A shift in livestock rearing pattern was another significant indicator of climate adaptation measures revealed by farmers at higher elevation of Sephu and Gangtey. They reported improved breed cattle (vulnerable to cold climatic condition) were doing well with a rising temperature.

2.4 Forest Resource

Forest resources in BC 08 are broadly used by local people and other entities for different purposes. Over 7900 people residing in and around BC 08 share forest resources closely with wild animals.

2.4.1. Forest management regimes

Biological Corridor 08 landscape has Community Forests (CFs) and Local Forest Management (LFM) regimes. There are three commercial logging sites or Forest Management Units (FMUs) overlapping with the boundary of BC 08. The most overlapping FMU with BC 08 is Gogona (90% of its total area 7852.49 ha) under Wangdue division followed by Chendibji FMU (9704.13 ha) with approximately 40% of its area overlapped Bumthang Division. Both FMUs are currently under operations with its operational plan in place (DoFPS, 2018). There are eight Community Forests inside the Biological Corridor established for the benefit of Gangtey, Sephu, Dangchu, and Kazhi Gewogs under Wangdue division. There are four Local Forest Management Areas (LFMA) inside the Biological Corridor that is falling in the administrative boundary of Kazhi, Nyisho and Sephu and Nubi Gewogs. In Bumthang division the Nubi LFMA overlaps with BC 08.

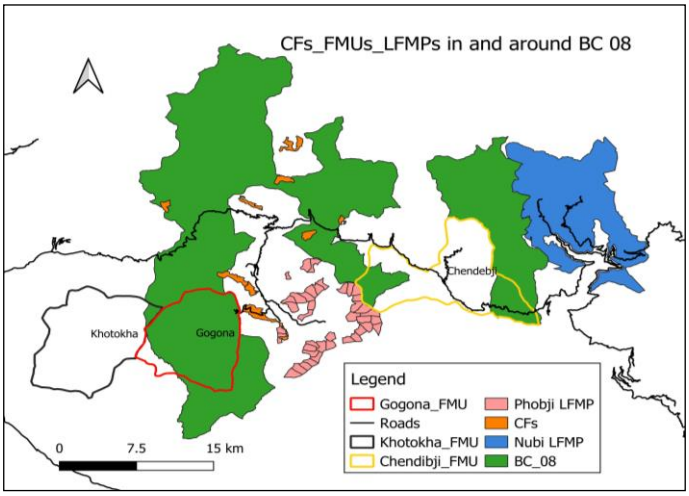

Figure 24: Biological Corridor 08 overlapping with FMU and access road

2.4.2 Firewood and Non-wood forest products use

Apart from timber, poles, posts and minerals extraction, farmers across BC 08 were reported for collection of non-wood forest products like bamboo, canes, mushroom including highly prized *Ophiocordycep sinensis*, *Paris polyphylla*, fern tops, and importantly firewood for heating and cooking purposes. Three important sources of firewood collections included *Sokshing,* State Reserved Forests (SRFs) and Community Forests (CF). Farmers of Wangdue Phodrang

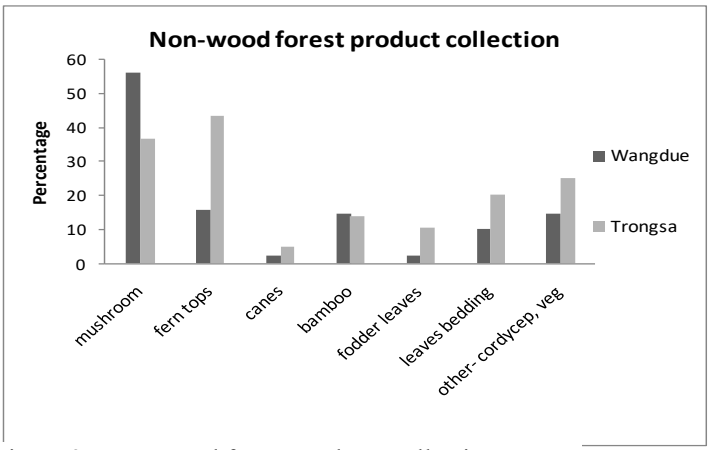

Figure 25: non-wood forest products collection

Dzongkhag revealed that CFs and SRFs were the main source of firewood while farmers of Trongsa collected it mostly from *Sokshing* and SRFs.

2.4.3 Grazing

The farmers in BC 08 are reported use of SRFs as grazing land given the wide altitudinal range from warm broadleaf to sub-alpine depending on type of cattle they rear. Besides use of land for grazing, the farmers also collect fodder to supplement the feeds and improved fodder planted in their land. Furthermore, BC 08 also accommodates big migratory herds (Yaks 3 herds, and cattle 2 herds) of *Dratshang* and royal herdsmen both in Trongsa and Wangdue Phodrang Dzongkhags.

2.5 Local Forest Management Area

There are only few fragmented settlements inside BC 08 and most of them are spread along BC boundary. People dwelling in and around BC depend on the forest resources inside BC and some of these dependents are communities from Kazhi, Nyisho, Sephu and Nubi Gewogs. Therefore, a Local Forest Management Area (LFMA) each is established in every Gewog. The LFMA, besides its main objective to manage and regulate rural timber, firewood, and NWFPS on a sustainable basis to the local communities, is expected to facilitate the wildlife habitat improvement in BC as well.

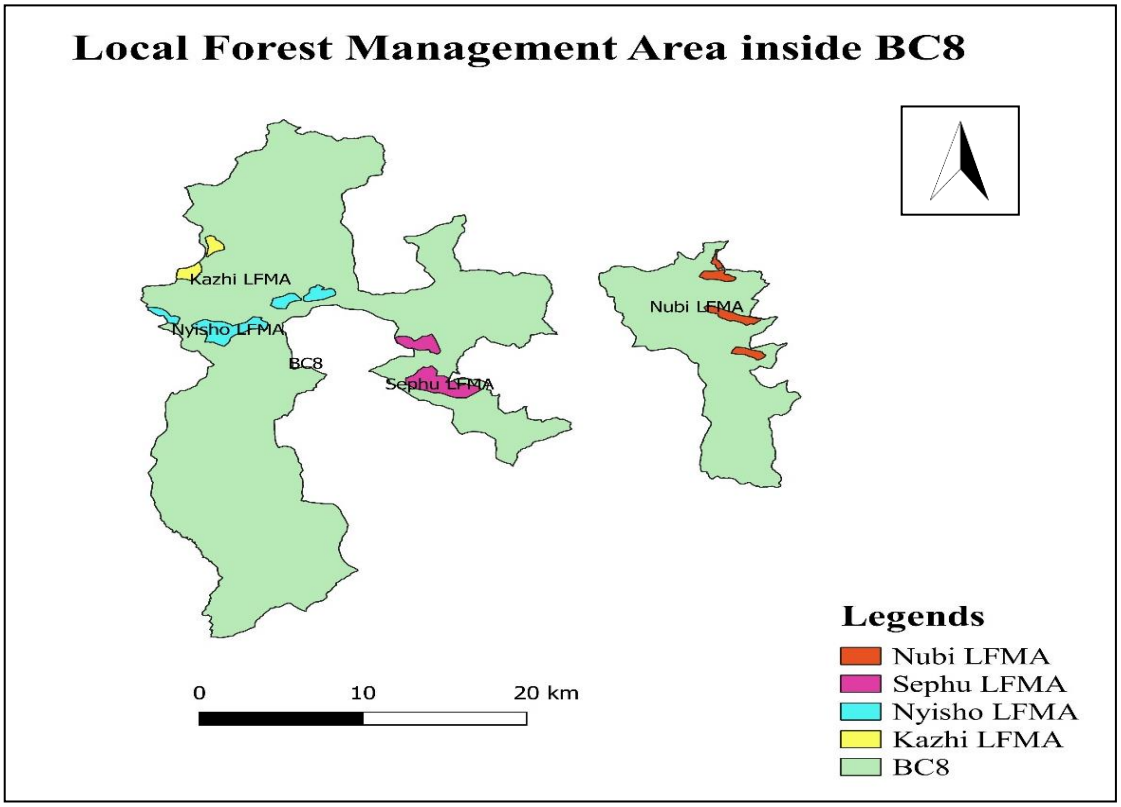

Figure 26: Local Forest Management Area in BC 08

A total area of 2482 ha of SRF land was surveyed and delineated as LFMA inside the BC 08. Its total production and protection area is 1901.9 ha and 454.7 ha respectively while a total non-production area is 125.3 ha only. Out of 5144 m^3 annual allowable cut (AAC), the maximum volume of production is 2868 m^3 from Sephu Gewog which has conifer forest while in other three Gewogs have predominantly a broadleaf forest. The average AAC per ha from LFMA is 2.85 m^3 per ha (Table 6).

Table 6: Relative total areas and production of 4 Gewogs

Gewogs	Kazhi	Nyisho	Sephu	Nubi	Total
Total LFMA area (ha)	262	910.8	821.5	487.7	2482
Total production area (ha)	172.8	650.6	654.8	423.7	1901.9
Total non-production area ha)	0	78.6	38.5	8.2	125.3
Total protection area (ha)	89.2	181.6	128.1	55.8	454.7
Total AAC (m^3)	707	937	2868	632	5144
Total AAC per ha (m^3/ha)	4.1	1.4	4.4	1.5	11.4

2.5.1 Kazhi Local Forest Management Area

Kazhi LFMA has two compartments with a total area of 262 ha. Total production area of these two compartments is 172.8 ha while protection area is 89.2 ha. Average basal area in these two compartments is 17.2 m^2/ha ad its average stand volume has been derived to 517 m^3/ha. The compartment I is predominated by mixed conifer and compartment II is composed of hardwood that was vastly dominated by *Quercus* species. Apparently, more than 70% of the total area is used for intensive grazing and therefore lopping of fodder trees are prominent. Daphne and bamboo are two common non-wood forest products found across two compartments in Kazhi. The firewood production is very significant with 162.6 m^3/ha. The Annual Allowable Cut (AAC) for the Kazhi Local Forest Management Area is 707 m^3, thus the AAC derived per hectare is 4.1 m^3 (Table 7, below).

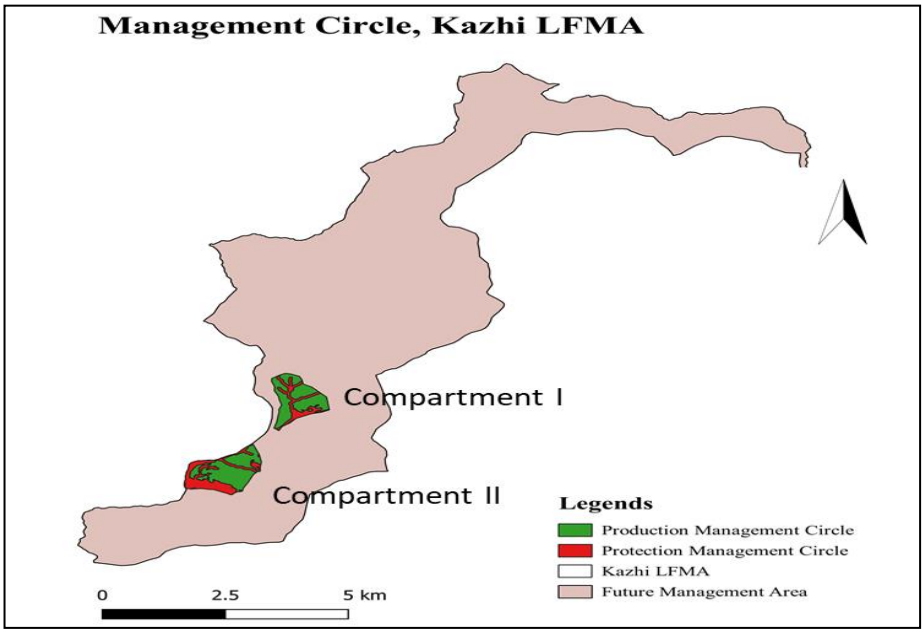

Figure 27: Kazhi Management Circle

Table 7: Summary Result of Kazhi LFMA

Summary Results for Forest Management Area: Kazhi

Unit	Area Distribution			
	Non Production	Protection	Production	Total
ha	0.0	89.2	172.8	262.0
%	0%	34%	66%	100%

Average basal area (m2/ha)	Aver. Stand Volume (m3/ha)	No of accessible sample plots
17.2	517	119

Unit	Forest Type Distribution								
	Hemlock	Fir	Spruce	Mix. Con.	Bluepine	Chirpine	Hardwood	Mixed HC	Total
%	3%	0%	0%	32%	0%	0%	56%	10%	**100%**
Unit	**Age distribution**					**Stand type distribution**			
	young	immature	mature	Overmature	Total	plantation	natural	coppice	Total
%	4%	34%	61%	0%	**99%**	0%	100%	0%	**100%**
Unit	**Canopy closure**					**Condition**			
	dense	closed	open	unstocked	Total	good	average	poor	Total
%	2%	36%	58%	4%	**99%**	22%	72%	6%	**100%**

Unit	Site Condition								
	Slope			Erosiveness			Soil Cover		
	gentle	moderate	steep	stable	moderate	unstable	high	moderate	low
%	7%	86%	7%	29%	58%	13%	6%	80%	14%

Unit	Forest Use					
	Intensive Side Uses			Extensive Side Uses		
	grazing	sokshing	lopping	grazing	sokshing	lopping
ha	70.2	0.0	28.1	2.2	0.0	0.0
%	27%	0%	11%	1%	0%	0%

Unit	NWFP Occurence and Firewood							
	NWFP abundant				NWFP sparse			
	Firewood	Bamboo	Cane	Daphne	Firewood	Bamboo	Cane	Daphne
ha	13.4	29.2	0.0	35.3	68.6	52.3	0.0	98.4
%	5%	11%	0%	13%	26%	20%	0%	38%

Unit	Potential Production				
	Timber				
	Drashing	Cham	Tsim	Poles,posts	Total
Ntot	4060	1491	293	184	**6028**
N/ha	23	9	2	1	**35**
m3	42587	1626	84	17	**44314**
m3/ha	246.5	9.4	0.5	0.1	**256.4**
Unit	**Firewood**				
	> 49cm	30-49cm	20-29 cm	10-19 cm	Total
Ntot	2695	3242	4175	4608	**14720**
N/ha	16	19	24	27	**85**
m3	23537	3030	1195	330	**28092**
m3/ha	136.2	17.5	6.9	1.9	**162.6**

Unit	Sivicultural Measures				
	Planting	Thinning	Felling (firewood)	Felling (timber)	No Activity
ha	26.2	74.5	76.3	29.0	57.6
%	10	28	29	11	22

Yield Regulation		
AAC	**707**	m3
	4.1	m3/ha
Prod. Potential / AAC	**102**	years

2.5.2 Nyisho Local Forest Management Area

A total area of 910.8 ha of the Nyisho LFMA is divided into five compartments. It has a production area of 650.6 ha (71%) and is countered by non-production area of 78.6 ha (9%) while protection area is 181.6 ha (20%). Its average basal area is 22.4 m^2/ha with average stand volume of 187 m^3/ha. All five compartments are composed of hardwood forest (97%) predominated by Quercus species. Apparently, 549.6 ha (60%) of the total area is used for grazing by the local communities and evidence of lopping is very prominent (12%). Daphne is sparsely distributed across five compartments in this LFMA thus covering a total area of 106.6 ha.

