

CONSERVATION
MANAGEMENT PLAN
SAKTENG WILDLIFE SANCTUARY (2017-2027)

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ENDORSEMENT AND APPROVAL OF THE ROYAL GOVERNMENT OF BHUTAN

Conservation Management Plan of Sakteng Wildlife Sanctuary (2017-2027)

"In accordance to the provision under Section 21 subsection (b) of the Forest and Nature Conservation Act of Bhutan, 1995"

Submitted for Approval:



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Recommended for Approval:



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Department of Forests & Park Services

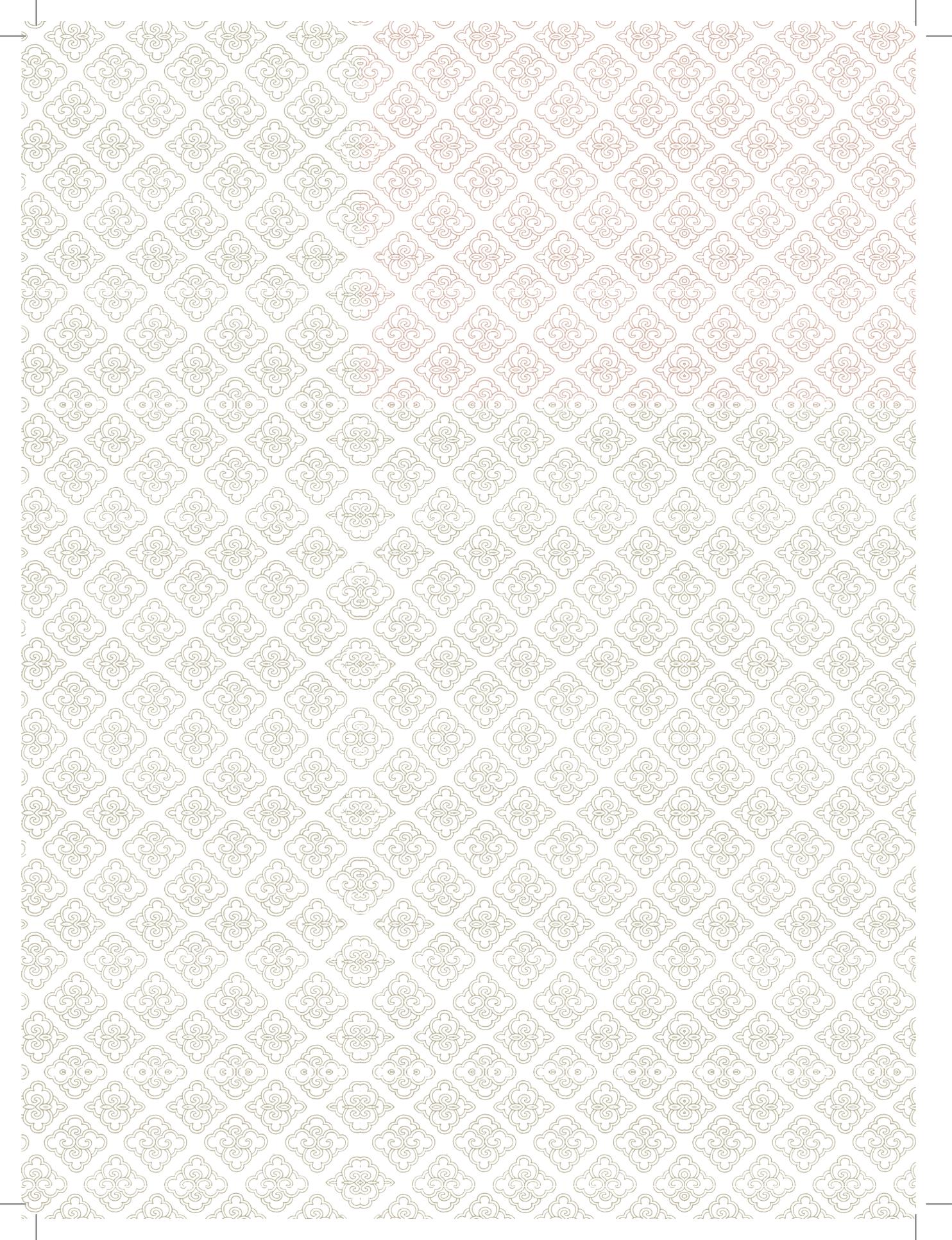


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Approved by:



His Excellency the Minister
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PREFACE

Today, Bhutan is recognized for its sound and strong conservation policies all over the world despite its small size. Under the dynamic leadership of Wangchuck dynasty, in the early 1960's, protected area system was established to sustain, conserve and promote naturally gifted rich biodiversity of the country. Though concept of protected area system originated from developed countries, Bhutan has adopted its unique conservation approach by following the principle of "middle path" which focus on integrated conservation and sustainable development approach. Being a Buddhist nation and with people's dependency on natural resources for their livelihood for eons, it has helped Bhutanese to be an environmental friendly society even in the era of rapid globalization. To continue with such a harmonious co-existence between the people and nature, the legal framework set in the Forest and Nature Conservation Act of Bhutan, 1995 allows local people to reside inside the protected areas unlike in other parts of the world.

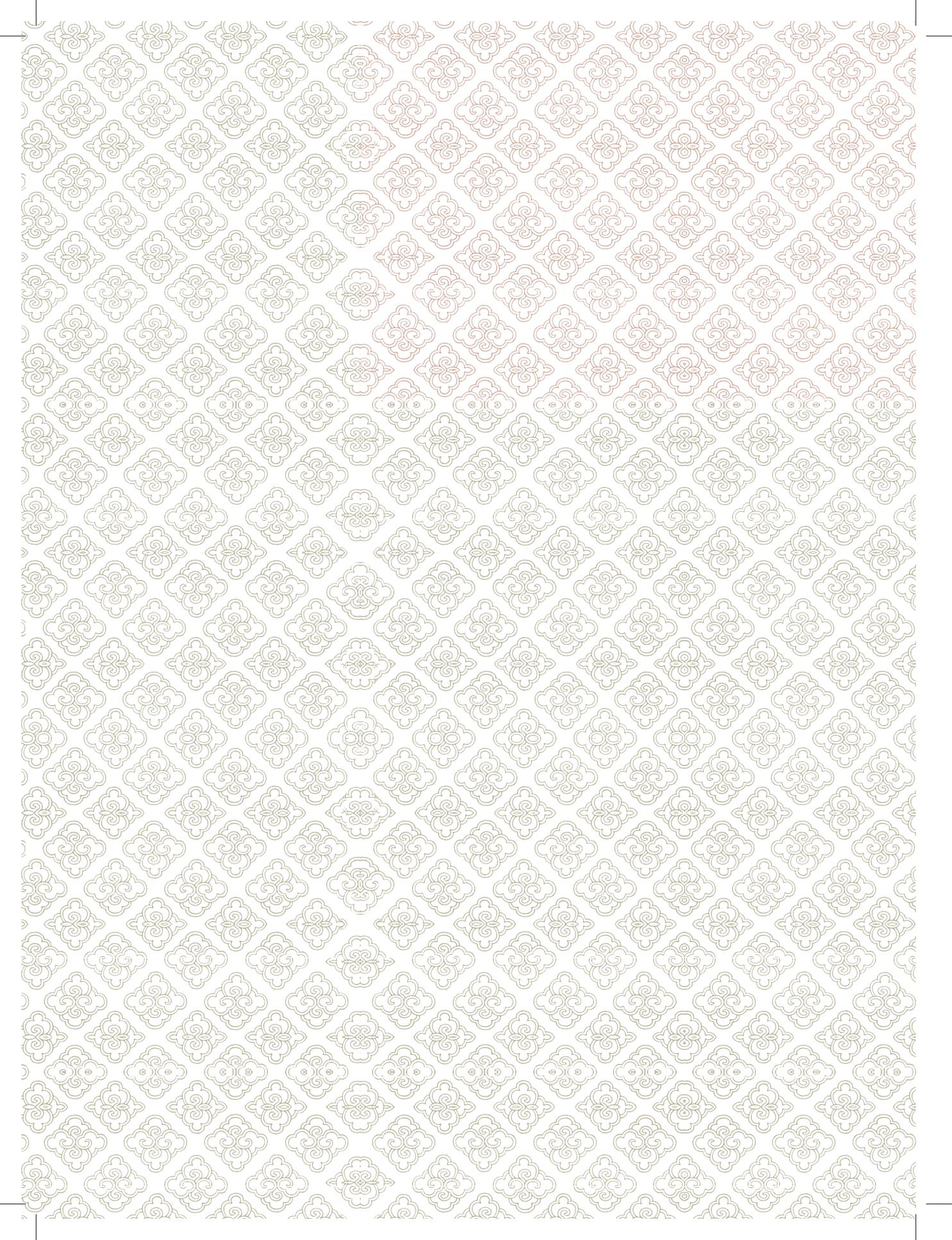
As of now, the country has 71% land under forest cover which harbours healthy diversity of flora and fauna. Several species belong to the globally critically endangered schedule. However, in pursuit of meeting the forest resources needs of both rural and urban inhabitants, the Department of Forests and Park Services is confronted with many challenges. The challenges and threat of the sustainability of forest resources and habitat management are inescapable, given the current rate of urbanization, population growth and other necessary developmental activities. Therefore, it has become critical to draw a conservation management plan for every protected area to implement sound habitat management and meanwhile contribute to the sustainable development of the nation.

Therefore, I would like to congratulate and extend my deepest appreciation to Sakteng Wildlife Sanctuary staff for coming up with new conservation management plan which will be a guiding document of the agency for coming years. Further, I wish SWS success in effective implementation for ensuring an environmentally sustainable future and maintaining 60% forest for perpetuity.

TASHI DELEK!



(Yeshey Dorji)
MINISTER



FORWARD

Bhutan has 51.44% of land as protected areas giving an opportunity to preserve the largely intact biodiversity. There are 10 protected areas in the country which represents intricate and unique ecological processes having the potential capacity to provide human needs at the same time protecting the environmental values. The protected area plays a greater role in the implementation of several International Conventions like the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) and Convention on Biological Diversity (CBD).