The Annual Allowable Cut (AAC) for the Nyisho Local Forest Management Area is 937 m^3, thus the AAC derived per hectare is 1.4 m^3 (Table 8, below).

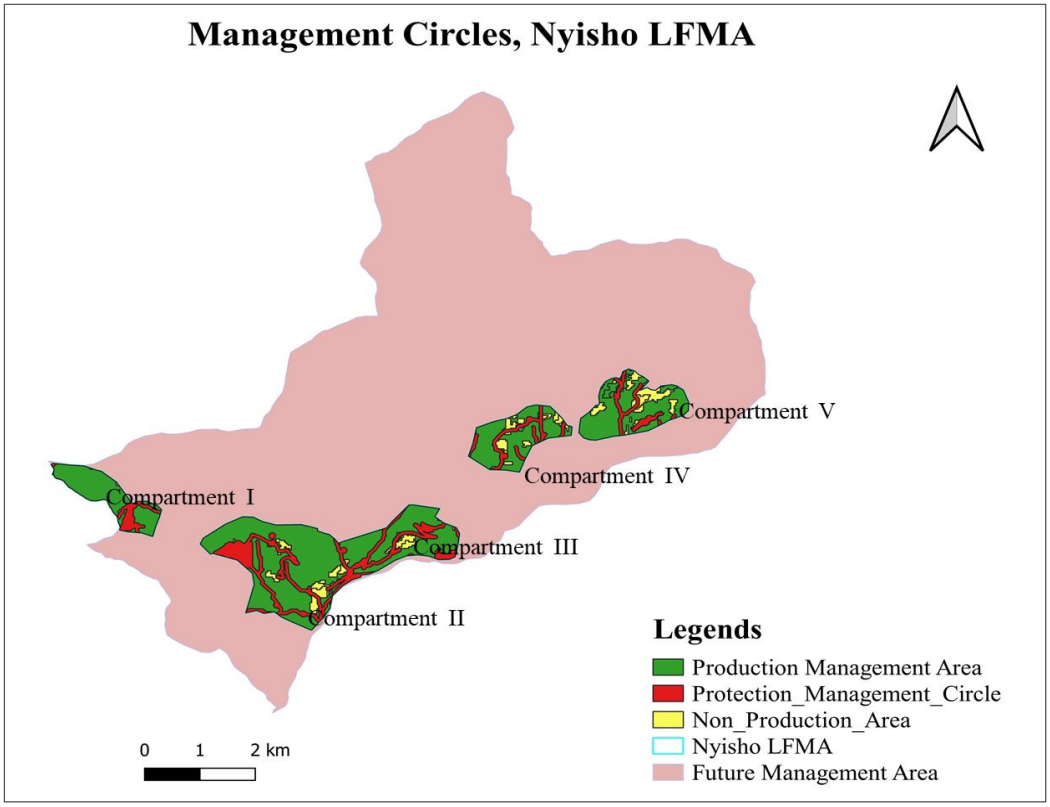

Figure 28: Nyisho Management Circle

Table 8: Nyisho Summary Result

Summary Results for Forest Management Area: Nyisho

Unit	Area Distribution			
	Non Production	Protection	Production	Total
ha	78.6	181.6	650.6	910.8
%	9%	20%	71%	100%

Average basal area (m2/ha)	Aver. Stand Volume (m3/ha)	No of accessible sample plots
22.4	187	175

Unit	Forest Type Distribution								
	Hemlock	Fir	Spruce	Mix. Con.	Bluepine	Chirpine	Hardwood	Mixed HC	Total
%	0%	0%	0%	0%	0%	0%	97%	3%	**100%**
Unit	**Age distribution**					**Stand type distribution**			
	young	immature	mature	Overmature	Total	plantation	natural	coppice	Total
%	6%	44%	49%	0%	**100%**	0%	100%	0%	**100%**
Unit	**Canopy closure**					**Condition**			
	dense	closed	open	unstocked	Total	good	average	poor	Total
%	0%	32%	64%	3%	**99%**	31%	63%	5%	**100%**

Unit	Site Condition								
	Slope			Erosiveness			Soil Cover		
	gentle	moderate	steep	stable	moderate	unstable	high	moderate	low
%	7%	93%	0%	38%	59%	2%	23%	74%	2%

Unit	Forest Use					
	Intensive Side Uses			Extensive Side Uses		
	grazing	sokshing	lopping	grazing	sokshing	lopping
ha	273.7	20.6	99.2	275.9	7.3	7.3
%	30%	2%	11%	30%	1%	1%

Unit	NWFP Occurence and Firewood							
	NWFP abundant				NWFP sparse			
	Firewood	Bamboo	Cane	Daphne	Firewood	Bamboo	Cane	Daphne
ha	230.8	8.0	0.0	0.0	238.8	36.0	0.0	106.6
%	25%	1%	0%	0%	26%	4%	0%	12%

Unit	Potential Production				
	Timber				
	Drashing	Cham	Tsim	Poles,posts	Total
Ntot	768	2283	0	0	**3051**
N/ha	1	4	0	0	**5**
m3	1881	1928	0	0	**3809**
m3/ha	2.9	3.0	0.0	0.0	**5.9**
Unit	**Firewood**				
	> 49cm	30-49cm	20-29 cm	10-19 cm	Total
Ntot	5826	11156	2347	3731	**23060**
N/ha	9	17	4	6	**35**
m3	37589	11571	701	275	**50136**
m3/ha	57.8	17.8	1.1	0.4	**77.1**

Unit	Sivicultural Measures				
	Planting	Thinning	Felling (firewood)	Felling (timber)	No Activity
ha	89.9	253.1	327.1	41.8	193.9
%	10	28	36	5	21

Yield Regulation		
AAC	**937**	m3
	1.4	m3/ha
Prod. Potential / AAC	**58**	years

2.5.3 Sephu Local Forest Management Area

The Sephu LFMA, with its total area of 821.5 ha is divided into three compartments. It has a production area of 654.8 ha (80%), non-production area 38.5 ha (5%) and protection area of 128.1 ha (16%). The average basal area of this LFMA is 18.6 m^2/ha with average stand volume of 538 m^3/ha. This LFMA largely has mixed conifer forests (79%), fir (13%) and hemlock (6%). Bamboo and daphne is commonly distributed across three compartments in Sephu LFMA thus covering a total area of 595.6 ha. Firewood is abundant with a volume of 31361 m^3 although it is distributed sparsely. The Annual Allowable Cut (AAC) for the Sephu Local Forest Management Area is 2868 m^3, thus the AAC derived per hectare is 4.4 m^3 (Table 8, below).

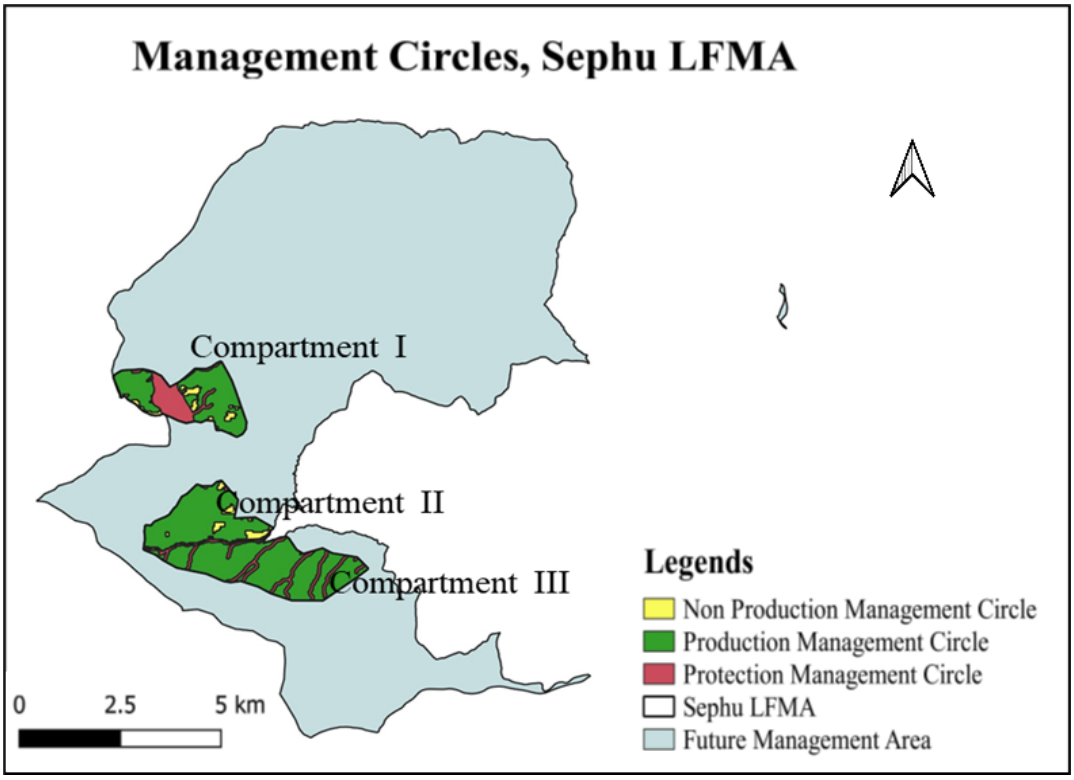

Figure 29: Sephu Management Circle

Table 9: Sephu Summary Result

Summary Results for Forest Management Area: Sephu

Unit	Area Distribution			
	Non Production	Protection	Production	Total
ha	38.5	128.1	654.8	821.5
%	5%	16%	80%	100%

Average basal area (m2/ha)	Aver. Stand Volume (m3/ha)	No of accessible sample plots
18.6	538	158

Unit	Forest Type Distribution								
	Hemlock	Fir	Spruce	Mix. Con.	Bluepine	Chirpine	Hardwood	Mixed HC	Total
%	6%	13%	0%	79%	0%	0%	0%	1%	**100%**
Unit	**Age distribution**					**Stand type distribution**			
	young	immature	mature	Overmature	Total	plantation	natural	coppice	Total
%	15%	14%	71%	0%	**100%**	0%	100%	0%	**100%**
Unit	**Canopy closure**					**Condition**			
	dense	closed	open	unstocked	Total	good	average	poor	Total
%	4%	17%	71%	7%	**100%**	15%	82%	3%	**100%**

Unit	Site Condition								
	Slope			Erosiveness			Soil Cover		
	gentle	moderate	steep	stable	moderate	unstable	high	moderate	low
%	39%	61%	0%	50%	50%	0%	22%	75%	2%

Unit	Forest Use					
	Intensive Side Uses			Extensive Side Uses		
	grazing	sokshing	lopping	grazing	sokshing	lopping
ha	384.2	0.0	86.6	178.6	0.0	0.0
%	47%	0%	11%	22%	0%	0%

Unit	NWFP Occurence and Firewood							
	NWFP abundant				NWFP sparse			
	Firewood	Bamboo	Cane	Daphne	Firewood	Bamboo	Cane	Daphne
ha	35.5	302.5	0.0	31.6	299.9	292.5	0.0	337.1
%	4%	37%	0%	4%	37%	36%	0%	41%

Unit	Potential Production				
	Timber				
	Drashing	Cham	Tsim	Poles,posts	Total
Ntot	20992	3437	0	0	**24429**
N/ha	32	5	0	0	**37**
m3	198781	3727	0	0	**202508**
m3/ha	303.6	5.7	0.0	0.0	**309.3**
Unit	**Firewood**				
	> 49cm	30-49cm	20-29 cm	10-19 cm	Total
Ntot	4308	979	227	315	**5829**
N/ha	7	1	0	0	**9**
m3	30256	1031	53	21	**31361**
m3/ha	46.2	1.6	0.1	0.0	**47.9**

Unit	Sivicultural Measures				
	Planting	Thinning	Felling (firewood)	Felling (timber)	No Activity
ha	55.8	197.4	143.7	200.8	223.9
%	7	24	17	24	27

Yield Regulation		
AAC	**2868**	m3
	4.4	m3/ha
Prod. Potential / AAC	**82**	years

2.5.3 Nubi Local Forest Management Area

With a total area of 487.7 ha Nubi LFMA is divided into three compartments. Its production area is 423.7 ha (87%) while non-production area is 8.2 ha (2%) much lower than the protection area which is 55.8 ha (11%). The average basal area of this LFMA is 20.2 m^2/ha with average stand volume of 19.4 m^3/ha. All three compartments of this LFMA are composed of hardwood forests varying its age classes. More than 98 ha (21%) of total area is utilized for grazing.

Firewood is abundant with a volume of 44625 m^3 distributed across all three compartments. The Annual Allowable Cut (AAC) for the Nubi Local Forest Management Area is 632 m^3, thus the AAC derived per hectare is 1.5 m^3 (Table 9, below).

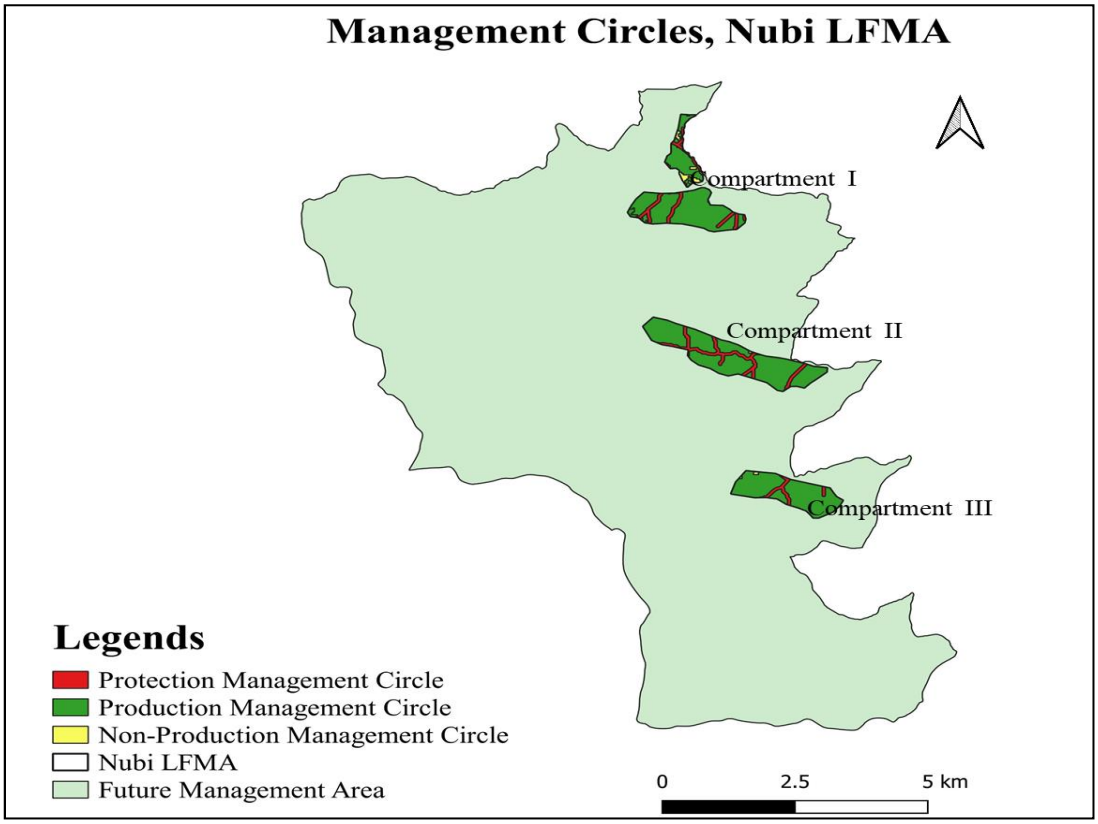

Figure 30: Nubi Management Circle

Table 10: Nubi Summary Result

Summary Results for Forest Management Area: Nubi

Unit	Area Distribution			
	Non Production	Protection	Production	Total
ha	8.2	55.8	423.7	487.7
%	2%	11%	87%	100%

Average basal area (m2/ha)	Aver. Stand Volume (m3/ha)	No of accessible sample plots
20.2	194	202

Unit	Forest Type Distribution								
	Hemlock	Fir	Spruce	Mix. Con.	Bluepine	Chirpine	Hardwood	Mixed HC	Total
%	0%	0%	0%	0%	0%	0%	100%	0%	**100%**
Unit	**Age distribution**					**Stand type distribution**			
	young	immature	mature	Overmature	Total	plantation	natural	coppice	Total
%	14%	43%	43%	0%	**100%**	0%	100%	0%	**100%**
Unit	**Canopy closure**					**Condition**			
	dense	closed	open	unstocked	Total	good	average	poor	Total
%	2%	39%	55%	5%	**100%**	28%	61%	10%	**100%**

Unit	Site Condition								
	Slope			Erosiveness			Soil Cover		
	gentle	moderate	steep	stable	moderate	unstable	high	moderate	low
%	29%	71%	0%	56%	40%	4%	54%	45%	1%

Unit	Forest Use					
	Intensive Side Uses			Extensive Side Uses		
	grazing	sokshing	lopping	grazing	sokshing	lopping
ha	52.0	0.0	15.3	46.6	0.0	0.0
%	11%	0%	3%	10%	0%	0%

Unit	NWFP Occurence and Firewood							
	NWFP abundant				NWFP sparse			
	Firewood	Bamboo	Cane	Daphne	Firewood	Bamboo	Cane	Daphne
ha	104.6	345.7	0.0	9.3	81.7	115.7	0.0	93.7
%	21%	71%	0%	2%	17%	24%	0%	19%

Unit	Potential Production				
	Timber				
	Drashing	Cham	Tsim	Poles,posts	Total
Ntot	462	1336	509	0	**2307**
N/ha	1	3	1	0	**5**
m3	4307	1186	138	0	**5631**
m3/ha	10.2	2.8	0.3	0.0	**13.3**
Unit	**Firewood**				
	> 49cm	30-49cm	20-29 cm	10-19 cm	Total
Ntot	3853	12268	10236	768	**27125**
N/ha	9	29	24	2	**64**
m3	29548	11934	3081	62	**44625**
m3/ha	69.7	28.2	7.3	0.1	**105.3**

Unit	Sivicultural Measures				
	Planting	Thinning	Felling (firewood)	Felling (timber)	No Activity
ha	135.9	89.5	171.5	8.9	81.9
%	28	18	35	2	17

Yield Regulation		
AAC	**632**	m3
	1.5	m3/ha
Prod. Potential / AAC	**80**	years

2.6 Future Plans of Development activities in BC 08

While it is difficult to project the future plans of the various developmental activities that may happen within the BC in the next 10 years as the main source for drawing up of such information depends mostly in the FYPs. The 12th FYP is on the verge of completion and the 13th FYP is yet to be developed/finalized. Hence based on the final year of the 12th FYP of the gewogs and few consultations, some of the activities projected are as mentioned in the table below.

All of these activities will occur within the private lands within the BCs and the SRFLs in the BCs but will be ensured that any important habitats are well protected and these activities happen with minimum impact to the biological corridor and its functionality.

Table 11: 12th Five Year Plan of Gewogs in BC 08

1.	**Nubi Gewog**	**Plan period**		
Sl #	**Activity**	**2020-2021**	**2021-2022**	**2022-2023**
1	Length of irrigation channel construction (km)		2	
2	Length of farm road construction (km)		10	5
3	Length of electric fencing construction (km)	20	11	
4	Length of electrics fencing maintenance (km)	15	2	
5	Suspension bridge maintenance/construction	4	2	1
6	Health infrastructure construction	1	1	
7	Educational infrastructure construction/maintenance	2	2	1
8	Religious infrastructure renovation	1	1	3
2	**Tangsibji Gewog**	**Plan period**		
Sl #	**Activity**	**2020-2021**	**2021-2022**	**2022-2023**
1	Length of irrigation channel construction (km)	2		
2	Length of farm road construction (km)		20	
3	Length of electric fencing construction (km)	10	10	10
4	Length of electric fencing maintenance (km)	7.5	7.5	7.5
5	Suspension bridge maintenance		1	1
6	Health infrastructure renovation	1	1	1
7	Educational infrastructure construction/maintenance	2	2	1
8	Religious infrastructure renovation	1	1	2
3	**Athang Gewog**	**Plan period**		
Sl #	**Activity**	**2020-2021**	**2021-2022**	**2022-2023**
1	Length of irrigation channel construction	5		
2	Educational infrastructure maintenance	1		
3	Religious infrastructure renovation			1
4	Wooden bridge construction	1		

4	Bjena Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction/maintenance	3	1	1
3	Length of farm road construction (km)	1.6		
5	Length of electric fencing construction (km)		1.3	
6	Waste disposal pit construction	1		
5	Dangchu Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction/maintenance	2	2	1
2	Length of electric fencing construction (km)	1.5		
3	Religious infrastructure renovated	2		1
4	Landfill construction	1		
6	Gangtey Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction/maintenance	3		1
2	Religious infrastructure renovation	1	1	1
3	Landfill maintenance		1	
7	Kazhi Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction		1	1
2	Length of irrigation channel construction (km)	1	2	
3	Length of farm road construction (Km)	6	6	2
4	Length of electric fencing maintenance (km)	2	2	2
5	Religious infrastructure renovation	1		
6	Suspension bridge construction	1		
8	Nyisho Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction	1	1	
2	Length of farm road construction (km)	2.7		
3	Length of electric fencing construction (km)	5	6	
4	Suspension bridge construction		1	
9	Phobji Gewog	Plan period		
Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure construction/maintenance	3	3	1
2	Religious infrastructure renovated	1		
3	Length of electric fencing construction (km)	4	4	3.5
4	Waste disposal pit construction	3		
10	Sephu Gewog	Plan period		

Sl #	Activity	2020-2021	2021-2022	2022-2023
1	Educational infrastructure maintenance	2		
2	Length of farm road construction (km)	3	5	
3	Length of electric fencing construction (km)	4	4	3.5
4	Religious infrastructure renovation	3	2	
5	Waste disposal pit construction	2	1	
6	Wooden bridge renovation		1	1

CHAPTER III

THREAT ANALYSIS

3. Determining Strength, Weakness, Opportunity and, Threats (SWOT), and Issues

Management effectiveness assessment carried out in respect of Biological Corridor 08 in two divisions very recently (June 2019) revealed poor management results. Out of 123 points predetermined for 35 sets of questions, it scored 38 (30.8%) which was fairly poor. And the reason for this poor management was apparently due to lack of management plan, fund, inadequate communication facilities, and equipment. From the ecological and socio-economic survey result, the management interventions required in respect of wildlife and human-wildlife associated issues (detailed hereunder) were found critically important without further delay.

3.1 Threats on floral diversity

Results from Bhutan Monitoring Effectiveness Tracking Tools (Bhutan METT^{+}) and ecological survey concluded and critically identified four significant threats such as road, grazing and logging on the flora in BC 08. Of the four threats, livestock farming and grazing was a severe threat categorized as 'major and continuous impact' to biodiversity conservation and road was categorized as 'minor impact' while other two threats were severe and categorized as 'major but not continuous'. All these threats were classified as current and potential ones across BC 08.

Table 12: Threats on flora in BC 08

Threats (T) or Issues (I)	Impact of threat		Management response
Status of threats Current (C), Potential (P)	Extent: Describe the extent of the impact 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
Roads (T) (C) & (P)	A: Small section of the site (5-10%):	Adverse impact inflicted due to indiscriminate felling of trees and consequent land degradation and landslide.	1. Prioritize the road construction on the basis of genuineness. 2. Road construction should be eco-friendly as per the

			existing policy and law.
Legal logging (T) (C) & (P)	B: Several areas of the site (11-50%):	Major adverse impact inflicted by commercial logging especially on the steep terrain and catchment area due to intensive felling of timber and disturbance on the ground vegetation.	1. Follow the Annual Allowable Cut as required by existing FNCRR, 2017. 2. Strengthen the field staffs for effective monitoring
Livestock farming and grazing (T) (C) & (P)	C: Most of the site (51-100%):	Adverse impact inflicted due to continuous grazing and browsing of herb, shrubs and grass by cattle and associated felling/lopping of trees by herdsmen. Grazing also induces invasion by exotic weeds that are non-palatable	1. Promotion of Fodder trees Species 2. Capacity Development Program on Livestock Breed 3. Encourage Improved breeds of Cattle 4. Encourage Stall Feeding 5. Uprooting the exotic weeds
Pest and diseases (T) (C) & (P)	A: Small section of the site (5-10%):	In some places, conifer forests (especially fir and spruce) are infested by diseases and bark beetle under Wangdue division	1. Apply sanitary felling
Forest fire	A: Small section of the site (5-10%):	Both manmade and natural fires ravages forests conifer forests across BC 08	Awareness to the people for prevention of fire

3.2 Threat on mammals and avifauna

Forest resources were closely shared by cattle which were occasionally preyed upon by tiger and wild dogs. So, a potential threat to tiger and wild dog might be a retaliatory killing by herdsmen. Dhungdhung Nyelsa and Beylangdra areas were reported for sambar deer while musk deer was recorded from Gogona area only. This indicated depletion in musk deer population in most areas of Wangdue Phodrang Dzongkhag due to poaching. In one occasion of informal discussion with a resident from Baedrog under Kazhi Gewog in 2021, he reported that musk deer population was depleted a decade ago due to poachers in their locality and therefore switched to other places. Beylangdra, which appeared to be poor in species composition, was reported for presence of Himalayan black bear. Potential threat on bear should not be remained unexpected because of its

written market value on its body part like tiger and musk deer. While cattle supplement the natural prey species in the food requirement of big felids and canids inter-species food competition between large herd of cattle and wild ungulate such as sambar, muntjac and serow appeared to be a threat to the food requirement by wild ungulates especially in conifer forests where palatable undergrowth is poor.

In case of Trongsa area, Drangichu and Banglapokto was reported for highest species composition relatively with 14 mammal species that comprised of conservation significance species. Broadleaf forest, which was reported for highest record of tiger's occupancy compared with other forests, was appeared to be exploited extensively by people and associated cattle. Cattle's occurrence in the same locality was reported for predation by tigers. In this case, potential retaliatory actions by herdsmen should be considered as one potential threat. Tiger, as an apex predator, appeared to overlap habitats with most of the ungulate and significantly with cattle (66.7%) and equine (50%) while habitat overlap between tiger and sambar was very evident in Trongsa. And wild dog habitat overlaps with cattle too appeared very significant. In view of this ecological behavior, occasional livestock predation by big felids and canids may result to retaliatory killing by herdsmen.

Potential threats to avifauna vary across the two Dzongkhags in the BC 08 are inflicted due to terrestrial birds hunting by a pack of guarding dogs owned by herdsmen in the camp, poaching or snaring. However, the severity of threats to bird conservation was not serious apparently. Tangsibji Hydro-Power Project was reported for affecting the bird occupancy due to sound pollution and habitat degradation both at canopy and ground surface.

Table 13: Threat on fauna in BC 08

Threats (T) or Issues (I)	Impact of threat		Management response
Status of threats Current (C), Potential (P)	Extent: Describe the extent of the impact 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
Wildlife poaching		Adverse impact inflicted due to	1. Strengthen and enhance periodic anti-poaching patrol.

(T) (C) & (P)		poaching of musk deer and tiger (for example of a couple of cases were detected in 2020,2021) on musk deer and tiger poaching.	2. Wildlife population monitoring and habitat rehabilitation. 3. Identify Key Biodiversity Hotspot area and strategize conservation programs. 4. Carry out survey to identify wildlife in the area vulnerable to poaching 5. Borrow and apply appropriate wildlife management practices.
Loss of key stone species (I) (C) & (P)		Adverse impact inflicted due to poaching of tiger, which is a key-stone species in BC 08	1. Periodic monitoring of BC. 2. Awareness/ education program on biodiversity. 3. Identify Key Biodiversity Hotspot area. 4. Community based monitoring system in place through awareness programs.

3.3 Threat on people and properties

When human's encounters with wild animals entailed to consequent loses of property and lives it is resonated human-wildlife conflict wherein actual reason for the encounter on wild animals' perspective was barely given a thought. Thus, human-wildlife conflict was always viewed and judged in respect of people's welfare knowing the fact that wildlife could not afford to persuade a justice. So called, human-wildlife conflict was not an exception across BC 08 landscape. Most conflicting mammals according to the farmers in BC 08 are tiger, leopard, wild dog, wild pig, bear, sambar, muntjac and macaques. Incidences of livestock predation by tiger were largely reported from Trongsa. Leopard and wild dog were also responsible for livestock predation largely in

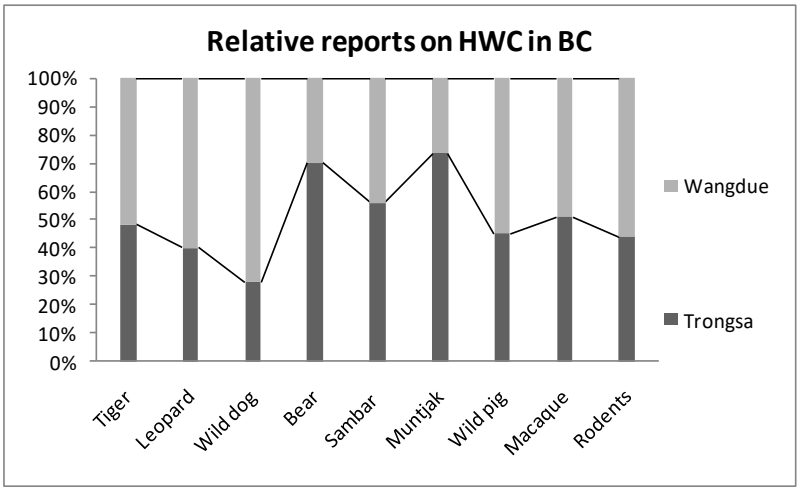

Figure 26: Rate of crop damage by wild animals for crop damage in BC 08

case of Wangdue division while tiger and bear are conflicting more with the farmers of Trongsa. In case of crop depredation, wild pig, muntjac, and sambar were largely reported by farmers.