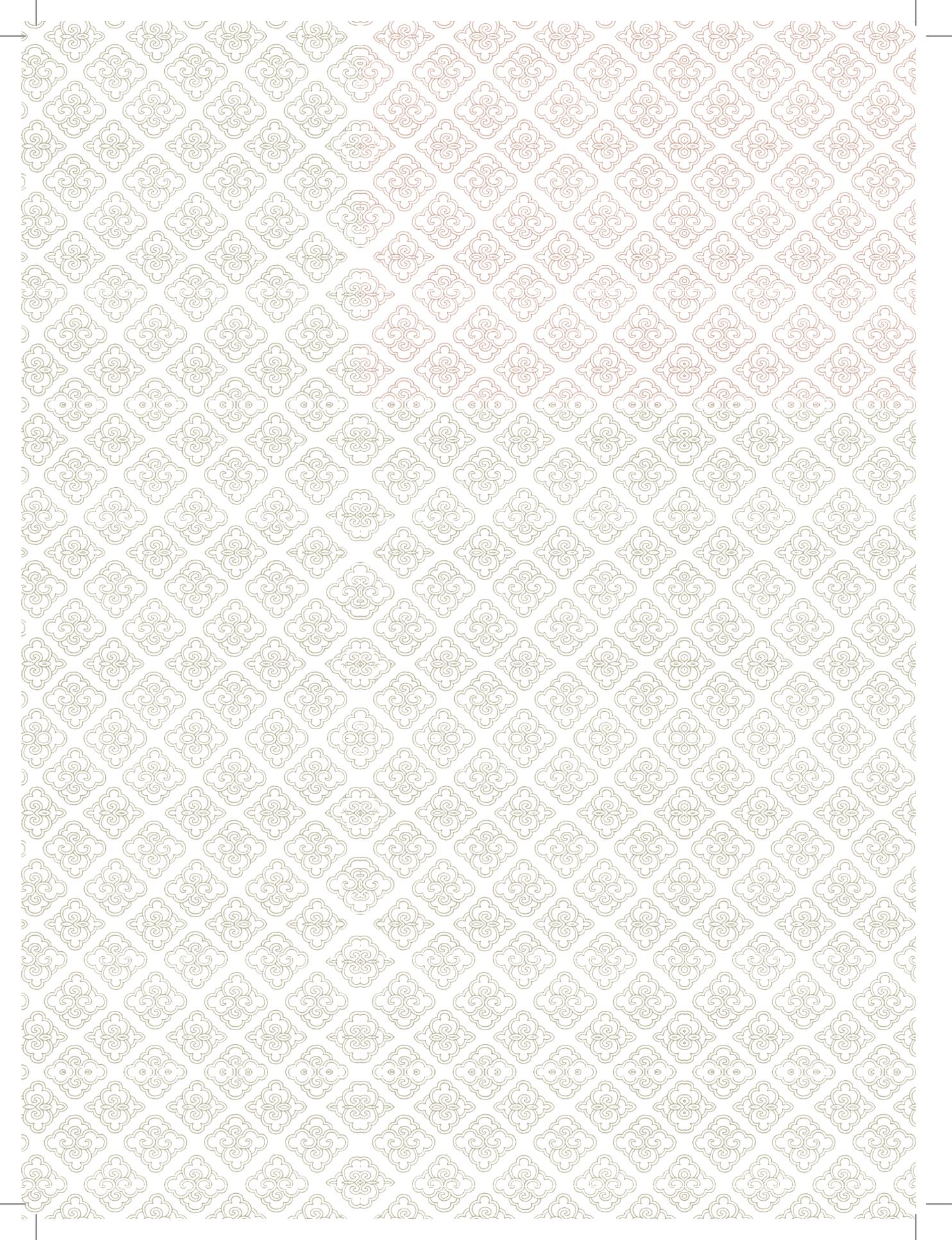
Understanding the significance of protected areas and future needs, forests should be managed in such a way that helps to uphold their multiple values. For this, the conservation management plan is crucial as a tool to ensure the overall management of the protected area. This includes the management of wildlife habitat, natural resources and the service delivery to the community residing inside and outside the park. Recently, Bhutan Management Effectiveness Tracking Tool Plus (METT+) 2016 has come up as a new approach to evaluate the management effectiveness of protected areas. This new approach will help the managers to monitor and design the specific management programs to achieve its objective.

Therefore, I am glad that Sakteng Wildlife Sanctuary has successfully come up with the publication of their second Conservation Management Plan. I am confident that the plan will serve as a tool to guide the implementation of the strategic action through the non-negotiable principles and multi-disciplinary approach. I am also hopeful that this plan will address the protection of wildlife and rare species of plants following the best management practices. At the same time SWS will cater to community needs by integrating the ecological, social and economic aspects.

TASHI DELEK!



(Rinzin Dorji)
SECRETARY



FORWARD

Forests in Bhutan play a vital role in the socio economic development of the country besides providing regulatory services such as watershed protection, prevention of soil erosion and climate mitigation. Further, deforestation and forest degradation is acknowledged as one of the main causes of climate change acceleration.

Recognizing this urgency and also to ensure the constitutional mandate of 60% forest cover for perpetuity, the Department of Forests and Park Services have declared large area of forest landscapes as protected areas. Sakteng Wildlife Sanctuary with high ecological diversity and unique cultural heritage of the *Brokpa* community is a very important protected area not only for the conservation of the floral and faunal species but also for the promotion of the unique cultural heritage of the *Brokpa* community. For successful management of such ecological landscapes, a dynamic and robust management plan developed through adequate understanding of field situation is of paramount importance.

This plan provides concise information on the floral and faunal diversity of SWS, the issues and challenges faced by the management team and most importantly the management prescriptions recommended to solve the emerging issues in the Sanctuary. The conservation management plan will not only help to mainstream the conservation effort but also act as a guiding force towards achieving the goals of the department as a whole.

For the commendable effort put in to produce this extremely important document, I would like to congratulate and extend my warmest appreciation to the staff of Sakteng Wildlife Sanctuary and other stakeholders involved. I am hopeful that this plan will guide SWS to secure species persistence and landscape conservation through promoting socio-economic condition of the local community.

TASHI DELEK!



(Phento Tshering)

DIRECTOR

List of Abbreviation

B2C2	Bhutan Biological Conservation Complex
BHU	Basic Health Unit
BTFEC	Bhutan Trust Fund for Environmental Conservation
DoFPS	Department of Forests and Park Services
FNCA	Forest and Nature Conservation Act
GRF	Government Reserved Forest
HH	Household(s)
IFAD	International Fund for Agricultural Development
IUCN	International Union for Conservation of Nature
IVI	Important value index
MAGIP	Marketing Access and Growth Intensification Project
METT	Management Effectiveness Tracking Tool
PA	Protected Area(s)
PRA	Participatory Rural Appraisal
RGoB	Royal Government of Bhutan
sp/spp	Species/Plural of species
SWS	Sakteng Wildlife Sanctuary
WCPA	World Congress on Protected Areas
WWF	World Wildlife Fund
FR	Forest Ranger
FO	Forestry Officer
Fr.	Forester

Glossary of Local Terms

Aum Jomo	Local deity
Brokpa(s)	Local inhabitants of Merak and Sakteng Geog
Chhu/Ri	Stream/river
Dungkhag	Subdivision of district
Dzo	Male crossbreed of Yak & cattle
Dzom	Female crossbreed of Yak & cattle
Dzongkhag	District
Gewog(s)	Cluster of villages under one local administrative unit
Gomchen	Buddhist scholar/monk
Tsamdro:	Pasture land
Yoshu	Fermented cheese
Resoop	Village Forester

TABLE OF CONTENTS

Executive Summary	1
Chapter I: Introduction	5
1.1 Description	6
1.1.1 Global Significance	6
1.1.2 National Significance	6
1.1.3 Local Significance	7
1.2 Biophysical Characteristics	7
1.2.1 Location	7
1.2.2 Climate and Topography	8
1.2.3 Hydrology and Drainage	9
1.2.4 Vegetation Type	10
1.2.5 Floral Diversity	12
1.2.6 Faunal Diversity	13
1.2.6.1 Mammal	13
1.2.6.2 Birds	14
1.2.6.3 Herpetofauna (Reptiles and Amphibians)	14
1.2.6.4 Fish	14
1.2.6.5 Butterflies	15
1.2.6.6 Freshwater Macroinvertebrates	15
1.3 People and Culture	16
1.3.1 Cultural Resources	16
1.3.2 Socioeconomic Situation	17
1.3.3 Local Economy	18
1.3.4 Demography	19
1.4 Service Sectors	20
1.5 Administration	21
1.5.1 Existing Infrastructure	22
1.5.2 Mobility	22
1.6 Synoptic Review of Past Management Plan	22
1.6.1 Infrastructure Development	22
1.6.2 Species Conservation	23
1.6.3 Integrated Conservation and Development Program	23
1.6.4 Livelihood Enhancement	24
1.6.5 Capacity Development	24
1.6.6 Zonation	24

Chapter II: Analysis of Issues and Problems	25
2.1 Resource Use, Poaching and Associated Threats	25
2.1.1 Timber and Firewood Consumption	25
2.1.2 Sand and Stone Consumption	26
2.1.3 Illegal Activities	27
2.1.4 Livestock and Grazing	27
2.1.5 Tsamdro (Pasture land)	28
2.1.6 Livestock Depredation	29
2.1.7 Agriculture and Crop Depredation	30
2.1.8 Livestock Population	31
2.2 Environmental, Biodiversity and Species Conservation threats	32
2.2.1 Habitat Fragmentation	32
2.2.1.1 Road and Hydropower Transmission Line	32
2.2.2 Species	32
2.2.2.1 Poaching of Flora and Fauna	33
Chapter III: Vision and Objectives	35
3.1 Vision	35
3.2 Mission	35
3.3 Goal	35
3.4 Conservation Objectives	35
Chapter IV: Zoning and Objectives	37
4.1 Core Zone	37
4.2 Multiple Use Zone	38
4.3 Buffer Zone	38
4.4 Special Protection Zone	38
Chapter V: The Conservation Management Plan	39
5.1 Guiding Principles for Plan Implementation	39
5.2 Legislation	39
5.3 Management Plan Prescription	40
5.3.1 Insufficient Tsamdro (Pasture land)	40
5.3.1.1 Rationale	40
5.3.1.2 Policy Objectives	40
5.3.1.3 Implementation: Actions and Guidelines	40
5.3.2 Human-Wildlife Conflict – Crop Depredation	41
5.3.2.1 Rationale	41
5.3.2.2 Policy Objectives	41
5.3.2.3 Implementation: Actions and Guidelines	41