In this kind of scenario, we need to pursue serious situational analysis on the perspective of wild animals and their habitats rather than inarguably taking into account the human perspective as bestowed rights over resource use.

3.4 Climate change impacts

In the last five years, severe climatic factors were reported for adversely impacting livelihood of farmers across two divisions. A few numbers of households even lost their properties. Farmers of Trongsa were adversely impacted by hailstorm, and pest and diseases outbreak on agriculture crops. They were also affected due to belated rainfall during the agriculture crop cultivation season. Similarly, Wangdue Phodrang farmers were also affected adversely by pest and diseases outbreak on agriculture crops. Moreover, erratic rainfall or prolonged rainfall was very detrimental for agriculture crop cultivation as reported by the Wangdue Phodrang farmers. Relatively, farmers of Wangdue Phodrang reported high intensity of adverse impact of climate change compared with Trongsa farmers.

Perception on impact of climate change varied from individual farmers despite being in the same locality because of nature of different and intensity of farming practices by individual household. The changing climate induced impacts at various levels to the different segment of people. A major segment of farmers (90% respondents) from Trongsa reported that adverse impact of climate change acerbated in the last five years while 10% respondents reported more or less 'Same' for them. About 53% respondents from Wangdue Phodrang reported that climate change impact was on its increasing trend while 32% respondents asserted that impact went unnoticed in the last five years.

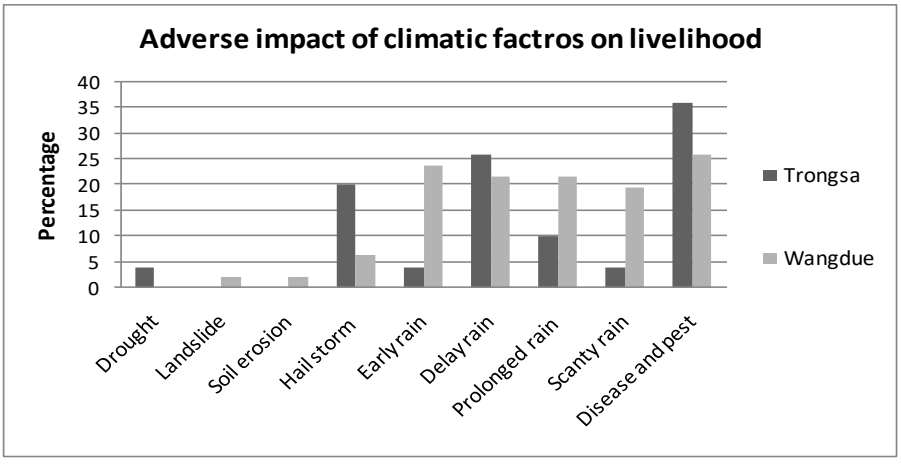

Figure 32: Adverse impact of climatic factors on livelihood of farmers in BC 08

3.5 Strength, Weakness, Opportunity, and Threats (SWOT analysis)

The strength, weakness, opportunity, and threats (SWOT) analysis of Biological Corridor 08 landscape was based on the key findings in identification-oriented analyses and anecdotal information in across two Dzongkhags. The SWOT analysis was aimed to identify key internal factors (strength and weakness) and external factors (opportunity and threats) that were considerably important to achieve the conservation objectives. Thus, the SWOT matrix offered rationale to deduce amicable intervention measures to address the issues for the benefitof both wildlife and farmers.

Table 14: Strength, Weakness, Opportunity, and Threats matrix

A	Strength	B	Weakness
1	Large conservation landscape sprawled over two divisions	1	Inefficient conservation and wildlife management
2	Human-associated landscape inhabited by agro-pastoralists that can support conservation through human induced activities	2	Human-wildlife conflict over resource sharing
3	Agriculture and livestock farming – largely free range grazing improve wildlife habitats	3	Human-wildlife conflict over resource sharing
4	Three divisions for effective management	4	Disparity amongst three divisions in management regimes
5	Beautiful landscape adorned with rich diversity of plants, birds and mammals	5	Potential for poaching and hunting
6	Four endangered mammals such as Tiger, wild dog, red panda and Himalayan musk deer and three vulnerable species occurring in BC. So, can take up tiger as flagship or umbrella species in the BC for landscape conservation	6	Aggravate human-wildlife conflict especially due to livestock predation by tiger and wild dog.
7	Easy access for monitoring patrol due to highway, forest road and farm roads running inside corridor	7	Potential for poaching and hunting and illegal collection of forest products
8	Forest management units and Community forests can help improve wildlife habitats especially the ground cover which can entice ungulates	8	Over exploitation of forest; Hunting or accidental killing of wildlife

9	Power transmission line that supplies electricity for the residents	9	Poor quality work may entails to cost life of wildlife and human
C	Threats	D	Opportunities
1	Restrictions in use of forest products and other developmental activities	1	Conservation of flora and fauna diversity
2	Deterioration of habitats; forest fire breakout; diseases, illegal harvest of forest products, Habitat fragmentation, poaching and hunting wild animals	2	Induce balanced conservation and development activities; Build conservation partners with local residents
3	Land encroachment, forest degradation, killing of wildlife in the process of crop guarding and cattle herding, wildlife susceptible to communicable zoonotic diseases from livestock, Interspecies food competition	3	Supplementary food for herbivores and big cats; facilitate heterogeneous habitat formation for wildlife
4	Conflict of conservation interests	4	Consolidated wildlife management regimes; effective monitoring patrol and control illegal activities
5	Invasion of agriculture and grazing land by aggressive plant species; crop damage and livestock depredation	5	Conduct study on various flora and fauna; Attraction for tourists and subsequent income generation.
6	Highly vulnerable to poaching and retaliatory killing of predators like tiger and wild dog due to livestock predation.	6	Study-prey-predator dynamics and interconnectedness in the future. Can easily contribute and increasing the number of tiger and reviving the wild dog population in the future.
7	Habitat fragmentation, accidental killing of wildlife by vehicles, poaching and hunting of wildlife, pollution due to solid waste disposal and sound	7	Curb illegal activities due to timely monitoring patrol; study impact of road and provide subsequent recommendations.
8	Forests degradation due to over harvest; facilitate soil erosion and landslide due to dragging of logs. Shifting of wildlife due to unrelenting mechanical sound and tree felling	8	Create heterogeneous wildlife habitats; study the impact of FMU and strategize the management intervention
9	Electrocution of wild animals especially birds; Forest fire breakout due to short electric circuit	9	Decrease use of firewood; Improve wildlife habitat due to clear felling of tree along transmission line

3.6 Biodiversity hotspot in Biological Corridor 08

In order to determine the biodiversity hotspot of BC 08 the key biodiversity index taken into account included endangered mammal species recorded during the survey in the specific areas. Tiger was taken as flagship species out of other species of conservation significance like wild dog, red panda, clouded leopard, and musk deer.

Occurrence of tiger and other endangered mammals was evident across BC 08 landscape thus indicating a need of special attention given its status. In this respect, both the territorial divisions need to carryout series of strategic management interventions in pursuit of sustaining viable population of tiger and its prey. Wangdue division needs to pay special attention in Sephu and Gogona areas- the prime habitats of tiger, wild dog, and Red panda as indicated in the map. Actually, tiger was largely reported from Trongsa as revealed in the map below. In this respect, Bumthang Division's attention and effort should not be discontinued under any circumstances. Tiger's distribution range appeared to reach beyond specifically mentioned areas like Sephu and Trongsa according to the prediction made by ecological modeling. Therefore, concerned division must pay importance accordingly to manage the habitats and conduct monitoring patrol.

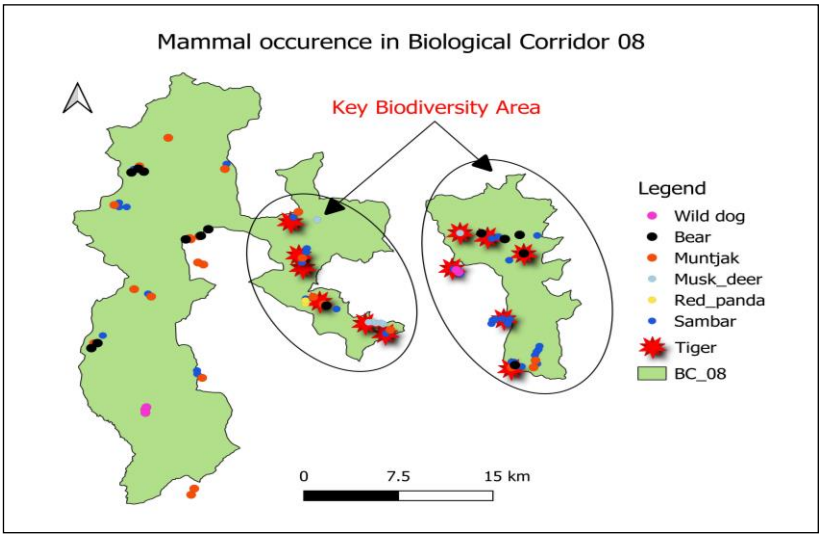

Figure 33: Mammals occurrence (biodiversity hotspot) in Biological Corridor 08

Given that tiger is the flagship specie in the Biological Corridor both the divisions must focus in conserving the tiger and its habitat. Thus, other mammals characterized by symbiotic relationship will be benefited to thrive therein.

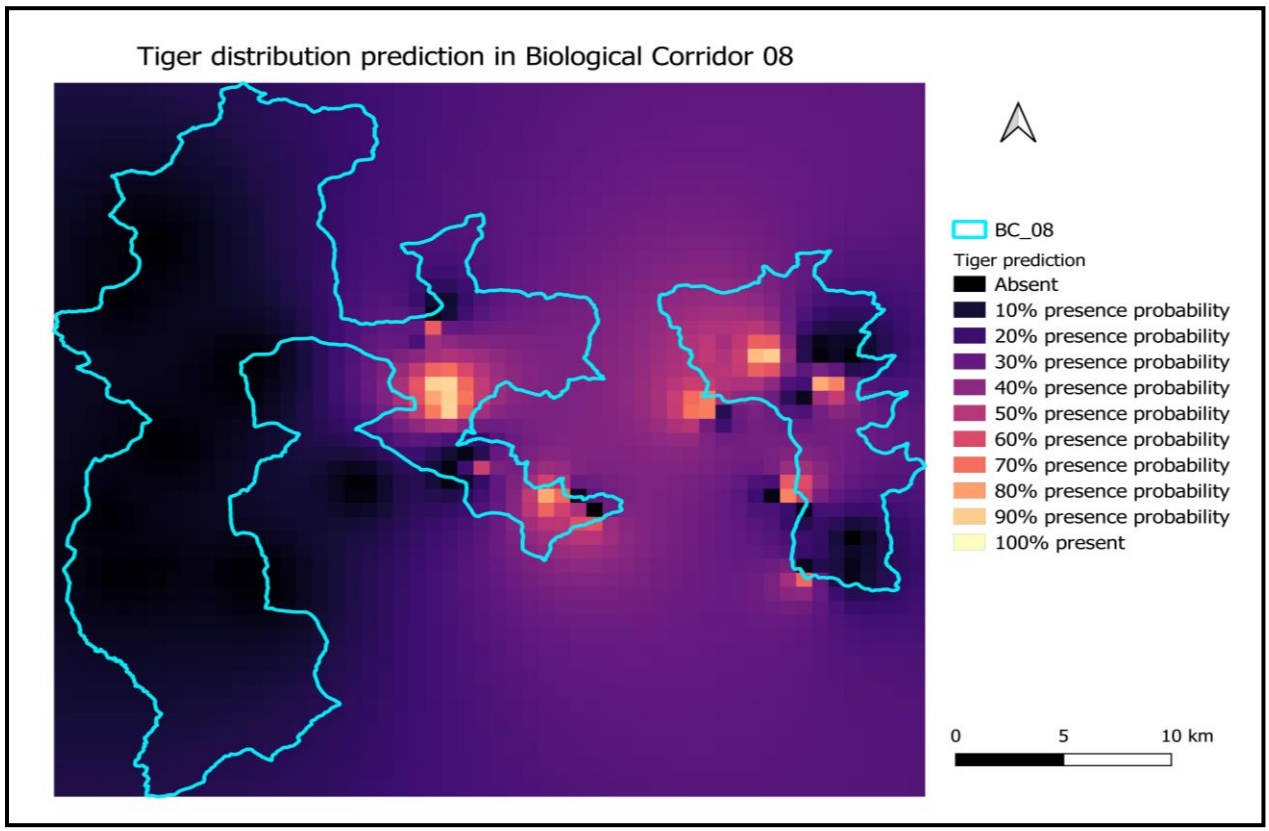

Figure 34: Tiger distribution in Biological Corridor 08

CHAPTER IV

MANAGEMENT INTERVENTIONS

4.1 Management intervention measures

Consistent to planning-oriented analyses carried out in Chapter III from the perspectives of social, ecological, and management effectiveness, and subsequent SWOT matrix, the management intervention measures were proposed for the benefit of flora, fauna and people living in and around BC 08. These proposed intervention measures were categorized under various programs and then aligned with DoFPS' major programs consistent to expected outputs enshrined in 12th Five Year Plan.