5.3.3	Human-Wildlife Conflict – Livestock Depredation	42
	5.3.3.1 Rationale	42
	5.3.3.2 Policy Objectives	43
	5.3.3.3 Implementation: Actions and Guidelines	43
5.3.4	Preservation and Promotion of Culture and Traditions	44
	5.3.4.1 Rationale	44
	5.3.4.2 Policy Objectives	44
	5.3.4.3 Implementation: Actions and Guidelines	45
5.3.5	Meeting Resource Needs Sustainably and Promote Conservation Stewardship	45
	5.3.5.1 Rationale	45
	5.3.5.2 Policy Objectives	46
	5.3.5.3 Implementation: Actions and Guidelines	46
5.3.6	Promote Ecotourism and Recreation	47
	5.3.6.1 Rationale	47
	5.3.6.2 Policy Objectives	48
	5.3.6.3 Implementation: Actions and Guidelines	48
5.3.7	Ensuring Species Persistence	49
	5.3.7.1 Rationale	49
	5.3.7.2 Policy Objectives	49
	5.3.7.3 Implementation: Actions and Guidelines	50
5.3.8	Soil and Water Conservation	51
	5.3.8.1 Rationale	51
	5.3.8.2 Policy Objectives	51
	5.3.8.3 Implementation: Actions and Guidelines	51
5.3.9	Ensuring Climate Resilient Community	52
	5.3.9.1 Rationale	52
	5.3.9.2 Policy Objectives	52
	5.3.9.3 Implementation: Actions and Guidelines	52
5.3.10	Institutional Strengthening and Services Delivery	53
	5.3.10.1 Rationale	53
	5.3.10.2 Policy Objectives	53
	5.3.10.3 Implementation: Actions and Guidelines	53
Chapter VI: Financial Projection		55
Chapter VII: Monitoring and Review		57
Bibliography		58

List of Figures, Tables, and Annexure

Figure 1:	Administrative Map of SWS	7
Figure 2:	Rainfall trend of Sakteng Wildlife Sanctuary (2012-2015)	8
Figure 3:	SWS watershed map	9
Figure 4:	Wealth category (Merak & Sakteng)	17
Figure 5:	Occupational group (Merak & Sakteng)	18
Figure 6:	Different migratory destination	19
Figure 7:	Range Jurisdiction	21
Figure 8:	SWS Organogram	21
Figure 9:	Timber supply trend (2007-2015)	25
Figure 10:	Energy usage in Merak & Sakteng	25
Figure 11:	Firewood supply trend in Merak & Sakteng	26
Figure 12:	Sand & Stone supply trend	26
Figure 13:	Forest offence trend	27
Figure 14:	Average Livestock Population in 2 Gewogs	27
Figure 15:	Average Tsandro area owned	28
Figure 16:	Peoples Response on Sufficiency of Tsamdro	28
Figure 17:	Average no. of livestock loss to wild predators in last 10 years	29
Figure 18:	Common Wild Predator of Livestock	29
Figure 19:	Cereals grown by the community	30
Figure 20:	Major issues/problem with agriculture farming	30
Figure 21:	Crop Depredation, Preferred Crop and Problem Wildlife Species	31
Figure 22:	Livestock Population Trend in Merak & Sakteng	31
Figure 23:	Zonation Map of SWS	37
Table 1:	Family Biotic Index of Macroinvertebrate	15
Table 2:	Cultural calendar of Merak & Sakteng	17
Table 3:	No. of HH (Merak & Sakteng)	19
Table 4:	Service sectors in Merak & Sakteng	20
Table 5:	Firewood Consumption in Schools (Merak & Sakteng)	26
Table 6:	Zone details	38
Table 7:	Abstract of Projected Fund	55
Annexure 1:	Checklist of Plant Species of SWS	59
Annexure 2:	Important Value Index (IVI) of tree species	74
Annexure 3:	Checklist of Rhododendron Species of SWS	77
Annexure 4:	Checklist of Orchid Species of SWS	78
Annexure 5:	Checklist of Mammal Species of SWS	80
Annexure 6:	Checklist of Bird Species of SWS	81
Annexure 7:	Checklist of Butterfly Species of SWS	86
Annexure 8:	Financial Projection for Plan Period (Recurrent)	87
Annexure 9:	Work Plan and Financial Projection for Plan Period (Capital)	88
Annexure 10:	Logical Framework for Monitoring and Evaluation of Plan Program	108

EXECUTIVE SUMMARY

Sakteng Wildlife Sanctuary (SWS) is one of the ten protected areas declared by the Royal Government of Bhutan under the farsighted leadership of His Majesty the fourth Druk Gyalpo Jigme Singye Wangchuck. With an assemblage of rich ecosystem diversity and distinctive culture, it is home to some of the rarest and globally threatened wild flora and fauna. The area is adorned with diverse ecosystem ranging from warm broadleaved forests to alpine meadows. SWS is the only protected area with highest diversity of *Rhododendron* species (41 species) in the country. To protect and conserve this diverse assemblage of biodiversity and unique cultural heritage, the SWS was operationalized in 2003 with financial support from RGoB and WWF. In 2013, the Sanctuary was proposed to be designated as one of the four PAs to be included under World Heritage site.

Located in easternmost part of the country, it has an area of 740.60 km² encompassing Merak and Sakteng Gewogs (cluster of villages under one local administrative unit) under Trashigang Dzongkhag (district) and a part of Lauri Gewog under Samdrup Jongkhar Dzongkhag. The Sanctuary also shares border with the Indian State of Arunachal Pradesh in the East and North. For promoting a healthy faunal population, the Sanctuary is well connected by biological corridor to Jomotshangkha Wildlife Sanctuary forming a part of the Bhutan Biological Conservation Complex (B2C2).

The Sanctuary can be categorized into three climatic zones – subtropical, temperate and alpine zone. Major part of the Sanctuary area falls under temperate zone characterized by cold winter and warm summer. Highest rainfall occurs in the months of June to August and snowfall starts from October to April. Three river systems– Gam-ri, Mera-ama-ri and Jomo-ri originate from the Sanctuary.

The first management plan for Sakteng Wildlife Sanctuary (2008-2013) was prepared based on the rapid biodiversity assessment conducted along major trekking routes and few accessible trails. Because of the limited field survey, the biodiversity was tremendously under-represented and consequently recommended for total biodiversity assessment of the area. Consequently, the major emphasis of the first management plan for SWS (2008-2013) was focused on restoration of wildlife species, providing alternative to timber resources, enhancement of income generation opportunities, zoning of area, capacity building of staff and development of infrastructures.

The current conservation management plan is prepared based on findings of robust assessment of the biodiversity and socio-economic survey. In addition, a strategic framework analysis and several participatory appraisals, stakeholder consultation at local, regional and national level have contributed to dynamic plan document.

For the first time in the history of protected area management in Bhutan, the present conservation management plan for SWS covers ten year period effective from July 2017 until June 2027. Cost for biodiversity and socio-economic survey for producing and publication of this conservation management plan was funded by the BTFEC. The RGoB had supported Staff remuneration and operational cost of the SWS management.

A total of 858 plants, 37 mammals, 2  birds, 63 butterflies, 5 reptiles, 3 amphibians, and 2 fish species were recorded from the biodiversity assessment conducted in 105 plots covering the entire area of the Sanctuary.

The Sanctuary is home to about 5000 semi-nomads (*Brokpa*) of Merak and Sakteng largely dependent on livestock rearing as a source of livelihood sustenance. Eighty-three percent of the household income is generated from the livestock husbandry. Of 772 households (HH) in 13 villages under Merak and Sakteng Gewog, 85% (567 HH) depends on livestock farming. Very few people living in the lower areas (below 2500m altitude) depend on subsistence farming. Owing to the transhumance practice of the *Brokpa* community dependency on the natural resources is immense.

Socio-economic study result indicates that major problems and issues faced by the local community are insufficient *Tsamdro* (pasture land), livestock and crop depredation, loss of culture and tradition, and degradation of pasture land and water resources. Similarly, biodiversity assessment result reveals habitat fragmentation and species loss caused by excessive livestock grazing, overexploitation of natural resources, poaching, developmental activities (road and transmission lines), and dependency of local people on natural resources are major sources of threat to the biodiversity conservation in the Sanctuary.

To realize the set vision and overall goal, SWS management have proposed a set of objectives and strategic actions that shall address both social and biodiversity issues. Priority objective of the plan period is to provide maximum protection to representative ecosystems through implementation of strategic conservation programs, building local economy without compromising age old culture and traditions.

Total fund projection for plan period (10 year) is Nu. 496.96 million (four hundred ninety six million nine hundred sixty thousand). Of the total projected fund, 48.21% is recurrent expenses and 51.29% for capital financing. The recurrent expenditure is expected to meet from RGoB contribution and the remaining financial gap of 51.79% will be required to source from potential donors.

In accordance to the IUCN guidelines for preparation of protected area management plan, the conservation management plan for SWS consists of seven chapters – introduction, analysis of issues, vision and objectives, zonation, management prescription, financial projection, and monitoring and review.



Chapter 1

INTRODUCTION

The Royal Government of Bhutan (RGoB) places enormous emphasis on conserving the country's biological resources through establishment of protected area (PA) networks and biological corridors. Around 51.44% of the country's geographical area has been set aside under the PA and biological corridors to allow free movement of various wildlife species thus assuring their viability. The revision of the PA system in Bhutan was done in 1993 to ensure representation of the different ecosystems of the country; it currently comprises of five national parks, four wildlife sanctuaries, and one strict nature reserve.

Sakteng Wildlife Sanctuary (SWS) with an area of 740.60 km² was established in 2003 to represent the easternmost temperate and alpine ecosystems of Bhutan. It is home to some of the rarest and globally threatened wildlife species and harbours the maximum number of *Rhododendron* species with 41 species out of 46 *Rhododendron* species recorded in the country (Pradhan, 1999). "Brokpas" the semi-nomadic highlanders with unique culture and traditions are the inhabitants of the Sanctuary. The PAs of Bhutan are unique from rest of the world due to the presence of settlements which makes the conservation task complex and challenging. Consequently, the Bhutan's PAs management approach needs to be comprehensive, embracing many disciplines. Further, the Forest and Nature Conservation Act (FNCA)1995 of Bhutan mandates to manage PAs of the country with prescribed scientific management plans.

The Department of Forests and Park Services (DoFPS) is one of the oldest departments of Bhutan established in the year 1952. The management of PAs in Bhutan was initiated only after the enactment of National Forest Policy in 1974 and notification of National Parks and Wildlife Sanctuaries in 1979. However, majority of the Bhutan's PAs were operationalized from the early nineties. The conservation management plans in the past were mostly prepared by external experts and the trend still prevails in some PAs.

The first five year management plan (2008-2013) for SWS was based on the biodiversity data collected along major trails and livestock migratory routes. Hence, the biodiversity of the Sanctuary was under represented. The present plan is based on biodiversity data collected from 105 terrestrial and 30 fresh water plots inclusive of total forest types covering entire area of the Sanctuary. Additionally, social information was collected using the Participatory Rural Appraisal (PRA) tool through an interactive workshop involving total of 772 households (HHs) of the Sanctuary. Individual HH data were collected from 173 representatives HHs using a structured questionnaire.

The present conservation management plan (2017-2027) is initiated and prepared by the staff of SWS with generous funding support from Bhutan Trust Fund for Environmental Conservation (BTFEC) and can be pronounced as “by the people for the people”. This management plan shall serve as a tool to source funds to implement the management prescriptions to promote harmonious co-existence of nature and local community. It will also provide PA manager optimum strength to bargain with policy makers on core issues of conservation and gain general public empathy towards biodiversity conservation and its dynamics.