Table 15: Proposed activities for management interventions in BC 08

Programs and Outputs
Program 1: Understanding landscape, species composition, abundance, and functionality of Biological Corridor 08
Output 01: Knowledge on flora and fauna diversity enhanced
Activity 1: Monitoring of tiger to understand the population prey-predator dynamics
Activity 2: Documentation on orchid diversity, grass, ferns, fishes, lesser known reptiles and amphibians
Output 02: Ecosystem diversity and habitats contiguity maintained
Activity 1: Identify and map the suitable habitat of red panda and musk deer
Activity 2: Understand grazing impacts on different ecological zone
Activity 3: Photographic evidences of key sites in different seasons of the year
Program 2: Wildlife habitat enrichment and species resilience in Biological Corridor 08
Output 01: Adequate availability of minerals and water for wild animals enhanced
Activity 1: Map the waterholes, saltlicks and flagship species hotspots
Activity 2: Restore degraded waterholes and saltlicks
Output 02: Adequate availability of food and cover for wild animals enhanced
Activity 1: Inventory degraded forest land and map
Activity 2: Uproot exotic plant species and replace with native palatable plant species
Activity 3: Carryout habitat enrichment through plantation
Activity 4: Sanitary felling of trees and cleaning of forests to improve the wildlife habitats
Output 03: Key stone and /flagship species resilience enhanced
Activity1: Identify and demarcate critical conservation areas
Activity 2: Surveillance and management of wildlife diseases
Activity 3: Conduct periodic anti-poaching patrol in suspected and prone area for hunting
Program 3: Intertwining climate smart adaptations and ensuring species persistence
Output 01: Natural capital accounting system for major ecosystems established
Activity 1: Feasibility study on payment for environment services
Activity 2: Carry out valuation of wetland ecosystems
Activity 3: Carry out valuation of forest ecosystem services

Output 02: Conservation and management of wetlands enhanced
Activity 1: Assess climate vulnerable landscape and responding terrestrial and aquatic species
Activity 2: Intervention in management of drying water sources
Program 4: Empowering local people and ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water
Output 01: Sustainable management and utilization of timber promoted
Activity 1: Resource allocation from Local Forest Management Area, FMUs and CFs
Activity 2: Revision of old CF plans
Activity 3: Review of FMU plans of Gogona and Chendebji
Output 02: Technology on sustainable resource management and utilization of Non-Wood Forest Products developed
Activity 1: Conduct training on efficient use of timber by wood-based industries
Activity 2: Support alternative heating and cooking energy use to reduce fuel wood
Output 03: Community participation in sustainable forest management and conservation increased
Activity 1: Promote cultivation of NWFPs (medicinal plants) in private land wherever feasible
Output 04: Incidences of forest fire reduced
Activity 1: Strengthen existing Forest Fire Management Committee (Procurement of forest fire equipment)
Activity 2: Identify and map forest fire prone zone and develop forest fire line.
Activity 3: Yearly advocacy on forest fire prevention and management.
Program 5: Ensuring harmonious coexistence through alternative livelihood supports to farmers in Biological Corridor 08
Output 01: Livelihood and food security of farmers through integrated conservation and development programs enhanced
Activity 1: Study on NWFP product diversification opportunities
Activity 2: Procure and supply of NWFPs processing equipment
Activity 3: Support NWFPs product marketing
Activity 4: Support and encourage community on agriculture and livestock intensification program to mitigate HWC
Output 02: Community-based ecotourism and product diversification enhanced
Activity 1: Establish short walking and biking trails at Banglapokto
Activity 2: Establish community based sustainable Agro/pastoral tourism
Activity 3: Capacity building of Biological Corridor 08 staffs and community on nature-based tourism governance
Output 03: HWC mitigation measures enhanced
Activity 1: Update human wildlife conflict hotspot map
Activity 2: Support on cost effective crop protection measures to avoid accidental killing of significant conservation species (tiger) in the process of lethal retaliatory action by farmers
Activity 3: Support the community-based insurance scheme to mitigate HWC

Activity 6: Explore/Adopt and implement cost effective HWC mitigation measures
Program 6: Strengthening institutional capacity for effective service delivery
Output 01: Protected Area management enhanced/strengthened Activity 1: Update ecological and social survey data for next BC management plan Activity 2: Assess BC management effectiveness using Bhutan METT+ Activity 3: Construct office in Kazhi and Nubi Gewogs Activity 4: Procure furniture for new office Activity 5: Procure laptops, printers and photocopiers *Output 02: Forest protection and enforcement enhanced* Activity 1: Procure field equipment (drones) Activity 2: Commission and implement SMART real-time connect Activity 3: Conduct training on anti-poaching patrol techniques Activity 4: Establish intelligence network between various law enforcement agencies Activity 5: Maintenance of old office buildings and staff quarters *Output 03: Professional capacity enhanced* Activity 1: Attend training on carbon stock assessment Activity 2: Support community NWFP group member on capacity building Activity 3: Build the capacity of Biological Corridor 08staffs on wildlife management and statistical analysis Activity 4: Capacity building for Biological Corridor 08staffs and community on PA landscape management Activity 5: Study tour for field staff on wildlife management Activity 6: Capacity building for staff on wildlife study designing and methodology Activity 7: Capacity building for staff on wildlife monitoring techniques Activity 8: Capacity building for staff on GPS handling and application Activity 9: Capacity building for staff on PAs management and conservation leadership Activity 10: Capacity building for staff on writing grant/project proposals and project
Program 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management
Output 01: Conservation education/awareness through conservation arts and specimens strengthened Activity 1: Observe international/national days related to wildlife and conservation programs Activity 2: Procure audio-visual equipment Activity 3: Create awareness or educate target community on conservation and protection regime of significant species Activity 4: Develop signboards/signages in the BC Activity 5: Support nature club programs in schools and monasteries Activity 6: Form and conduct short trainings for birding and botany for citizen scientist and division staffs Activity 7: Carry out advocacy and awareness programmes on wetland conservation

Output 02: Waste management activities in the forest area enhanced Activity 1: Conduct awareness campaign on waste management Activity 2: Carry out cleaning campaign
Program 8: Strengthening Institutional Linkages, Monitoring and Evaluation
Output 01: Institutional linkage with biodiversity conservation partner agencies enhanced Activity 1: Convene coordination meeting on communication/Intelligence network between various law enforcement agencies Activity 2: Conduct land inspection and submit report to the concerned Dzongkhag Land Registrar related to Forestry clearance Activity 3: Conduct joint monitoring patrol across the BC conservation landscape in high poaching areas *Output 02: Systematic monitoring and evaluation of activities ensured* Activity 1: Carryout mid-term review of BC 08 management plan Activity 2: Carryout mid-term review of CF management plan Activity 3: Monitor CF and NWFPs governance (field and record keeping) Activity 4: Carryout monitoring and evaluation of plantation Activity 5: Carryout monitoring and evaluation of wood-based industries Activity 6: Monitor established HWC mitigation measures (Solar electric fence, GECC)

CHAPTER V

IMPLEMENTATION SCHEDULE AND BUDGET

5.1 Budget overview of two Divisions against program and expected outputs

Table 16: Budget overview of two divisions

Program	Outputs	Bumthang Division	Wangdue Division	Total output budget	Total program budget
Programme 1: Better understanding the landscape and species abundance in Northern Biological Corridor	Output 01: Knowledge on floral and faunal diversity enhanced	0.8	0.85	1.65	3.71
	Output 02: Ecosystem diversity and habitats contiguity maintained	1.06	1	2.06	
Programme 2: Wildlife habitat enrichment and species resilience in Biological Corridor 08	Output 01: Adequate availability of minerals and water for mammals enhanced	1.1	1.8	2.9	10.8
	Output 02: Adequate availability of food and cover for wild animals enhanced	1.1	1.6	2.7	
	Output 03: Key stone / flagship species resilience enhanced	1.5	3.7	5.2	
Programme 3: Intertwining climate smart adaptations and ensuring species persistence	Output 01: Natural capital accounting system for major ecosystems established	0.6	1	1.6	3.3
	Output 02: Conservation and management of wetlands enhanced	0.7	1	1.7	

Programme 4: Empowering local people to ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water	Output 01: Sustainable management and utilization of timber promoted	1	1	2	7.94
	Output 02: Technology on sustainable resource management and utilization of Non-Wood Forest Products developed	1.3	1.5	2.8	
	Output 03: Community participation in sustainable forest resource management and conservation increased	0.25	1.1	1.35	
	Output 04: Incidences of forest fire reduced	0.67	1.12	1.79	
Programme 05: Ensuring harmonious coexistence of wildlife and people through alternative livelihood supports	Output 01: Socio-economic well-being of communities through integrated development programs and management of forest resources enhanced	5.05	6.3	11.35	29.4
	Output 02: Community-based ecotourism and product diversification enhanced	3.9	2.5	6.4	
	Output 03: HWC mitigation measures enhanced	6.85	4.8	11.65	
Programme 6: Enhancing institutional capacity for effective service delivery	Output 01: Protected Area (BC) management enhanced/ strengthened	4.5	4.9	9.4	32.55
	Output 02: Forest protection and enforcement enhanced	2.9	2.9	5.8	

	Output 03: Professional capacity enhanced	7.45	9.9	17.35	
Programme 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management	Output 01: Conservation education/awareness through conservation arts and specimens strengthened	5	5.2	10.2	11.25
	Output 02: Waste management activities in the forest areas strengthened	0.45	0.6	1.05	
Programme 8: Strengthening Institutional Linkages and coordination	Output 01: Institutional linkage with biodiversity conservation partner agencies enhanced	3.2	3.2	6.4	13.65
	Output 02: Systematic monitoring and evaluation of implemented activities ensured	4.85	2.4	7.25	
Total	**Total**	**54.23**	**58.37**	**112.6**	**112.6**

5.1.1 Implementation schedule and Budget outlay against activities of BC 08 under Bumthang Forest Division

Table 17: Implementation schedule and Budget outlay against activity for Bumthang Division

Programme 1:	**Better understanding the landscape and species abundance in BC 08**											
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)									Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 01: To maintain viable population of flora and fauna in BC 08	Enhance knowledge on floral and faunal diversity	Activity 1: Monitoring of tiger to understand the population prey-predator dynamics				0.3							0.3
		Activity 2: Documentation on orchid diversity, grass, ferns, fishes, lesser-known reptiles and amphibians			0.2								0.2
		Activity 3: Monitoring of wild dog and understand its dietary pattern					0.3						0.3
	Maintain ecosystem diversity and habitats contiguity	Activity 1: Identify and map the suitable habitat of red panda and musk deer		0.36			0.2						0.56
		Activity 2: Understanding grazing impacts on different ecological zone						0.2					0.2

		Activity 3: Photographic evidences of key sites in different seasons of the year	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.3
		Total	0.03	0.39	0.23	0.33	0.53	0.23	0.03	0.03	0.03	0.03	1.86

Programme 2. Wildlife habitat enrichment and species resilience in Biological Corridor 08

Objectives	Strategies	Actions	Annual Budget (Nu. in Million)										
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
Objective 02: To enhance habitat and species resilience in BC 08	Enhance adequate availability of minerals and water for mammals	Activity 1: Map the waterholes, saltlicks and flagship species hotspots	0.1	0.1	0.1								0.3
		Activity 2: Restore degraded waterholes and saltlicks			0.4					0.4			0.8
	Enhance adequate availability of food and cover for wild animals	Activity 1: Inventory degraded forest land and map		0.05				0.05					0.1
		Activity 2: Uproot exotic plant species and replace with native palatable plant species		0.1			0.1				0.1		0.3
		Activity 3: Carryout habitat enrichment through plantation		0.3				0.2					0.5

		Activity 4: Sanitary felling of trees and cleaning of forests to improve the wildlife habitats	0.1						0.1				0.2
	Enhance key stone / flagship species resilience enhanced	Activity 1: Identify and demarcate critical conservation areas		0.1					0.1				0.2
		Activity 2: Surveillance and management of wildlife diseases		0.1			0.1			0.1			0.3
		Activity 3: Conduct periodic anti-poaching patrol in suspected or prone area for hunting	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1
		Total	0.3	0.85	0.6	0.1	0.3	0.35	0.3	0.6	0.2	0.1	3.7
Programme 3: Intertwining climate smart adaptations and ensuring species persistence													
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 03: To weave climate smart adaptations and ensure species persistence in	Establish natural capital accounting system for major ecosystems	Activity 1: Feasibility study on payment for environment services					0.2						0.2
		Activity 2: Carry out valuation of wetland ecosystems						0.2					0.2

BC 08		Activity 3: Carry out valuation of forest ecosystem services						0.2					0.2
	Enhance conservation and management of wetlands	Activity 1: Assess climate vulnerable landscape and responding terrestrial and aquatic species		0.2									0.2
		Activity 2: Intervention in management of drying water sources			0.1				0.2			0.2	0.5
		Total	0	0.2	0.1	0	0.2	0.4	0.2	0	0	0.2	1.3

Programme 4: Empowering local people to ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water

Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objectives 04: To ensure sustainable utilization of forest resources - timber, nwfps, stones sand and water	Sustainable management and utilization of timber	Activity 1: Resource allocation from Local Forest Management Area, FMUs and CFs	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5
		Activity 2: Review of FMU plans of Chendebji FMU				0.5							0.5
	Technology on sustainable resource management and utilization of	Activity 1: Conduct training on efficient use of timber for wood-based industries		0.2				0.2					0.4

	improved alternative energy	Activity 2: Support alternative energy use for cooking pots to the schools and monasteries		0.4			0.3			0.2			0.9
	Community participation in sustainable forest resource management and conservation	Activity 1: Revision of old CF plans		0.05		0.1			0.1				0.25
	Reduce Incidences of forest fire reduced	Activity 1: Strengthen existing Forest Fire Management Committee (Procurement of forest fire equipment)			0.2				0.2				0.4
		Activity 2: Identify and map forest fire prone zone and develop forest fire line.			0.05			0.05			0.05		0.15
		Activity 3: Advocacy on forest fire prevention and management.		0.03		0.03			0.03			0.03	0.12
		Total	0.05	0.73	0.3	0.68	0.35	0.3	0.38	0.25	0.1	0.08	3.22

Programme 05: Ensuring harmonious coexistence of wildlife and people through alternative livelihood supports

Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	

Objective 05: To alleviate socio-economic well-being of the communities in and around BC 08	Enhance socio-economic well-being of communities through integrated development programs and management of forest resources	Activity 1: Explore and conduct NWFP product diversification training		0.15					0.1				0.25
		Activity 2: Procure and supply of NWFPs processing equipment			0.65				0.7				1.35
		Activity 3: Support community in NWFPs product marketing			0.1				0.15				0.25
		Activity 4: Support and encourage community on agriculture and livestock intensification program to mitigate HWC		0.35	0.3	0.3	0.2	0.3	0.4	0.3	0.3	0.3	2.75
		Activity 5: Review ICDP activities and wildlife management interventions		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.45
	Enhance community-based ecotourism and product diversification	Activity 1: Establish short walking and biking trails Chendibji-Drenshing			0.9	2.5							3.4
		Activity 2: Establish community based sustainable Agro/pastoral tourism		0.2				0.3					0.5
	Enhance HWC mitigation measures	Activity 1: Update human wildlife conflict hotspots map			0.1				0.15				0.25