1.1 Description

1.1.1 Global Significance

SWS represents an eastern Himalayan temperate ecosystem which harbours a number of globally threatened and endangered species like the Royal Bengal Tiger (*Panthera tigris*), Red Panda (*Ailurus fulgens*), Musk Deer (*Moschus* sp.) Capped Langur (*Trachypithecus pileatu*), Himalayan Black Bear (*Ursus thibetanus laniger*), and Himalayan Serow (*Capricornis thar*) to name a few. Home to diverse flora and fauna, it has a number of outstanding universal values that qualifies SWS as a mixed World Heritage Site and has made to the tentative list of UNESCO world heritage site in 2013. The area exhibits unique cultural traditions, an outstanding example of a traditional human settlement and land-use, natural beauty, aesthetic value and the most important and significant natural habitats for in-situ conservation of biological diversity from the science and conservation point of view.

SWS shares borders with the Indian State of Arunachal Pradesh, which is described as the Orchid State of India and the paradise of Botanists due to extremely rich biodiversity (Bajaj,2015). Arunachal Macaque (*Macaca munzala*), an endangered monkey species discovered in western Arunachal Pradesh recently is most likely to occur in the Sanctuary although the area remains to be surveyed for the species.

1.1.2 National Significance

SWS is designated to protect the easternmost temperate ecosystem of Bhutan. It also forms the head waters of major river systems of the country for production of clean hydro power energy for increased revenue generation. SWS contribute towards achieving the philosophy of Gross National Happiness (GNH) by strongly promoting Environmental Conservation and Preservation and Promotion of Culture. The Sanctuary offers opportunity of upholding the constitutional mandate of maintaining 60% forest cover for all times and realizing the Bhutan’s commitment of remaining carbon neutral.

1.1.3 Local Significance

SWS is home to the highest diversity of Rhododendron with 41 species out of 46 recorded in the country. SWS is at the head water source of Gam-ri watershed which benefits lower valleys of Phongmey, Radhi, Shongphu, Samkhar, Bidung and Bartsam Gewogs (cluster of villages under one local administrative unit) under Trashigang Dzongkhag. The Sanctuary has numerous streams and alpine lakes feeding a constant supply of water into the downstream rivers. It provides livelihood sustenance to around 5000 semi-nomads depending on livestock farming as a source of economic mainstay.

Culturally, the Brokpa tradition is unique not only to Bhutan but also to the world and it calls for greater attention for preservation as economic development and modernization enter into remote corners of the country.

1.2 Biophysical Characteristics

1.2.1 Location

SWS is located in between the latitudes; 27°09'00" - 27°28'08" North and longitudes; 91°47'04" - 92°07'02" East covering an area of 740.60km². It borders with the Indian State of Arunachal Pradesh in north and east, Phongmey Gewog under Trashigang Dzongkhag in the west and Lauri Gewog, Samdrup Jongkhar in south. The Sanctuary is connected to Jomotshangkha Wildlife Sanctuary by a biological corridor in the south forming a part of Bhutan Biological Conservation Complex (B2C2).

Officially SWS cover about 85.2 % of Sakteng, 67.3% of Merak Gewog and 9.4% of Lauri Gewog (Figure 1). However, for faster public service delivery and to save administrative cost, SWS management provides forestry services to the remaining villages falling outside the Sanctuary area viz. Sheytami, Drana and Chipling areas (seasonal grazing area of Merak Gewog) and Joenkhar, Bumlock, Murbee and Yongbazor under Sakteng Gewog. In reality the SWS manages the entire Gewogs of Merak, Sakteng, and a part of Lauri covering a total of 937.62 km².

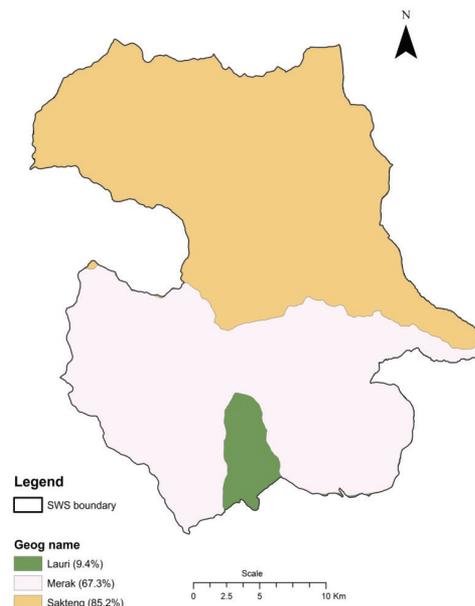


Figure 1: Administrative Map of SWS

1.2.2 Climate and Topography

Broadly SWS can be categorized into three climatic zones; subtropical, temperate, and alpine meadows. Altitude ranges from 1500-4500 m with sub-tropical climate in the low-lying valleys to alpine meadows in the higher mountains. The majority of the SWS fall under temperate zone. The temperate climatic condition is characterized by cold winters and warm summers with occasional heavy rainfall. Area receives highest rainfall during the month of June, July and August with sporadic rainfall throughout late April to early October, especially during late afternoon (Figure 2). Snowfall occurs from mid October till early April.

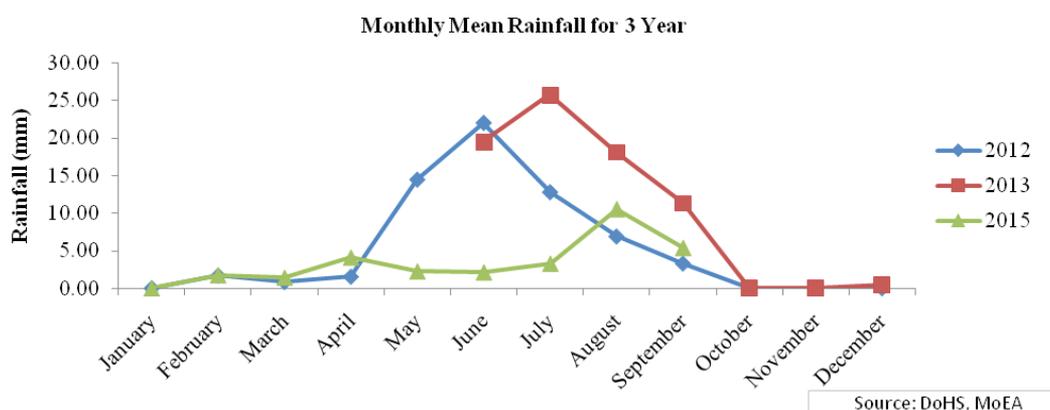


Figure 2: Rainfall trend of Sakteng Wildlife Sanctuary (2012-2015)

Geologically, the Sanctuary is Tethyan meta-sediments and surface drift comprise of Periglacial, Aeolian and Colluvium on slopes with substantial alluvium in high valley (WII, 2005). The upper part of SWS is wide with gentle slopes and scree, harbouring numerous alpine lakes. The lower parts are scoured steeply by streams and rivers forming narrow valleys.

Merak and Gyengu villages under Merak Gewog and Pussa, Tengma, Manirong, Sakteng, Borangmang and Borangtse under Sakteng Gewog are located in the mid valley. Thrakthri, Dak, Murbee and Kheliphu are situated in the lower hill slope. Joenkhar, Tholong, Shingkar and Khashiteng are located on lower valley.

1.2.3 Hydrology and Drainage

SWS can be divided into five sub-watersheds of Eastern Bhutan (Figure 3). Amongst which Gam-ri watershed comprise of 39.2% of total area followed by Yachu (19.4 %), Shaar-chhu (18.9%), Jomo-ri (15.1%) and smallest being Mera-ama-ri (7.4%).

Three major rivers of SWS: Gam-ri, Mera-ama-ri and Jomo-ri are fed by numerous small and medium size lakes, streams and seasonal rain/snow. There are no permanent snow-capped mountains in SWS. Gam-ri originates from the extreme north eastern part of the bordering India at Jang-Puensum (three brothers) and Dremaling lake joined by numerous small streams. Bamukpa-ri is the major tributary of Gam-ri originating from Tsho-na, Tshezung area.

Mera-ama-ri originates from Kayakpa, northern flank of Mount Yanglay-Yangchung. Gam-ri meets Drangme-Chhu below Trashigang Dzong (Chhazam) and Mera-ama-ri joins Bara-Nadhi (river) in India. The Jomo-ri originates from Serkemla and Mount Jomo Kungkhar joined by numbers of small and big streams. Taktakpa-ri originates from Mount Yanglay-Yangchung flowing through Taktakpa village, Gerkhu-ri and Kheliphu-ri flowing through Kheliphu village joins Jomo-ri at Jompa village in Lauri under Samdrup Jongkhar.

Based on the preliminary study, 104 lakes of different sizes were recorded within the Sanctuary and it feeds to about fourteen small rivers from its catchment area forming important tributaries of some of the major river system like Mera-ama-ri and Drangme-chhu in the East (SWS, 2010). Of the total lakes, more than 90% of the lakes are located in alpine areas.

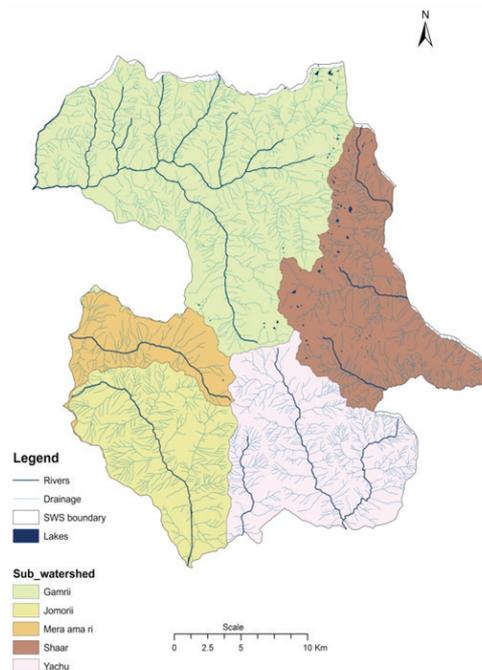


Figure 3: SWS watershed map

1.2.4 Vegetation Types

Based on the frequency and crop density of forest, Adhikari, (2005) determined 10 forest types at 50% similarity threshold through a computer program TWINSpan (Two-way Indicator Species Analysis);

1. Conifer-broadleaved
2. Riverine
3. Mixed Broadleaved
4. Broadleaved-deciduous
5. Broadleaved-conifer
6. Broadleaved-evergreen
7. Fir/mixed-coniferous
8. Juniper
9. Mixed
10. Coniferous

However, with recent biodiversity survey 2015, the forest was reclassified into eight forest types based on classification system of National Forest Inventory of Bhutan, 2012 as follows:

1. Dry Alpine Scrub
2. Rhododendron Scrub
3. Fir Forest
4. Hemlock Forest
5. Cool Broadleaved Forest
6. Bhutan Pine Forest
7. Chir Pine Forest
8. Warm Broadleaved Forest

1. **Dry Alpine Scrub:**

Dry Alpine Scrub starts beyond 4000m altitude with a diversity of flowering plants such as *Rhododendron setosum*, *R. anthopogon*, *R. bhutanense*, *Primula* spp., *Potentilla* spp., *Gentiana* spp., *Rheum* spp., *Meconopsis* spp. and *Rhodiola* spp. The area harbours numerous alpine lakes that support streams and rivers downhill. The highest altitude of Sanctuary area is 4500m measured only on a few mountain peaks.

2. **Rhododendron Scrub:**

Such kinds of forest types are anthropogenic in origin and spreads sporadically from 3100-4200m altitude. This forest appeared due to the clearance of large tracks of pristine conifer forest in the past by herders to create open grazing ground and subsequently unpalatable shrub like Rhododendron and Juniper invaded the areas.

3. Fir Forest:

Old growths of Fir forest are found from 2800-4100m altitude mostly on southern aspects. In northern aspects and deep valleys associate species like *Betula utilis*, *Rhododendron hodgsonii*, *R. kesangiae*, and *R. falconeri* occupy the area.

4. Hemlock Forest:

Being a shade bearer in its initial stage, Hemlock forests are mostly found on the north facing slopes from 2500-3500m altitude. In higher elevations, Hemlock forest is associated with *Abies densa*, *Betula utilis*, *B. alnoides*, *Hydrangea* spp., *Rhododendron arboreum*, *Magnolia* spp., *Taxus baccata*, *Borinda grossa* and *Alnus nepalensis* in mid and lower altitude. *Quercus semecarpifolia* was concentrated on south facing slopes along Gam-ri in Sakteng valley.

5. Cool Broadleaved Forest:

Cool broadleaved forest is interspersed with Hemlock and Bhutan Pine forest from 2200-3000m. This forest is dominated by *Acer* spp., *Betula* spp., *Rhododendron* spp., *Quercus* spp., *Sorbus* spp., *Salix* spp., *Hydrangea* spp., *Viburnum* spp., *Lyonia* sp., *Magnolia* spp., *Castanopsis* spp. and *Schima* spp. with profuse growth of *Borinda grossa*.

6. Bhutan Pine Forest:

Matured stands of Bhutan pine forest occur at the altitude range from 1800-3000m. Being a light demanding species, patches of *Pinus bhutanica* was found mostly on exposed and south facing slopes. *Quercus lanata*, *Lyonia* spp., *Rhododendron arboreum* and *Schima* spp. were main associates in Bhutan pine forest.

7. Chir Pine Forest:

Chir pine forest was concentrated from 1500- 2500m altitude on hot and dryer slopes. *Quercus griffithii*, *Q. lanata*, *Lyonia* spp., *Rhododendron arboreum*, *Schima* spp. were main associates in Chir pine forest. After exclusion of fire since establishment of SWS in 2003, broadleaved species are growing profusely in this forest and new recruits of *Pinus roxburghii* is almost lacking.

8. Warm Broadleaved Forest:

These types of forest occur at the altitude range from 1500-2000m in the pockets of dryer mountain valleys. *Lithocarpus elegans*, *Schima wallichii*, *Juglans regia*, *Michelia champaca*, *Quercus griffithii*, *Q. lanata* were dominant species in this forest.

1.2.5 Floral Diversity

A total of 858 plant species with 141 families under 35 orders were recorded from the terrestrial biodiversity survey (Annexure 1). Out of this 57% were herbs (including climbers), 17% trees, 14% shrubs and 12% orchids. About 65% of SWS is dominated by coniferous forest comprised of 12 species of conifer under seven genera viz. Fir (*Abies densa*), Hemlock (*Tsuga dumosa*), Larch (*Larix griffithii*), Himalayan Yew (*Taxus* sp.) Bhutan pine (*Pinus bhutanica*), Chir pine (*Pinus roxburghii*) and Spruce (*Picea spinulosa*), and five species of Juniper (*Juniperus recurva*, *J. communis*, *J. cf. indica*, *J. squamata* and *J. pseudosabina*).

Fir is the most dominant conifer species followed by Hemlock and Juniper with Important Value Index (IVI) 78.07, 34.51 and 12.63 respectively. Larch is mostly concentrated along stream/river beds and landslide areas above 2500m altitude. *Rhododendron* (20 species of shrub/tree) has the highest encounter rate with 70.03 IVI, forming undergrowth storey of the conifer forest (Annexure 2). Few isolated *Taxus baccata* are found in mixed conifer forest. Countable *Picea spinulosa* were recorded around Pussa village in Sakteng valley making it locally endangered and needs immediate management intervention. Sporadic stands of matured *Pinus bhutanica* was found around Joenkhar, Tholong, Dak, Thrakthri and few immature trees in Sakteng, Drana and Shingkhar. Small patches of *Pinus roxburghii* was found in Gelongphukpa core zone only.

Broadleaved forest covers 19% of the Sanctuary consisting of *Acer campbellii*, *Betula utilis* and *B. alnoides* with IVI 10.13, 6.35 and 4.56 respectively. Scattered growth of *Sorbus* spp., *Hydrangea* spp., *Salix* spp., *Swida* spp., *Enkianthus* spp. and *Viburnum* spp. with IVI <3 were also found in this area. *Quercus semecarpifolia* (IVI 2.17) is confined along Gam-ri bank is the most preferred firewood species in Sakteng valley and requires special conservation efforts.

As an adaptation (disturbance and harsh climatic condition) mechanism, some of the tree species restricted their development into shrubs viz. *Rhododendron*, *Salix*, *Viburnum*, *Lyonia*, *Hydrangea*, *Sorbus* and *Juniperus*. In higher altitudes (above 3800m) the shrub layer is dominated by *krummholz* (growth form of tree under great environmental stress) of *Rhododendron* spp. and *Juniperus* spp. along with scanty growth of *Juncus*, *Geranium*, *Gentiana*, *Bistorta*, *Rheum*, *Primula*, *Fragaria* and grasses (*Poa* sp). At 3000-3800m altitude range, the area is covered by shrubs like *Rhododendron*, *Rosa*, *Daphne*, Bamboo, *Rubus*, *Salix*, *Viburnum*, *Sorbus*, *Hydrangea* etc. along with luxuriant growth of *Aconogonon*, *Primula*, *Potentilla*, *Anaphalis*, *Epolobium*, *Saussurea*, *Persicaria* and *Geranium*. Majority of the settlements in SWS falls within this altitude exerting tremendous pressure on the natural resources.

In mid altitude range between 2200-3000m; *Rosa*, *Vaccinium*, *Daphne*, Bamboo, *Rhododendron*, *Berberis*, *Elsholtzia*, *Salix*, *Hydrangea* and *Ribes* forms the dominant shrub layer. *Gnaphalium*, *Carex*, *Rubus*, *Pteridium*, *Bidens*, *Fragaria*, *Rumex*, *Ageratina*, *Hypericum* etc. constitutes the ground cover. Below 2200m, the main species of shrubs are *Desmodium*, *Daphne*, *Oxyspora*, *Rubus*, *Dichroa*, *Hypericum*, *Viburnum*, *Ribes*, *Elsholtzia*, *Ageratina*, Ferns and Bamboos. *Elatostema*, *Calamagrostis*, *Galium*, *Oxalis*, *Persicaria*, *Viola*, *Pilea*, *Impatiens*, *Senecio* and *Inula* form the ground cover in the lower altitude.

During the biodiversity survey 2015, 41 species of *Rhododendron*s were recorded inclusive of two endemic species viz. *Rhododendron bhutanense* and *R. kesangiae* (Annexure 3). *Rhododendron* in association with other tree species occupies the majority of the forest type – ranging from Chir pine forest to Alpine scrub. *Rhododendron grande* is the largest and tallest (up to 40cm diameter and 25m height) *Rhododendron* sp. in the Sanctuary mostly occupying cool broadleaved forest. *Rhododendron arboreum* has the widest growing range, starting from 1700m to 3500m.

Orchids are a diverse and widespread family of flowering plants, with very colourful and often fragrant flowers under *Orchidaceae* family. It has about 800-1,000 genera with 25,000-35,000 known species in the world (Gogoi, *et al.*, 2012). Out of 426 orchids in Bhutan, 131 species of orchids were recorded in SWS (Annexure 4).

1.2.6 Faunal Diversity

Owing to the presence of rugged terrain characterised by huge variation in altitude from 1500m-4500m, SWS harbours outstanding biodiversity and ecosystems. It provides home to many critically endangered and threatened faunal species. The biodiversity survey 2015 revealed assemblage of diverse terrestrial, avian and aquatic species many of which are endemic to eastern Himalayan region and of global conservation significance. Sclater's Monal (*Lophophorus sclateri*), Arunachal Macaque (*Macaca munzala*) and Chinese Goral were discovered recently in Arunachal Pradesh. These species are likely to be found in SWS as it shares stretches of pristine forest with Arunachal.

1.2.6.1 Mammals

A total of 37 mammal species was recorded representing 7 orders of animal kingdom (Annexure 5). Of the aggregates, 15 species were carnivores under six families, 2 species each of Dog and Weasel, 1 species each of Red Panda, Bear and Civet, 8 species are Rodents under 4 families including Squirrel, Porcupine, Vole and Mouse. 7 species are ungulates under 4 families composed of Antelope, Deer, Musk Deer and Pig. Remaining includes 3 species of lagomorphs, and 2 species of primates.

Out of 37 mammal species recorded from the survey, 35 species have been identified at species level and confirmed their existence. However, the confirmation of Musk Deer at species level, existence of Clouded Leopard and Himalayan Pika needs further validation. The Musk Deer was believed to be wiped out from this area due to poaching before the establishment of the SWS. However, its presence was re-established during 2015 national tiger survey and SWS biodiversity survey.

1.2.6.2 Birds

Bird population trends often indicate well being of ecosystem and biodiversity in nature. A total of 28 species of birds (Annexure 6) were recorded, however, the list is not exclusively exhaustive because most bird species are altitudinal and long range migrants. Hence, recording of all birds in one season was not possible.

Major group of birds recorded were Babbler (40 spp.), Warbler (27 spp.), Finch (16 spp.), Flycatchers (12 spp.), Corvid (10 spp.), Cuckoo (10 spp.), Galliformes (9 spp.), Tit (9 spp.), Bird of Prey (8 spp.) and Pigeon (8 spp.). Further, SWS also serves as potential winter roosting ground for endangered species like Black Necked Crane (*Grus nigricollis*) as evidenced in 2013 at Thrakthri and Borangmang under Sakteng Range.

1.2.6.3 Herpetofauna (Reptiles and Amphibians)

Diversity of herpetofauna was comparatively low in the Sanctuary. Only five species of reptiles and three species of amphibians were recorded during biodiversity survey 2015.