		Activity 2: Support on cost effective crop protection measures to avoid accidental killing of significant conservation species (tiger) in the process of lethal retaliatory action by farmers			0.4	0.3	0.4	0.5	0.5	0.4	0.3	0.3	3.1
		Activity 3: Explore and implement cost effective HWC mitigation measures		0.3		0.4		0.5		0.4	0.3		1.9
		Activity 4: Explore and institutionalize insurance scheme for livestock and crop loss		0.5	0.4	0.3				0.4			1.6
		Total	0	1.55	2.9	3.85	0.65	1.65	2.05	1.55	0.95	0.65	15.8
Programme 6: Enhancing institutional capacity for effective service delivery													
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 06: To enhance institutional capacity to deliver effective service to the local people living in an	Strengthen protected Area (BC 08) management	Activity 1: Ecological and social survey for next BC management plan										1	1
		Activity 2: Construct office in Nubi Gewog			2.5								2.5
		Activity 3: Procure furniture for new office				0.4							0.4

around BC 08		Activity 4: Procure laptops, printers and photocopiers				0.3		0.1			0.1		0.5
		Activity 5: Assess BC management effectiveness using Bhutan METT+					0.05					0.05	0.1
	Enhance forest protection and enforcement	Activity 1: Procure field equipment (GPS, binoculars, audio visuals)					0.2			0.2			0.4
		Activity 2: Commission and implement SMART real-time connect		0.5		0.5			0.5			0.5	2
		Activity 3: Conduct training on anti-poaching patrol techniques		0.1				0.1					0.2
		Activity 4: Establish intelligence network between various law enforcement agencies		0.1				0.2					0.3
	Enhance professional capacity of staff	Activity 1: Attend training on carbon stock assessment			0.2					0.2			0.4
		Activity 2: Support community NWFP group member on capacity building		0.3				0.5					0.8
		Activity 3: Training on wildlife management and statistical analysis		0.5				0.6					1.1

		Activity 4: Capacity building for Biological Corridor 08staffs and community on PA landscape management		0.5			0.4				0.4		1.3
		Activity 5: Study tour for field staff on wildlife management		0.2		0.4			0.6		0.4		1.6
		Activity 6: Capacity building for staff on wildlife study designing and methodology				0.4				0.4			0.8
		Activity 7: Capacity building for staff on wildlife monitoring techniques			0.3			0.3			0.3		0.9
		Activity 8: Capacity building for staff on PAs management and conservation leadership	0.15						0.2				0.35
		Activity 9: Capacity building for staff on writing grant/project proposals and project		0.1					0.1				0.2
		Total	0.15	2.3	3	2	0.65	1.8	1.4	0.8	1.2	1.55	14.85

Programme 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management													
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	

Objective 07: To strengthen environment education and interpretation on biodiversity conservation and waste management	Strengthen conservation education/awareness through conservation arts and specimens	Activity 1: Observe international/national days related to wildlife and conservation programs		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
		Activity 2: Procure audio-visual equipment (Video camera and sound recorder) and subsequent accessories	0.3			0.2				0.3			0.8
		Activity 3: Create awareness or educate target community on conservation and protection regime of significant species	0.1		0.1		0.1		0.1		0.1		0.5
		Activity 4: Develop signboards/signages in the BC					0.1				0.1		0.2
		Activity 5: Support nature club programs in schools and monasteries	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0.1	0.2	0.3	2
		Activity 6: Form and conduct short trainings for birding and botany for citizen scientist and division staffs		0.15	0.15				0.15	0.15			0.6
	Strengthen waste management activities in the forest areas	Activity 1: Conduct awareness campaign on waste management			0.1			0.1				0.1	0.3
		Activity 2: Carry out cleaning campaign		0.05			0.05				0.05		0.15

		Total	0.6	0.5	0.55	0.5	0.65	0.4	0.55	0.65	0.55	0.5	5.45

Programme 8: Strengthening Institutional Linkages and coordination												
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)									Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 08: To strengthen institutional linkages and coordination	Enhance institutional linkage with biodiversity conservation partner agencies	Activity 1: Convene coordination meeting on communication/ Intelligence network between various law enforcement agencies		0.1		0.1		0.1		0.1		0.1	0.5
		Activity 2: Conduct joint patrol across the BC conservation landscape in high poaching areas		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.8
		Activity 3: Conduct land inspection and submit report to the concerned Dzongkhag Land Registrar related to Forestry clearance		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
	Ensure systematic monitoring and evaluation of implemented activities	Activity 1: Carryout mid-term review of BC 08 management plan					0.1						0.1
		Activity 2: Carryout mid-term review of CF management plan	0.1	0.1		0.1		0.2		0.1			0.6

		Activity 3: Monitor CF and NWFPs governance (field and record keeping)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2
		Activity 4: Carryout monitoring and evaluation of plantation		0.1			0.2			0.2		0.2	0.7
		Activity 5: Carryout monitoring and evaluation of wood-based industries		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.45
		Activity 6: Monitor established HWC mitigation measures (Solar electric fence, etc)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1
		Total	0.4	0.95	0.65	0.85	0.95	0.95	0.65	1.05	0.65	0.95	8.05

5.1.2 Implementation schedule and Budget outlay against activities of BC 08 under Wangdue Forest Division

Table 18: Implementation schedule and Budget outlay against activity for Wangdue Division

Programme 1: Better understanding the landscape and species abundance in BC 08												
Objectives	**Strategies**	**Actions**	**Budget in Nu. (Million)**									Total (Nu)
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 01: To maintain viable population of flora and fauna in BC 08	Enhance knowledge on floral and faunal diversity	Activity 1: Monitoring of tiger to understand the population prey-predator dynamics					0.6						0.6
		Activity 2 Documentation on orchid diversity, grass, ferns, fishes, lesser-known reptiles and amphibians		0.25									0.25
	Maintain ecosystem diversity and habitats contiguity	Activity 1: Identify and map the suitable habitat of red panda and musk deer				0.3							0.3
		Activity 2: Understanding grazing impacts on different ecological zone						0.4					0.4

		Activity 3: Photographic evidences of key sites in different seasons of the year	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.3
		Total	0.03	0.28	0.03	0.33	0.63	0.43	0.03	0.03	0.03	0.03	1.85

Programme 2. Wildlife habitat enrichment and species resilience in Biological Corridor 08

Objectives	**Strategies**	**Action**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 02: To enhance habitat and species resilience in BC 08	Enhance adequate availability of minerals and water for mammals	Activity 1: Map the waterholes, saltlicks and flagship species hotspots		0.1	0.1	0.1							0.3
		Activity 2: Restore degraded waterholes and saltlicks			0.5			0.5		0.5			1.5
	Enhance adequate availability of food and cover for wild animals	Activity 1: Inventory degraded forest land and map			0.1								0.1
		Activity 2: Uproot exotic plant species and replace with native palatable plant species		0.3			0.2				0.2		0.7
		Activity 3: Carryout habitat enrichment through plantation			0.3			0.3					0.6

		Activity 4: Sanitary felling of trees and cleaning of forests to improve the wildlife habitats		0.1					0.1				0.2
	Enhance key stone / flagship species resilience enhanced	Activity 1: Identify and demarcate critical conservation areas			0.3					0.1			0.4
		Activity 2: Surveillance and management of wildlife diseases			0.1			0.1			0.1		0.3
		Activity 3: Conduct periodic anti-poaching patrol in suspected or prone area for hunting	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3
		Total	0.3	0.8	1.7	0.4	0.5	1.2	0.4	0.9	0.6	0.3	7.1
Programme 3: Intertwining climate smart adaptations and ensuring species persistence													
Objective	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 03: To weave climate smart adaptations and ensure species persistence in	Establish natural capital accounting system for major ecosystems	Activity 1: Feasibility study on payment for environment services					0.3						0.3
		Activity 2: Carry out valuation of wetland ecosystems						0.3					0.3

BC 08		Activity 3: Carry out valuation of forest ecosystem services						0.4					0.4
	Enhance conservation and management of wetlands	Activity 1: Assess climate vulnerable landscape and responding terrestrial and aquatic species			0.4								0.4
		Activity 2: Intervention in management of drying water sources			0.2				0.3			0.1	0.6
		Total	0	0	0.6	0	0.3	0.7	0.3	0	0	0.1	2

Programme 4: Empowering local people to ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water

Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objectives 04: To ensure sustainable utilization of forest resources - timber, NWFPS, stones sand and water	Sustainable management and utilization of timber	Activity 1: Resource allocation from Local Forest Management Area, FMUs and CFs	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5
		Activity 2: Review of FMU plans of Gogona					0.5						0.5
	Technology on sustainable resource management and utilization of	Activity 1: Conduct training on efficient use of timber by wood-based industries			0.3				0.4				0.7

	improved alternative energy	Activity 2: Support alternative energy use for cooking and heating to reduce fuel wood			0.5				0.3				0.8
	Community participation in sustainable forest resource management and conservation	Activity 1: Revision of old CF plans			0.1		0.1	0.1		0.1			0.4
		Activity 2: Promote cultivation of in private land wherever feasible		0.3	0.3								0.6
	Reduce Incidences of forest fire reduced	Activity 1: Strengthen existing Forest Fire Management Committee (Procurement of forest fire equipment)			0.2				0.2				0.4
		Activity 2: Identify and map forest fire prone zone and develop forest fire line.			0.3				0.3				0.6
		Activity 3: Advocacy on forest fire prevention and management.		0.03		0.03			0.03			0.03	0.12
		Total	0.05	0.38	1.75	0.08	0.65	0.15	1.28	0.15	0.05	0.08	4.62

Programme 05: Ensuring harmonious coexistence of wildlife and people through alternative livelihood supports												
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	

Objective 05: To alleviate socio-economic well-being of the communities in and around BC 08	Enhance socio-economic well-being of communities through integrated development programs and management of forest resources	Activity 1: Explore and conduct NWFP product diversification training			0.2				0.2				0.4
		Activity 2: Procure and supply of NWFPs processing equipment			0.7			0.7			0.7		2.1
		Activity 3: Support community in NWFPs product marketing				0.1						0.3	0.4
		Activity 4: Support and encourage community on agriculture and livestock intensification program to mitigate HWC			0.3	0.3	0.5	0.3	0.5	0.3	0.5	0.3	3
		Activity 5: Review ICDP activities and wildlife management interventions			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.4
	Enhance community-based ecotourism and product diversification	Activity 1: Establish community based sustainable Agro/pastoral tourism			0.2			0.3					0.5

		Activity 2: Capacity building for BC staffs and community on nature-based tourism governance			1				1				2
	Enhance HWC mitigation measures	Activity 1: Update human wildlife conflict hotspot map				0.2				0.2			0.4
		Activity 2: Support on cost effective crop protection measures to avoid accidental killing of significant conservation species (tiger) in the process of lethal retaliatory action by farmers			0.5	0.7	0.5	0.3	0.3	0.4			2.3
		Activity 3: Support the community-based insurance scheme to mitigate HWC		0.1		0.1			0.2		0.1		0.5
		Activity 4: Explore and implement cost effective HWC mitigation measures			0.3	0.2	0.3	0.3	0.3		0.2		1.6
		Total	0	0.1	3.25	1.65	1.35	1.95	2.55	0.55	1.55	0.65	13.6
Programme 6: Enhancing institutional capacity for effective service delivery													

Objectives	Strategies	Actions	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 06: To enhance institutional capacity to deliver effective service to the local people living in an around BC 08	Strengthen protected Area (BC 08) management	Activity 1: Ecological and social survey for next BC management plan										1.5	1.5
		Activity 2: Assess BC management effectiveness using METT+					0.05					0.05	0.1
		Activity 3: Construct office at Kazhi			2.5								2.5
		Activity 4: Procure furniture for new office			0.3								0.3
		Activity 5: Procure laptops, printers and photocopiers			0.3			0.1			0.1		0.5
	Enhance forest protection and enforcement	Activity 1: Procure field equipment (drone, GPS, binoculars, acoustic equipment)			0.2				0.2				0.4
		Activity 2: Commission and implement SMART real-time connect		0.5		0.5			0.5			0.5	2

		Activity 3: Conduct training on anti-poaching patrol techniques		0.1				0.1					0.2
		Activity 4: Establish intelligence network between various law enforcement agencies		0.1				0.2					0.3
	Enhance professional capacity of staff	Activity 1: Attend training on carbon stock assessment			0.2					0.2			0.4
		Activity 2: Support community NWFP group member on capacity building			0.3			0.5					0.8
		Activity 3: Training on wildlife management and statistical analysis		0.5				0.6					1.1
		Activity 4: Capacity building for staffs and community on PA landscape management		0.8			0.5				0.5		1.8
		Activity 5: Study tour for field staff on wildlife management		0.3		1.2			1		0.8		3.3
		Activity 6: Capacity building for staff on wildlife study designing and methodology	0.3			0.2				0.3			0.8

		Activity 7: Capacity building for staff on wildlife monitoring techniques		0.3		0.3		0.2			0.3		1.1
		Activity 8: Capacity building for staff on PAs management and conservation leadership	0.2						0.2				0.4
		Activity 9: Capacity building for staff on writing grant/project proposals and project		0.1					0.1				0.2
		Total	0.5	2.7	3.8	2.2	0.55	1.7	2	0.5	1.7	2.05	17.7
Programme 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management													
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 07: To strengthen environment education and interpretation on	Strengthen conservation education/ awareness through conservation arts and specimens	Activity 1: Observe international/national days related to wildlife and conservation programs		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9

biodiversity conservation and waste management		Activity 2: Procure audio-visual equipment (Video camera and sound recorder) and subsequent accessories	0.3			0.2				0.3			0.8
		Activity 3: Create awareness or educate target community on conservation and protection regime of significant species	0.1		0.1		0.1		0.1		0.1		0.5
		Activity 4: Develop signboards/signages in the BC			0.1			0.1			0.2		0.4
		Activity 5: Support nature club programs in schools and monasteries	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0.1	0.2	0.3	2
		Activity 6: Form and conduct short trainings for birding and botany for citizen scientist and division staffs		0.15	0.15				0.15	0.15			0.6
	Strengthen waste management activities in the forest areas	Activity 1: Conduct awareness campaign on waste management			0.1			0.1				0.1	0.3

		Activity 1: Carry out cleaning campaign		0.1			0.1				0.1		0.3
		Total	0.6	0.55	0.65	0.5	0.6	0.5	0.55	0.65	0.7	0.5	5.8
Programme 8: Strengthening Institutional Linkages and coordination													
Objectives	**Strategies**	**Actions**	Annual Budget (Nu. in Million)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Objective 08: To strengthen institutional linkages and coordination under	Enhance institutional linkage with biodiversity conservation partner agencies	Activity 1: Convene coordination meeting on communication/ Intelligence network between various law enforcement agencies		0.1		0.1		0.1		0.1		0.1	0.5
		Activity 2: Conduct joint patrol across the BC conservation landscape in high poaching areas		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.8

		Activity 3: Conduct land inspection and submit report to the concerned Dzongkhag Land Registrar related to Forestry clearance		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
	Ensure systematic monitoring and evaluation of implemented activities	Activity 1: Carryout mid-term review of BC 08 management plan					0.2						0.2
		Activity 2: Carryout mid-term review of CF management plan		0.1									0.1
		Activity 3: Monitor CF and NWFPs governance (field and record keeping)		0.1		0.1		0.1		0.1		0.1	0.5
		Activity 4: Carryout monitoring and evaluation of plantation			0.05		0.05			0.1		0.05	0.25
		Activity 5: Carryout monitoring and evaluation of wood-based industries		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.45

		Activity 6: Monitor established HWC mitigation measures (Solar electric fence, etc)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
		Total	0	0.75	0.5	0.65	0.7	0.65	0.45	0.75	0.45	0.7	5.6

CHAPTER VI

MONITORING AND EVALUATION

6.1 Monitoring and Evaluation Plan

We established baseline for some activities that had been carried out ever thus far for effective monitoring and evaluation in BC 08.