Reptile: Reptile includes five species of snakes viz. Mountain Pit Viper (*Ovophis monticola*), Green Rat Snake (*Ptyas nigromarginata*), Large-eyed Bamboo Snake (*Pseudoxenodon macrops*), Mountain Worm-eating Snake (*Trachischium* spp.), Flying Snake (*Chrysopelea* sp.), and two species of lizards viz. *Eutropis* sp. (skink) and *Japalura variegata* (East Himalayan/Variegated Mountain Lizard).

Amphibian: Three species of amphibian includes Annandale's Paa Frog (*Nanorana annandalii*), Sichuan Torrent Frog (*Amolops formosus*) and Sikkim Cat-eyed Toad (*Scutigera sikimmensis*).

1.2.6.4 Fish

Despite the presence of three major river in the Sanctuary, only two species of fish were recorded; Snowtrout (*Schizothorax richardsonii*) and Khaling Torrent catfish (*Parachilopteryx bhutanensis*) which is believed to be endemic catfish species. A group of Snowtrout (not confirmed) yearlings was sighted along the shallow pools of Gam-ri near Joenkhar. This indicates the potential site for Snowtrout spawning in the upper reach of Gam-ri.

1.2.6.5 Butterflies

Butterflies are not only important for pollination but also perform manifold functions such as ecological, economic, educational and social. In total, 63 species of butterflies were recorded from Sanctuary (Annexure 7).

1.2.6.6 Freshwater Macroinvertebrates

Physical, chemical and biological assessment of running water can provide a complete spectrum of water quality. Such a study entails huge investment, technical expertise and is time consuming. Yet, biological assessment alone can provide reliable information on water quality and is widely accepted (Iliopoulou-Georgudaki *et al.*, 2003). Macroinvertebrates are an integral part of wetland ecology with diverse ecological and environmental requirements. Change in natural variables of water directly affects their composition and is a good indicator of water quality.

The quality of Gam-ri and Mera-ama-ri was good with 100% frequency of sensitive species like Stonefly, Caddisfly and Mayfly. The pollution tolerant level of Macroinvertebrates is measured in numeric values ranging from 0 to 10. At 0 it is intolerant and the tolerance level increases with increasing value up to 10. The overall tolerance level assessed for two rivers (n=30) was 3.04 (Table 1).

Table 1: Family Biotic Index of Macroinvertebrate

SI #	Order	Pollution Tolerance Value	Nos.	Encounter	Frequency	Relative Frequency	Biotic Index
1	Mayfly (Ephemeroptera)	3.5	1299	30	100.00	18.87	1.37
2	Stonefly (<i>Plecoptera</i>)	1	687	30	100.00	18.87	0.21
3	Caddisfly (<i>Ticoptera</i>)	3	868	30	100.00	18.87	0.78
4	Nematoceranfly/Midge larvae (<i>Diptera</i>)	5	332	20	66.67	12.58	0.50
5	Crane fly (<i>Diptera</i>)	5	54	17	56.67	10.69	0.08
6	Flatworm (<i>Turbellaria</i>)	4	49	17	56.67	10.69	0.06
7	Beetle (Coleoptera)	4	25	10	33.33	6.29	0.03
8	Dobsonfly (<i>Megaloptera</i>)	2	4	2	6.67	1.26	0.00
9	Worms (Oligochaeta)	8	5	2	6.67	1.26	0.01
10	Slater (<i>Isopoda</i>)	8	1	1	3.33	0.63	0.00
Total			3324	159	530.00	100.00	3.04

Note: Tolerance value has been derived from the average tolerance value of entire family

1.3 People and Culture

Merak (literally means to “set on fire”) and Sakteng (means the “plateau of Bamboo”) located in the easternmost part of Bhutan is the land of semi-nomadic community named Brokpa. They are believed to be the descendents of Triwu Jangchubsempa (Kuensel Article, April 11, 2015) and have their ancestral roots from southern Tibet (ASPEN ALPINE GUIDES, 2012).

Brokpas are a distinctive group of people in Bhutan with unique costumes with perhaps some similarities to the tribal people of Arunchal Pradesh, Indian Monpa. They can easily be distinguished from other communities of Bhutan by their costumes which are exceptionally distinct. Their costumes are typically made from wool, silk and yak’s hair to help them adapt in the harsh geographical environment. “Transhumance” a highly specialized form of mixed farming is predominantly practiced by Brokpa community involving seasonal migration of their cattle. In summer, they take their herds to mountain pasturelands from May till October. By September, they climb down for winter pasture and remain there for about five to eight months until the next migratory cycle.

1.3.1 Cultural Resources

Apart from their unique culture and traditions, Merak and Sakteng are also known for Yak cham, Arpa cham, Ache Lamoi cham and Tercham (performed once in every three years). The famous mask dance “**Ache lamoi chaam**” performed by the “*Brokpas*” takes its origin back to the era of Guru Rinpoche when he was constructing the Lhasa monastery in Tibet. It is believed that this mask dance was performed by Guru Rinpoche to subdue the demons creating nuisance during the construction of Lhasa monastery. There are also numerous important cultural sites in Merak and Sakteng such as:

1. Jomo Phodrang in Merak which is the abode of local deity Aum Jomo.
2. Gyengu and Merak Lhakhang in Merak.
3. Chorten Nagpo in Damangchung on the way to Merak that was constructed after subduing evil “Deum Hachang” by “sey Kuentu Legpa” (relates to the story of Khando Drowa Zangmo)
4. Tsholung Gonpa in Sakteng
5. Borangtse Lhakhang in Sakteng
6. Kushu Guru and Yeujuk Lhakhang in Sakteng
7. Nyagchungla pass and Lhodrojong between Merak and Sakteng which had a significant role in the settlement of Merak and Sakteng
8. Nye Chap-shukpa in Sakteng
9. Serdam Goenpa in Joenkhar

Additionally, there are also many festivals which are of local significance (Table 2).

Table 2: Cultural calendar of Merak & Sakteng

Months (may vary according to Bhutanese calendar)	Gewog	
	Merak	Sakteng
January	-	Tenda Tshechu
May	-	Jomo Soecha
June	Jomo offering &Tenda Rimdro	Tercham (Once in 3 years)Trenda
July	Choekor	Choekor
August	Jomo Tshechu	Jomo Sekha
September	Jomo Kora & Jomo offering	Choekor
October	Jomo Tsekha	-

1.3.2 Socioeconomic Situation

Merak and Sakteng have remained in isolation from the rest of the country for many decades until recently and are considered the poorest Gewogs with 46.9% poverty rate (Trashigang, 2011). The road accessibility to Merak has reached only in 2015 which still get extremely difficult to ply during monsoon season. For Sakteng Gewog, the road is still under construction and may take another couple of years to complete.

However, with recent advancement of infrastructure development such as road and electricity connectivity, the living standard of these two communities have improved manifold. It has not only created more employment opportunities for the local people but also has attracted increasing number of tourists. The motor roads have given better market accessibility to the people to sell their products in wide range.

From the wealth ranking exercises conducted during the social survey in 2015, the majority of the households fall into “Middle” income category with mean annual income of Nu. 75,000.00 per household. Only few households fall in the “Poor” and “BPL” categories with mean annual income of Nu. 32,500.00 and Nu. 12,500.00 per HH respectively (Figure 4).

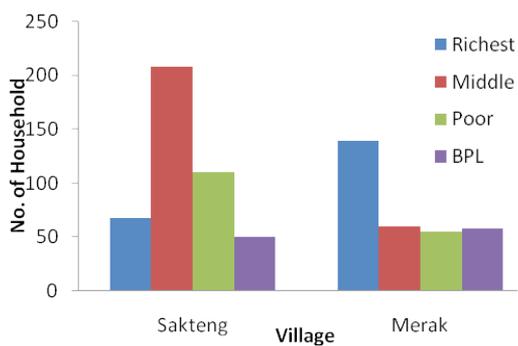


Figure 4: Wealth category (Merak & Sakteng)

1.3.3 Local Economy

More than 85% of the people in Merak and Sakteng practice semi-nomadic lifestyle with only a few households engaged in subsistence agriculture. Livestock farming is the mainstream occupation followed by civil servants and others (Figure 5). The “Others” includes occupation such as carpenter, weaver, cook, driver, caretaker, contractor, guide, painter, babysitter and helper. “Religious activities” are referred to monks, nuns, gomchen and tsampas.

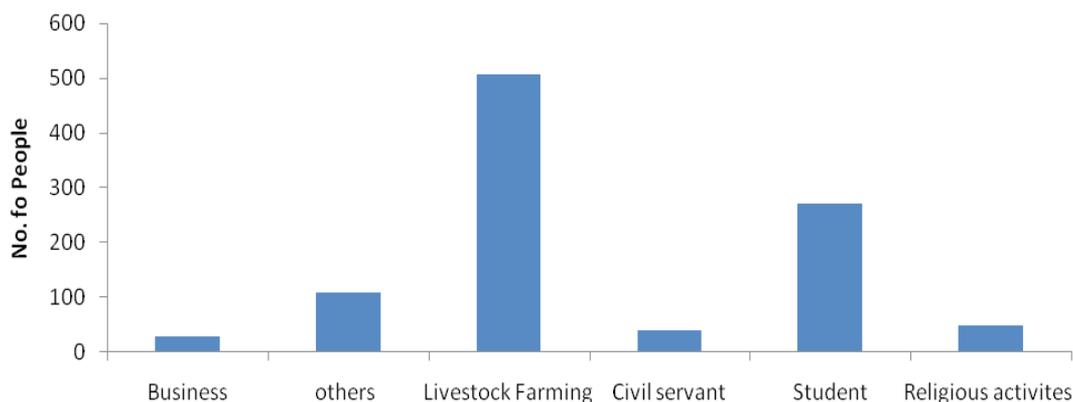


Figure 5: Occupational group (Merak & Sakteng)

Main sources of income for these two communities are from the sales of livestock produce such as butter, cheese, fermented cheese “Yoshu”, meat and wool to the nearby towns. Of late, they have also started collecting minor forest produce such as mushrooms, wild vegetables, tubers, incense making herbs and medicinal plants to supplement their income. These products are either marketed for cash or barter for grains and other necessary items that are not available locally.

1.3.4 Demography

Close to 5000 people in 13 villages with 772 households (Table 3) from two Gewogs of Merak and Sakteng resides inside the Sanctuary. Similar to situations of most villages in Bhutan, residents of Merak and Sakteng are mostly old and infants. Many adults and younger generation have migrated to different places in search of better education and employment opportunities.

Thimphu is rated as most preferred destination for out-migration of the productive people followed by Phongmey and Shingkhar respectively (Figure 6). Few people even migrate to the Indian State of Arunachal Pradesh because of the close interaction and proximity. The majority of teen agers leave for education and remain away from villages most of the time.

Table 3: No. of HH (Merak&Sakteng)

Sl#	Village	Gewog	No. of HH
1	Sakteng	Sakteng	104
2	Borangmang	Sakteng	64
3	Dak	Sakteng	12
4	Thelon	Sakteng	19
5	Joenkhar	Sakteng	23
6	Tengma	Sakteng	130
7	Murbee	Sakteng	28
8	Pussa	Sakteng	20
9	Thrakthri	Sakteng	52
10	Merak	Merak	235
11	Gyengu	Merak	58
12	Kheliphhu	Merak	12
13	Khashiteng	Merak	15
Total			772

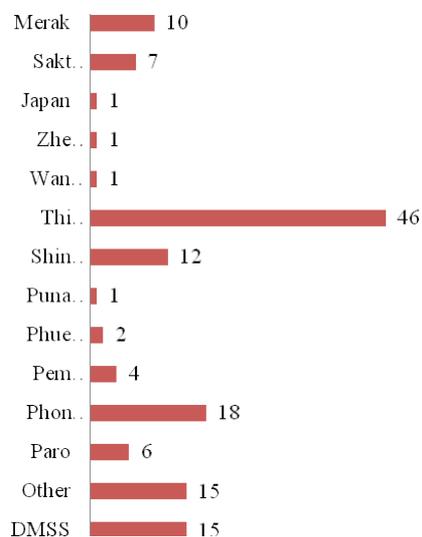


Figure 6: Different migratory destination

1.4 Service Sectors

Service Sectors are extremely vital for timely delivery of public services required by the community. Most of the essential Service Sectors are well established with adequate number of human resources both in Merak and Sakteng (Table 4).

Table 4: Service sectors in Merak & Sakteng

SI #	Service Sector Name	Quantity	Location
1	Dungkhag Administration	1	Sakteng
2	Dungkhag Court	1	Sakteng
3	Gewog Administration	2	Merak & Sakteng
4	Basic Health Unit	3	Merak, Sakteng & Joenkhar
5	Police Station	1	Sakteng
6	Lower Secondary School	1	Sakteng
7	Primary School	2	Merak & Joenkhar
8	Community Information Centre	2	Merak & Sakteng
9	Extended Class Room	1	Thrakthri
10	Renewable Natural Resources Extension Centre	3	Merak, Sakteng & Joenkhar
11	Bhutan Development Bank Limited	1	Sakteng
12	Royal Insurance Corporation of Bhutan Limited	1	Sakteng
13	Park Range Office	3	Joenkhar, Merak & Sakteng
14	Park Guard Post	1	Thrakthri
15	Shedra (Buddhist Institute)	1	Sakteng
16	Early Childhood Care & Development	2	Merak & Sakteng
17	Out Reach Clinic	2	Chipling & Thrakthri

1.5 Administration

SWS is divided into three ranges viz. Merak, Sakteng and Joenkhar (Figure 7). Park Manager (Chief Forestry Officer) heads the Sanctuary management supported by field and functional units (Figure 8). The Sanctuary head office is located at Phongmey, Trashigang.

SWS cover 67.30% of Merak and 85.2% of Sakteng Gewog area under Trashigang Dzonkhag and a part of Lauri Gewog 9.4% under Samdrup Jongkhar Dzongkhag. However, the SWS management is providing forestry services to total households under Merak and Sakteng Gewogs. Hence, the Sanctuary management is in the process of extending its area to total Gewog area of Merak and Sakteng.

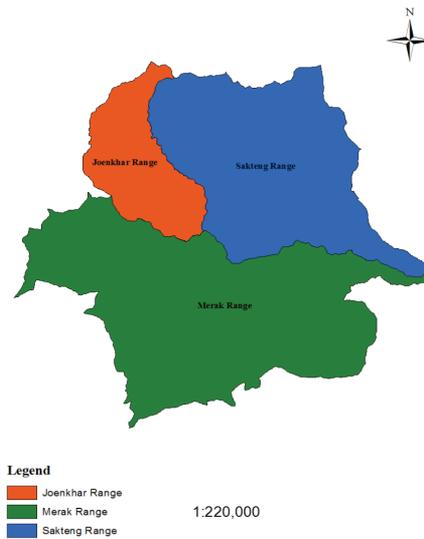


Figure 7: Range Jurisdiction

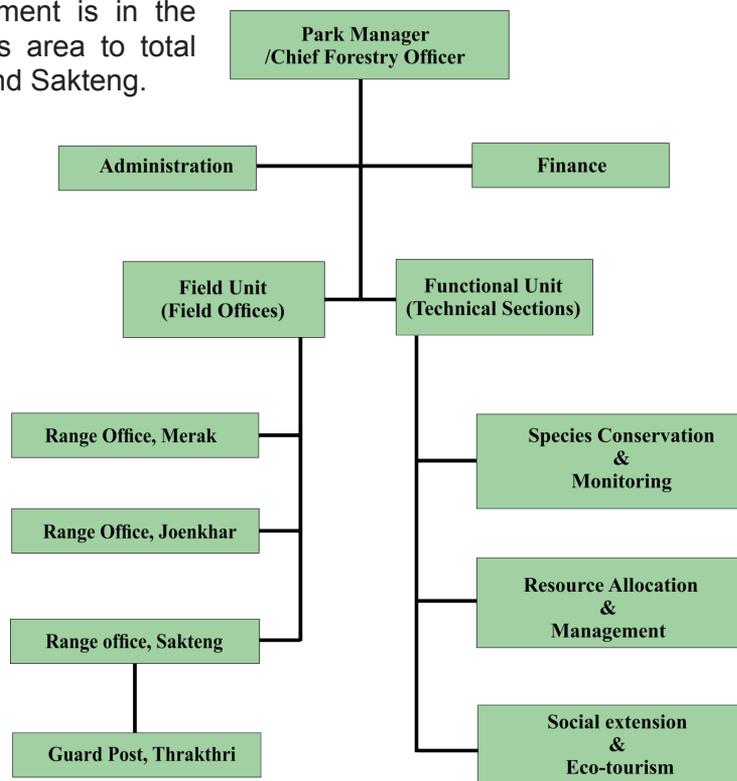


Figure 8: SWS Organogram

1.5.1 Existing Infrastructure

SWS Head office comprises of two storied office building, one unit Park Manager's resident and four unit staff quarter constructed with the funding support of WWF-Bhutan Program. Range Office –cum- transit camp building at Merak, Sakteng and Joenkhar and additional four unit staff quarter at SWS HQ constructed through RGoB funding.

1.5.2 Mobility

Toyota hilux procured with funding support of BTFEC is the only pool vehicle that enables the movement of the staffs. Consequently, there is an urgent need of additional one 4WD vehicle and four motor bikes to perform day to day activity efficiently and smoothly.

1.6 Synoptic Review of Past Management Plan

Sakteng Wildlife Sanctuary was operationalized on 17 April 2003 with the establishment of its head office at Radhi, Trashigang. For timely service delivery and efficient implementation of the conservation programs, three field offices at Merak, Sakteng and Joenkhar were established.

The first management plan was written and approved after five years of its establishment (2008-2013). Most activities were focused on infrastructure development, species conservation and livelihood enhancement through Integrated Conservation Development Program (ICDP). The RGoB, WWF-Bhutan, Tourism Council of Bhutan (TCB), Market Access and Growth Intensification Project (MAGIP) under International Fund for Agricultural Development (IFAD) and BTFEC were the main funding agencies. A summary of program activities implemented and outcomes achieved from the first management plan is provided for reference and future direction.

1.6.1 Infrastructure Development

Considerable effort has been put in building infrastructure and communication facilities. Major achievements include the construction of the head office and staff quarters at Phongmey, and range offices –cum- transit camp at Merak, Joenkhar and Sakteng.

Nine new traditional bridges were constructed to improve the accessibility of the local community especially in the monsoon. Furthermore, a number of trails and mule tracks were maintained. Investment in telecommunication and internet facilities was also made to enhance the efficiency of the Sanctuary staff.

1.6.2 Species Conservation

Advocacy and awareness programs have been pursued rigorously to achieve the objective of species conservation. Regular education on Forest and Nature Conservation Acts and Rules, awareness on the importance of conservation and the need to protect environmental heritage have also been conducted. Specific advocacy and awareness education on the importance of conserving Red Fox, Himalayan Goral, Himalayan Serow, Musk Deer and Pheasants have been conducted repeatedly.

Documentation of a few important species has also been initiated to promote species conservation. A detail study on distribution, habitat use and threats of Red Panda was conducted to provide relevant policy recommendations and develop conservation action plans for SWS. This research finding has helped the management to secure a rangeland management project for the herders of Merak from the DARWIN Initiative Fund UK. Recording of 37 mammal species in the 2015 terrestrial biodiversity survey is a good indicator of the effect of awareness and anti-poaching conducted as the plan prescription.

1.6.3 Integrated Conservation and Development Program

ICDP was initiated to generate community support in species conservation and resource management. Activities ranged from supply of agricultural inputs such as improved seeds, agricultural tools, and polyhouses to supply of subsidized solar lamps and Corrugated Galvanised Iron (CGI) sheets for roofing. A total of 628 households have been roofed with CGI sheets through donor support on a cost sharing basis. Additionally, 32 polyhouses have been supplied to individual household and schools for vegetable production.

A total of 46 households have been provided with wash basins, geysers and toilet pots to promote homestay development in the villages. Construction of five tourist campsites at different locations and development of new eco-trails and trail maintenance have been carried out to promote ecotourism in SWS.

1.6.4 Livelihood Enhancement

The SWS have provided homestay management and chef training in addition to supply of agricultural seeds and polyhouses as a part of livelihood enhancement program.

The department of livestock has also initiated numerous programs targeted towards enhancing the livelihoods of Brokpa community. Improved yak breeding bulls and milk skimming equipment were supplied through a donor supported project. More than five cooperative groups have been formed to manage products ranging from Dairy to Non Wood Forest Produce (NWFP) from the forest.

1.6.5 Capacity Development

Competent human resource is the key for successful implementation of conservation programs and enforcement of forest rules and regulations. Substantial efforts have been put to develop capable and proficient human resources since last few years. Short trainings in biodiversity and protected area management have been organized. Study tours on ecotourism and rural livelihood initiatives have been provided to all staffs.

1.6.6 Zonation

Zonation was considered imperative for appropriate planning and management interventions as there are numerous settlements and grazing areas spread all across the Sanctuary. This would ensure ecologically functional landscapes to guarantee viable movement of species. Accordingly, the zonation was completed in 2011, declaring 19.7% of the total area as core zone and 80.3% as multiple use zones. Buffer zones were designated outside the Sanctuary area.

Chapter II

ANALYSIS OF ISSUES AND PROBLEMS

2.1 Resource Use, Poaching and Associated Threats

2.1.1 Timber and Firewood Consumption

Annually, significant quantities of timbers have been allotted for rural house construction and maintenance as well as renovation of important religious structures (Figure 9). We also cater to the commercial demand for infrastructure development within the SWS jurisdiction.