6.1.1 Monitoring and Evaluation Plan of BC 08 for under Bumthang Forest Division

Table 19: Monitoring and evaluation plan for Wangdue Division

Programme 1:	Better understanding the landscape and species abundance in BC 08																
Objective	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance knowledge on floral and faunal diversity	Activity 1: Monitoring of tiger to understand the population prey-predator dynamics	No. of staff involved in planning, survey, and report in place	Nos	0	2021				1							1	
	Activity 2: Documentation on orchid diversity, grass, ferns, fishes, lesser-known reptiles and amphibians	No. of staff involved in planning, survey, and report in place	Nos	0	2021			1								1	
	Activity 3: Monitoring of wild dog and understand its dietary pattern	No. of staff involved in planning, survey, and report in	Nos	0	2021					1						1	

		place															
Objective 02: To maintain ecosystem diversity and habitats contiguity	Activity 1: Identify and map the suitable habitat of red panda and musk deer	No. of staff involved in planning and survey	Nos	0	2021		1				1					2	
	Activity 2: Understanding grazing impacts on different ecological zone	No. of staff involved in planning and survey	Nos	0	2021						1					1	
	Activity 3: Photographic evidences of key sites in different seasons of the year	No. of staff involved in planning and survey	nos	0	2021	1	1	1	1	1	1	1	1	1	1	10	

Programme 2. Wildlife habitat enrichment and species resilience in Biological Corridor 08																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance adequate availability of minerals and water for	Activity 1: Map the waterholes, saltlicks and flagship species hotspots	No. of staff involved in planning and survey, and report in place	Nos	0	2021	1	1	1								3	

mammals	Activity 2: Restore degraded waterholes and saltlicks	Sites identified and no. of sites for restoration reported	Nos	0	2021			20					20			40	
Objective 02: To facilitate adequate availability of food and cover for wild animals	Activity 1: Inventory and map degraded forest land	No. of staff involved in planning and survey, and report in place	Nos	0	2021		1				1					2	
	Activity 2: Uproot exotic plant species and replace with native palatable plant species	Approval and work order in place; No. of staff involved in monitoring the work	Nos	0	2021		1			1				1		3	
	Activity 3: Carryout habitat enrichment through plantation	No. of labor engaged, and staff involved in monitoring the work	ha	5	2021		2				1.5					4.5	
	Activity 4: Sanitary felling of trees and cleaning of forests to improve the wildlife habitats	Approval and work order in place;	Nos	1	2021	1						1				2	
Objectives 03:					2021												

To enhance key stone / flagship species resilience	Activity 1: Identify and demarcate critical conservation areas	No. of staff involved in planning and survey, and report in place	Nos	0	2021		1					1				2	
	Activity 2: Surveillance and management of wildlife diseases	Initiation meeting with Vet and area identified for dog sterilization campaign	Nos	1	2021		1			1			1			3	
	Activity 3: Conduct periodic anti-poaching patrol in suspected or prone area for hunting	No. of staff involved in antipoaching patrol	Nos	1	2021	2	2	2	2	2	2	2	2	2	2	20	

Programme 3: Intertwining climate smart adaptations and ensuring species persistence																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To establish natural capital accounting system for major	Activity 1: Feasibility study on payment for environment services	No. of staff involved in planning and survey, and report in place	Nos	1	2021					1						1	

ecosystems	Activity 2: Carry out valuation of wetland ecosystems	No. of staff involved in planning and survey, and report in place	Nos	0	2021						1					1	
	Activity 3 Carry out valuation of forest ecosystem services	No. of staff involved in planning and survey, and report in place	Nos	0	2021						1					1	
Objective 02: To enhance conservation and management of wetlands	Activity 1: Assess climate vulnerable landscape and responding terrestrial and aquatic species	No. of staff involved in planning and survey, and report in place	Nos	0	2021		1									1	
	Activity 2: Intervention in management of drying water sources	No. of staff involved in planning and survey, and report in place	Nos	1	2021			1				1			1	3	

Programme 4: Empowering local people to ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water																	
Objectives	Action	Indicator outputs	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To promote sustainable management and utilization of timber	Activity 1: Resource allocation from Local Forest Management Area, FMUs and CFs	No. of Gewogs where staff involved in marking and report in place	Nos Gewogs	3	2021	3	3	3	3	3	3	3	3	3	3	30	

	Activity 2: Review of FMU plans of Chendebji	No. of staff involved in monitoring and report in place	Nos. of FMU	1	2021				1							1	
Objective 02: To develop technology on sustainable resource management and utilization of Non-Wood Forest Products	Activity 1: Conduct training on efficient use of timber by wood-based industries	No. of participants attended the training	Nos	0	2021		15				15					30	
	Activity 2: Support alternative energy use for cooking and heating to reduce fuel wood	Tender call and supply order in place	Nos	0	2021		3			2			1			6	
Objective 03: To increase community participation in sustainable forest resource management and conservation	Activity 1: Revision of old CF plans	No. of community participants attended the meeting	Nos	2	2021		1		2			2				5	
Objective 04: To reduce incidences of forest fire	Activity 1: Strengthen existing Forest Fire Management Committee (Procurement of forest fire equipment)	No. of households involved in the meeting	Nos	12 Chiwogs	2021			1				1				2	

	Activity 2: Identify and map forest fire prone zone and develop forest fire line.	No. of gewogs/community and staff involved in the meeting and report in place	Gewogs	0	2021			2			2			2		6	
	Activity 3: Advocacy on forest fire prevention and management.	Work order in place for media agency	Nos	0	2021		1		1			1			1	4	

Programme 05: Ensuring harmonious coexistence of wildlife and people through alternative livelihood supports																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance socio-economic well-being of communities through integrated development programs and management of forest resources	Activity 1: Explore and conduct NWFP product diversification training	No. of staff involved in the planning and survey	Nos	0	2021		1					1				2	
	Activity 2: Procure and supply of NWFPs processing equipment	Quotation call and supply order in place	Nos. group	0	2021			1				1				2	
	Activity 3: Support community in NWFPs product marketing	No. of staff involved in NWFPS product marketing and report in place	Nos. group	0	2021			1				1				3	

	Activity 4: Support and encourage community on agriculture and livestock intensification program to mitigate HWC	No. of households involved in planning meeting and report in place	Nos of chiwogs	0	2021		2	2	2	1	1	2	2	2	2	17	
	Activity 5: Review ICDP activities and wildlife management interventions	No. of community participants attended the meeting and report in place	Nos	0	2021		1	1	1	1	1	1	1	1	1	9	
	Activity 1: Establish short walking and biking trails Chendibji-Drenshing	No. of participants involved in planning meeting and report in place	Nos	0	2021			1								1	
	Activity 2: Establish community based sustainable Agro/pastoral tourism	No. of staff and community participants attended the study tour	Nos	0	2021		1				1					2	
Objective 03: To enhance HWC mitigation measures	Activity 1: Update human wildlife conflict hotspot map	No. of community participants and staff involved in the meeting	Nos	0	2021			1				1				2	

	Activity 2: Support on cost effective crop protection measures to avoid accidental killing of significant conservation species (tiger) in the process of lethal retaliatory action by farmers	No. of households involved in planning meeting and report in place	Gowogs	2	2021			1	1	1	1	1	1	1	1	8	
	Activity 3: Explore and implement cost effective HWC mitigation measures	No. of households involved in planning meeting and report in place	Nos Gewogs	2	2021		1		1		1		1	1		5	
	Activity 4: Support the community-based insurance scheme to mitigate HWC	No. of households involved in planning meeting and report in place	Nos Gewogs	2	2021		1	1	1				1			4	

Programme 6: Enhancing institutional capacity for effective service delivery																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Output 01: To enhance or strengthen BC management	Activity 1: Ecological and social survey for next BC management plan	No. of staff involved in planning, survey and plan writing	Nos	1	2021										1	1	

	Activity 2: Assess BC management effectiveness using Bhutan METT+	No. of staff participated in the meeting	Nos	1	2021					1					1	2	
	Activity 3: Construct office in Nubi Gewog	Tender call and work order in place	Nos	0	2021			1								1	
	Activity 4: Procure furniture for new office	Quotation call and supply order in place	Nos	0	2021				1							1	
	Activity 5: Procure office equipment - laptops, printer, photocopier	Quotation call and supply order in place	Nos	0	2021				4		2			2		8	
Objective 02: To enhance forest protection and enforcement	Activity 1: Procure field equipment (GPS, binoculars, audio visuals, etc)	Quotation call and supply order in place	Nos	0	2021					1			1			2	
	Activity 2: Commission and implement SMART real-time connect	No.of staff involved and report in place	Nos	0	2021		1		1			1			1	4	
	Activity 3: Conduct training on anti-poaching patrol techniques	No. of staff attended the training and report in place	Nos	0	2021		1				1					2	

	Activity 4: Establish intelligence network between various law enforcement agencies	No. of agencies involved in the intelligence circuit	Nos	0	2021		1				1					2	
Objective 03: To enhance professional capacity	Activity 1: Attend training on carbon stock assessment	No. of staff attended the training and report in place	Nos staff	0	2021			2					2			4	
	Activity 2: Support community NWFP group member on capacity building	No. of community participants attended the training and report in place	Nos	0	2021		10				15					25	
	Activity 3: Training on wildlife management and statistical analysis	No. of staff attended the training and report in place	Nos	0	2021		2				3					5	
	Activity 4: Capacity building for staffs and community on PA landscape management	No. of staff / community participants attended the training and report in place	Nos	0	2021		12			8				8		28	
	Activity 5: Study tour for field staff on wildlife management	No. of staff attended the study tour and	Nos	0	2021		2		5			6		4		17	

		report in place															
	Activity 6: Capacity building for staff on wildlife study designing and methodology	No. of staff attended the study tour and report in place	Nos	0	2021				2				3			8	
	Activity 7: Capacity building for staff on wildlife monitoring techniques	No. of staff attended the study tour and report in place	Nos	0	2021			3			3			3		9	
	Activity 8: Capacity building for staff on PAs management and conservation leadership	No. of staff attended the study tour and report in place	Nos	0	2021	1						1				2	
	Activity 9: Capacity building for staff on writing grant/project proposals and project	No. of staff attended the study tour and report in place	Nos	0	2021		15					10				25	

Programme 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		

Objective 01: Strengthen conservation education/awareness through arts and specimens display	Activity 1: Observe international/national days related to wildlife and conservation programs	No. of events and report in place	Nos	0	2021		5	5	5	5	5	5	5	5	5	45	
	Activity 2: Procure audio-visual equipment (Video camera and sound recorder) and subsequent accessories	Upon quotation call subsequent supply order in place	Nos	0	2021	1			1				1			3	
	Activity 3: Create awareness or educate target community on conservation and protection regime of significant species	No. of community participants and report in place	Nos. chiwogs	10	2021	10		10		10		10		10		50	
	Activity 4: Develop signboards/signage in the BC	Quotation call/work order in place	Nos	0	2021					2				2		4	
	Activity 5: Support nature club programs in schools and monasteries	No. of schools participants and report in place	Nos	5	2021	2	2	1	2	3	2	2	1	2	3	20	
	Activity 6: Form and conduct short trainings for birding and botany for citizen scientist and division staffs	No. of participants attended the training and report in place	Nos. participants	0	2021		10	10				10	10			40	

Objective 02: To strengthen waste management and advocacy on wildlife protection	Activity 1: Conduct awareness campaign on waste management	No. of community participants attended and report in place	Nos chiwogs	0	2021			10			10				10	30	
	Activity 2: Carry out cleaning campaign	No. of staff/community participants involved and report in place	Nos chiwogs	10	2021		10			10				10		30	

Programme 8: Strengthening Institutional Linkages and coordination																	
Objectives	Activity	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance linkage with biodiversity conservation partner agencies	Activity 1: Convene coordination meeting on communication/ Intelligence network between various law enforcement agencies	Frequency and number of people from different agencies attended the meeting and report in place	Nos	0	2021		1		1		1		1		1	5	
	Activity 2: Conduct joint patrol across the BC conservation landscape in high poaching areas	Frequency of joint patrol condcuted and report in place	Nos	0	2021		2	2	2	2	2	2	2	2	2	18	

	Activity 3: Conduct land inspection and submit report to the concerned Dzongkhag Land Registrar related to Forestry clearance	Frequency of land inspection condcuted and report in place	Nos	0	2021		1	1	1	1	1	1	1	1	1	9	
Objective 02: To ensure systematic monitoring and evaluation of activities that are implemented	Activity 1: Carryout mid-term review of BC 08 management plan	No. of staff involved in review and report in lace	Nos	0	2021					1						1	
	Activity 2: Carryout mid-term review of CF management plan	No. of community participants attended the meeting	Nos	5	2021	1	1		1		1		1			5	
	Activity 3:Monitor CF and NWFPs governance (field and record keeping)	No. of staff involved in monitoring and report in place	Nos	5	2021		1	1	1	1	1	1	1	1	1	9	
	Activity 4: Carryout monitoring and evaluation of plantation	Frequency of moitoring condcuted and report in place	Nos	0	2021		1			1			1		1	4	
	Activity 5: Carryout monitoring and evaluation of wood-based industries	Frequency of moitoring condcuted and report in place	Nos	0	2021		2	2	2	2	2	2	2	2	2	18	

	Activity 6: Monitor established HWC mitigation measures (Solar electric fence, etc)	Frequency of moitoring condcuted and report in place	Nos	0	2021		1	1	1	1	1	1	1	1	1	9		

6.1.2 Monitoring and Evaluation Plan of BC 08 for under Wangdue Forest Division

Table 19: Monitoring and evaluation plan for Wangdue Forest Division

Programme 1: Better understanding the landscape and species abundance in BC																		
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance knowledge on floral and faunal diversity	Activity 1: Monitoring of tiger to understand the population prey-predator dynamics	No. of staff involved in planning, survey, and report in place	Nos	0	2021					1						1	
	Activity 2 Documentation on orchid diversity, grass, ferns, fishes, lesser-known reptiles and amphibians	No. of staff involved in planning, survey, and report in place	Nos	0	2021		1									1	

Objective 02: To maintain ecosystem diversity and habitats contiguity	Activity 1: Identify and map the suitable habitat of red panda and musk deer	No. of staff involved in planning and survey	Nos	0	2021				1							1	
	Activity 2: Understanding grazing impacts on different ecological zone	No. of staff involved in planning and survey	nos	0	2021						1					1	
	Activity 3: Photographic evidences of key sites in different seasons of the year	Quotation/ supply order in place	Nos	10	2021	1	1	1	1	1	1	1	1	1	1	10	

Programme 2. Wildlife habitat enrichment and species resilience in Biological Corridor 08

Objectives	Activity	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance adequate availability of minerals and water for mammals	Activity 1: Map the waterholes, saltlicks and flagship species hotspots	No. of staff involved in planning and survey, and report in place	Nos	0	2021		1	1	1							3	
	Activity 2: Restore degraded waterholes and saltlicks	Sites identified and acreage estimated for restoration	Nos	0	2021			1			1		1			3	

Objective 02: To facilitate adequate availability of food and cover for wild animals	Activity 1: Inventory and map degraded forest land	No. of staff involved in planning and survey, and report in place	Nos	0	2021			7								7	
	Activity 2: Uproot exotic plant species and replace with native palatable plant species	Approval and work order in place; No. of staff involved in monitoring the work	Nos	0	2021		2			2				2		6	
	Activity 3: Carryout habitat enrichment through plantation	Approval and work order in place; No. of staff involved in monitoring the work	ha	265	2021			0.5			0.5					1.5	
	Activity 4: Sanitary felling of trees and cleaning of forests to improve the wildlife habitats	Approval and work order in place;	Nos	1	2021		1					1				2	
Objectives 03: To enhance key stone / flagship species resilience	Activity 1: Identify and demarcate critical conservation areas	No. of staff involved in planning and survey, and report in place	Nos	0	2021			1						1		2	
	Activity 2: Surveillance and management of wildlife diseases	Initiation meeting with Vet and area identified for dog sterilization campaign	Nos	0	2021			1			1			1		3	

	Activity 3: Conduct periodic anti-poaching patrol in suspected or prone area for hunting	No. of staff involved in antipoaching patrol	Nos	1	2021	3	3	3	3	3	3	3	3	3	3	30	

Programme 3: Intertwining climate smart adaptations and ensuring species persistence																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To establish natural capital accounting system for major ecosystems	Activity 1: Feasibility study on payment for environment services	No. of staff involved in planning and survey, and report in place	Nos	1	2021					1						1	
	Activity 2: Carry out valuation of wetland ecosystems	No. of staff involved in planning and survey, and report in place	Nos	0	2021						1					1	
	Activity 3 Carry out valuation of forest ecosystem services	No. of staff involved in planning and survey, and report in place	Nos	0	2021						1					1	
Objective 02: To enhance conservation and management of wetlands	Activity 1: Assess climate vulnerable landscape and responding terrestrial and aquatic species	No. of staff involved in planning and survey, and report in place	Nos	0	2021			1								1	

	Activity 2: Intervention in management of drying water sources	No. of staff involved in planning and survey, and report in place	Nos	1	2021			1				1			1	3	

Programme 4: Empowering local people to ensure sustainable utilization of resources – timber, NWFPS, Stone, Sand and Water																	
Objectives	Action	Indicator outputs	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To promote sustainable management and utilization of timber	Activity 1: Resource allocation from Local Forest Management Area, FMUs and CFs	No. of Gewogs where staff involved in marking and report in place	Nos Gewogs	5	2021	5	5	5	5	5	5	5	5	5	5	50	
	Activity 2: Review of FMU plans of Gogona	No. of staff involved in monitoring and report in place	Nos. of FMU	1	2021					1						1	
Output 02: To develop technology on sustainable resource management and utilization of Non Wood Forest Products	Activity 1: Conduct training on efficient use of timber by wood-based industries	No. of participants attended the training	Nos	0	2021			20				30				50	
	Activity 2: Support alternative energy use for cooking and heating to reduce fuel wood	Tender call and supply order in place	Nos	0	2021			3				2				5	

Objective 03: To increase community participation in sustainable forest resource management and conservation	Activity 1: Revision of old CF plans	No. of community participants attended the meeting	Nos	2	2021			1		1	1		1			4	
	Activity 2: Promote cultivation of medicinal plants in private land wherever feasible	No. of community participants attended the meeting	Nos	1	2021		1	1								2	
Objective 04: To reduce incidences of forest fire	Activity 1: Strengthen existing Forest Fire Management Committee (Procurement of forest fire equipment)	No. of households involved in the meeting	Nos	12 Chiwogs	2021			1				1				2	
	Activity 2: Identify and map forest fire prone zone and develop forest fire line.	No. of gewogs/community and staff involved in the meeting and report in place	Gewogs	0	2021				3							3	
	Activity 3: Advocacy on forest fire prevention and management.	Work order in place for media agency	Nos	0	2021		1		1			1			1	3	
Programme 05: Ensuring harmonious coexistence of wildlife and people through alternative livelihood supports																	
Objectives	Actions	Output indicators	Baseline		Annual Plan Targets										Actual target	Remarks	

			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance socio-economic well being of communities through integrated development programs and management of forest resources	Activity 1: Explore and conduct NWFP product diversification training	No. of staff involved in the planning and survey	Nos	0	2021			1				1				2	
	Activity 2: Procure and supply of NWFPs processing equipment	Quotation call and supply order in place	Nos. group	0	2021			1			1			1		3	
	Activity 3: Support community in NWFPs product marketing	No. of staff involved in NWFPS product marketing and report in place	Nos. group	0	2021				1						1	2	
	Activity 4: Support and encourage community on agriculture and livestock intensification program to mitigate HWC	No. of households involved in planning meeting and report in place	Nos of chiwogs	0	2021			1	1	1	1	2	1	2	2	11	
	Activity 5: Review ICDP activities and wildlife management interventions	No. of community participants attended the meeting and report in place	Nos	0	2021			1	1	1	1	1	1	1	1	8	

	Activity 1: Establish community based sustainable Agro/pastoral tourism	No. of households involved in planning meeting and report in place	Nos	0	2021			1			1					2	
	Activity 2: Capacity building for BC staffs and community on nature-based tourism governance	No. of staff and community participants attended the study tour	Nos	0	2021			2				2				4	
Objective 03: To enhance HWC mitigation measures	Activity 1: Update human wildlife conflict hotspot map	No. of community participants and staff involved in the meeting	Nos	0	2021			1				1				2	
	Activity 2: Support on cost effective crop protection measures to avoid accidental killing of significant conservation species (tiger) in the process of lethal retaliatory action by farmers	No. of households involved in planning meeting and report in place	Gowogs	0	2021			1	1	1	1	1	1			6	
	Activity 3: Explore and implement cost effective HWC mitigation measures	No. of households involved in planning meeting and report in place	Nos Gewogs	0	2021			1	1	1	1	1		1		6	

	Activity 4: Support the community-based insurance scheme to mitigate HWC	No. of households involved in planning meeting and report in place	Nos Gewogs	2	2021		1		1			1		1		4	
Programme 6: Enhancing institutional capacity for effective service delivery																		
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Output 01: To enhance or strengthen BC management	Activity 1: Ecological and social survey for next BC management plan	No. of staff involved in planning, survey and plan writing	Nos	1	2021										1	1	
	Activity 2: Assess BC management effectiveness using Bhutan METT+	No. of staff participated in the meeting	Nos	1	2021					1					1	2	
	Activity 3: Construct office at Kazhi	Tender call and work order in place	Nos	0	2021		1									1	
	Activity 4: Procure furniture for new office	Quotation call and supply order in place	Nos	0	2021			1								1	
	Activity 5: Procure office equipment - laptops, printer,	Quotation call and supply order in place	Nos	0	2021			4			2			2		8	

	photocopier																
Objective 02: To enhance forest protection and enforcement	Activity 1: Procure field equipment (GPS, binoculars, audio visuals, etc)	Quotation call and supply order in place	Nos	0	2021			1				1	1			2	
	Activity 2: Commission and implement SMART real-time connect	Quotation call and supply order in place	Nos	0	2021		1		1			1			1	4	
	Activity 3: Conduct training on anti-poaching patrol techniques	No. of staff attended the training and report in place	Nos	0	2021		1				1					2	
	Activity 4: Establish intelligence network between various law enforcement agencies	No. of agencies involved in the intelligence circuit	Nos	0	2021		1				1					2	
Objective 03: To enhance professional capacity	Activity 1: Attend training on carbon stock assessment	No. of staff attended the training and report in place	Nos staff	0	2021			2					2			4	

	Activity 2: Support community NWFP group member on capacity building	No. of community participants attended the training and report in place	Nos	0	2021			10			15					25	
	Activity 3: Training on wildlife management and statistical analysis	No. of staff attended the training and report in place	Nos	0	2021		2				3					5	
	Activity 4: Capacity building for staffs and community on PA landscape management	No. of staff / community participants attended the training and report in place	Nos	0	2021		12			8				8		28	
	Activity 5: Study tour for field staff on wildlife management	No. of staff attended the study tour and report in place	Nos	0	2021		2		10			8		5		25	
	Activity 6: Capacity building for staff on wildlife study designing and methodology	No. of staff attended the study tour and report in place	Nos	0	2021	3			2				3			8	
	Activity 7: Capacity building for staff on wildlife monitoring techniques	No. of staff attended the study tour and report in place	Nos	0	2021		3		3		2			3		11	

	Activity 8: Capacity building for staff on PAs management and conservation leadership	No. of staff attended the study tour and report in place	Nos	0	2021	2						2				4	
	Activity 9: Capacity building for staff on writing grant/project proposals and project	No. of staff attended the study tour and report in place	Nos	0	2021		20					10				30	

Programme 7: Strengthening Environment Education and Interpretation on biodiversity conservation and Waste management																	
Objectives	Actions	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: Strengthen conservation education/awareness through arts and specimens display	Activity 1: Observe international/national days related to wildlife and conservation programs	No. of events and report in place	Nos	0	2021		5	5	5	5	5	5	5	5	5	45	
	Activity 2: Procure audio-visual equipment (Video camera and sound recorder) and subsequent accessories	Upon quotation call subsequent supply order in place	Nos	0	2021	1			1				1			3	

	Activity 3: Create awareness or educate target community on conservation and protection regime of significant species	No. of community participants and report in place	Nos. chiwogs	10	2021	10		10		10		10		10		50	
	Activity 4: Develop signboards/signage in the BC	Quotation call/work order in place	Nos	0	2021			3			3			3		9	
	Activity 5: Support nature club programs in schools and monasteries	No. of schools participants and report in place	Nos	5	2021	2	2	1	2	3	2	2	1	2	3	20	
	Activity 6: Form and conduct short trainings for birding and botany for citizen scientist and division staffs	No. of participants attended the training and report in place	Nos. participants	0	2021		10	10				10	10			40	
Objective 02: To strengthen waste management and advocacy on wildlife protection	Activity 1: Conduct awareness campaign on waste management (awareness and committee instituted)	No. of community participants attended and report in place	Nos chiwogs	0	2021	10		10			10				10	40	

	Activity 2: Carry out cleaning campaign	No. of staff/community participants involved and report in place	Nos chiwogs	10	2021		12			12				12		36	
Programme 8: Strengthening Institutional Linkages and coordination																	
Objectives	Activity	Output indicators	Baseline			Annual Plan Targets										Actual target	Remarks
			Unit	Qnty	Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
Objective 01: To enhance linkage with biodiversity conservation partner agencies	Activity 1: Convene coordination meeting on communication/ Intelligence network between various law enforcement agencies	Frequency and number of people from different agencies attended the meeting and report in place	Nos	0	2021		1		1		1		1		1	5	
	Activity 2: Conduct joint patrol across the BC conservation landscape in high poaching areas	Frequency of joint patrol condcuted and report in place	Nos	0	2021		2	2	2	2	2	2	2	2	2	18	

	Activity 3: Conduct land inspection and submit report to the concerned Dzongkhag Land Registrar related to Forestry clearance	Frequency of land inspection condcuted and report in place	Nos	0	2021		1	1	1	1	1	1	1	1	1	9	
Objective 02: To ensure systematic monitoring and evaluation of activities that are implemented	Activity 1: Carryout mid-term review of BC 08 management plan	No. of staff involved in review and report in lace	Nos	0	2021					1						1	
	Activity 2: Carryout mid-term review of CF management plan	No. of community participants attended the meeting	Nos	9	2021			1								1	
	Activity 3: CF and NWFPs governance (field and record keeping)	No. of staff involved in monitoring and report in place	Nos	9	2021		1	1	1	1	1	1	1	1	1	9	
	Activity 4: Carryout monitoring and evaluation of plantation	Frequency of moitoring condcuted and report in place	Nos	0	2021			1		1			1		1	4	
	Activity 5: Carryout monitoring and evaluation of wood-based industries	Frequency of moitoring condcuted and report in place	Nos	0	2021		2	2	2	2	2	2	2	2	2	18	

	Activity 6: Monitor established HWC mitigation measures (Solar electric fence, etc)	Frequency of moitoring condcuted and report in place	Nos	0	2021		1	1	1	1	1	1	1	1	1	9	

References

Beier, P., and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12:1241-1252.

DoFPS, 2018. Twelfth Five Year Plan 2018-2023. Department of Forests and Park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan, Tashichhodzong, Thimphu.

DoFPS, 2018. Forestry Facts, Figures and Trends. Department of Forests and Park Services,

Ministry of Agriculture and Forests, Royal Government of Bhutan, Tashichhodzong, Thimphu.

DoFPS, 2017. Forest and Nature Conservation Rules and Regulations. Department of Forests and Park Services. Ministry of Agriculture and Forests, Royal Government of Bhutan, Tashichhodzong, Thimphu.

NCD, 2018. Biological Corridors Regulations of Bhutan. Nature Conservation Division, Department of Forests and Park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan, Thimphu.

NSB, 2018: Statistical year Book of Bhutan. National Statistic Bureau, Royal Government of Bhutan, Thimphu.

RGoB, 2007. The Land Act of Bhutan. Royal Government of Bhutan, Thimphu.

RGoB 1995. Forest and Nature Conservation Act. Department of Forests Services. Ministry of Agriculture, Royal Government of Bhutan, Thimphu.

Sperienburg, P., and Namgyel, U. 2000. Socio-economic Survey Report for Jigme Singye Wangchuck National Report. Department of Forest, Ministry of Agriculture, Royal Government of Bhutan, Thimphu.

Wildlife Conservation Division (then Nature Conservation Division), DoFPS, RGoB 2010. Regulatory Framework for Biological Corridors in Bhutan, Part III: Policy Recommendations and Framework for Developing Corridor Management Plans. Report submitted to WWF-Bhutan and Wildlife Conservation Division, Department of Forests and Park Services, Royal Government of Bhutan, Thimphu.

UNDP Bhutan, 2016. Assessment of Biodiversity and Socio-economic Conditions in the Targeted Protected Areas and Biological. Enhancing Sustainability and Climate Resilience of Forest and Agriculture Landscape and Community Livelihoods in Bhutan. United nationa Development Program-Bhutan. Thimphu.