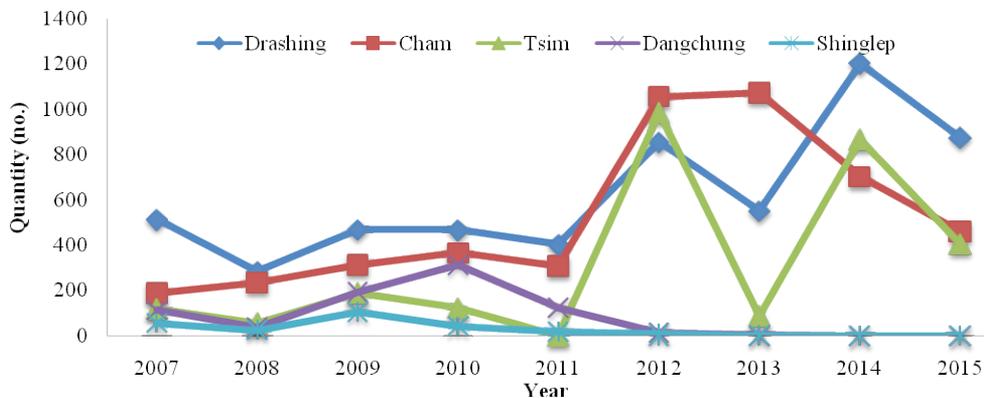


Figure 9: Timber supply trend (2007-2015)

Analyses of past records indicate increasing allocation of timbers to people from outside SWS leading to exhaustion of timber stock. Although electricity connection provides better energy alternatives, people still prefer firewood for cooking and heating purposes (Figure 10).

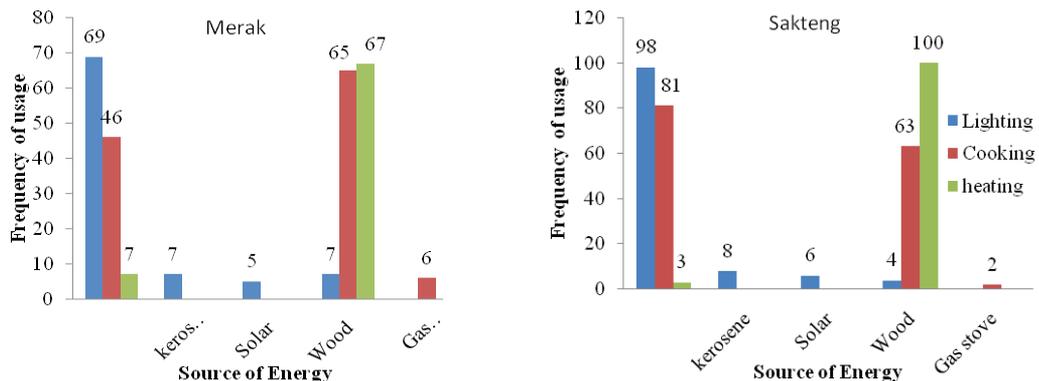


Figure 10: Energy usage in Merak & Sakteng

Consequently, the firewood consumption is significant in all villages in two Gewogs (Figure 11). A substantial amount of firewood is consumed by schools within the Sanctuary. An average of 583.92m³ of firewood equivalent to 292 standing trees are consumed annually (Table 5).



Figure 11: Firewood supply trend in Merak & Sakteng

Table 5: Firewood Consumption in Schools (Merak & Sakteng)

Name of the School	Merak	Sakteng	Joenkhar	Total
Number of Students (2015)	144	288	61	493
Quantity of Firewood Consumed in (m ³)	324.20	195.72	64.00	583.92

2.1.2 Sand and Stone Consumption

In addition to timber and firewood, significant amounts of sand and stone are being collected from the Sanctuary administered areas for construction of government offices and other infrastructures (Figure 12).

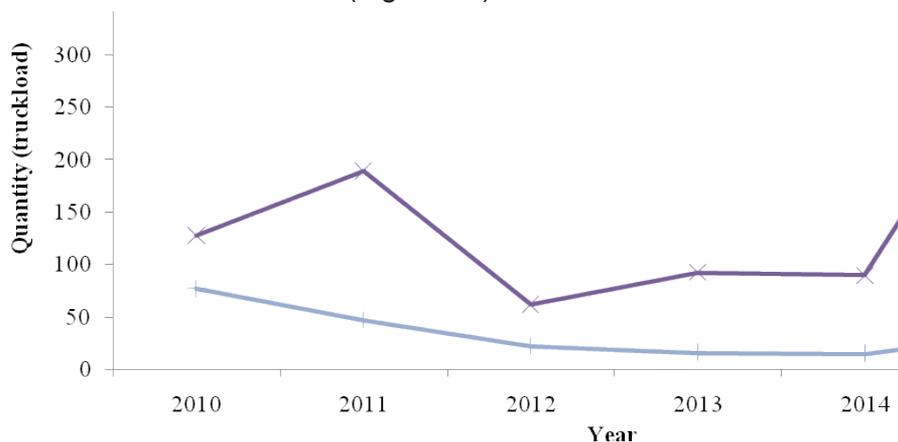


Figure 12: Sand & Stone supply trend

2.1.3 Illegal Activities

The majority of offences in the Sanctuary area are associated with illegal timber harvesting and transportation followed by girdling of trees (Figure 13).

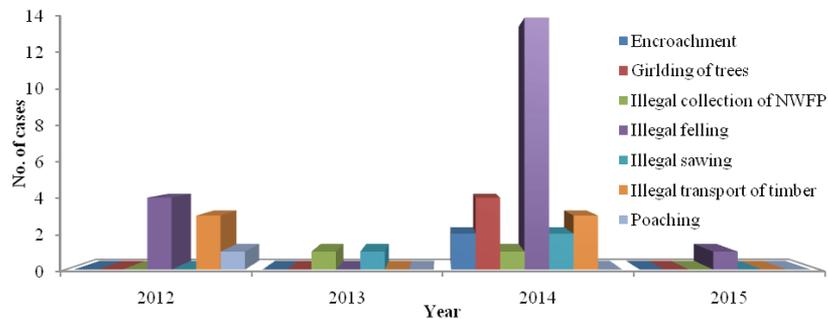


Figure 13: Forest offence trend

While most offences indicates declining trend, the illegal timber harvesting and transportation has significantly increased in 2013-2014 which could be because of the arrival of road accessibility. Also, the risk of poaching cannot be neglected as the people of Merak and Sakteng are often caught carrying unlawful animal products in other places.

2.1.4 Livestock and Grazing

More than 85% of the community depends on livestock farming. Their livestock migrates seasonally from alpine mountains to low lying areas in winter and vice versa in summer. Consequently, the grazing pressure on the forest is immensely high compared to other protected areas. Landuse analysis of SWS shows 38.5% of the total land area is open pasture and it spreads sporadically all across the Sanctuary. Most of this pasture is being continuously grazed with little or no management interventions.

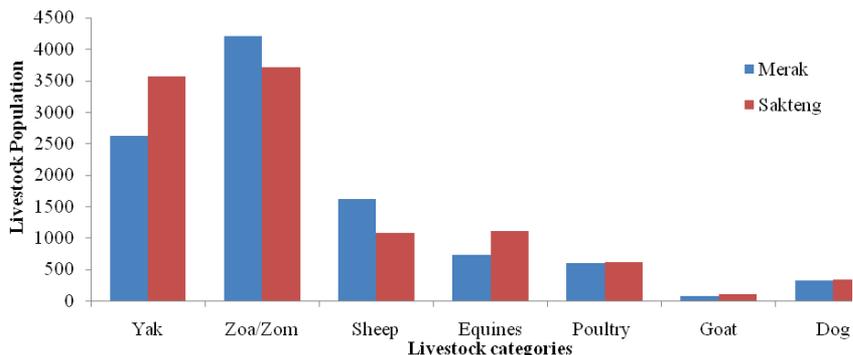


Figure 14: Average Livestock Population in 2 Gewogs

Considering that 75% of the Sanctuary area (554.4 km²) is accessible and 16,941 cattle (Figure 14) are being grazing in the forests, estimated cattle density is 30.5 heads/km² compared to 11.2 heads/km² of national grazing density (RNR Statistics, 2015). However, Sanctuary management should determine the extent of grazing and its impact on certain forest types.

Only about 18% of the total cattle population (n=173) was found productive (milking cow) and rest 82% are unproductive adding tremendous pressure to limited pasture land and natural forests.

People have also raised concerns of a rapid decline in sheep population in several meetings and discussions. Sheep provide essential raw materials for making their traditional dress that is unique from other parts of the country.

2.1.5 Tsamdro (Pasture land)

Tsamdro is the lifeline of the Brokpa community due to limited agricultural land holdings and unfavourable environmental conditions. The yearly increase in the number of livestock population and decrease of grazing area due to invasion of unpalatable plant species exerts huge challenges to the community. Prevalence of continuous unmanaged grazing is a serious threat that needs to be addressed without delay.

The social survey indicates that the community of Sakteng owns more Tsamdro than the community of Merak (Figure 15). However, detailed study needs to be conducted to ascertain the Tsamdro holdings by individual household.

Community responses on sufficiency of Tsamdro (Figure 16) shows that the majority of the people do not own sufficient Tsamdro leading to excessive grazing and degradation of the available Tsamdro. Apart from Tsamdro degradation, continuous grazing also impedes the forest regeneration because of the continuous trampling effect.

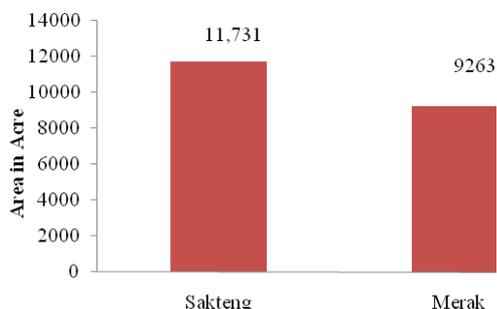


Figure 15: Average total Tsamdro area owned

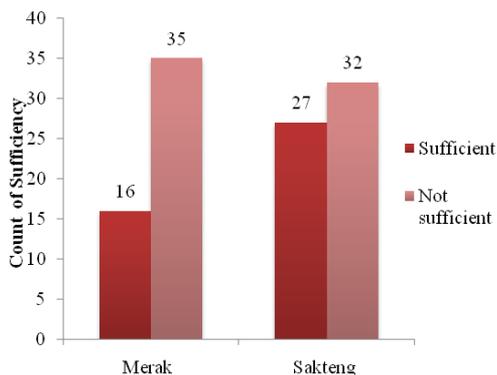


Figure 16: People's Response on Sufficiency of Tsamdro

2.1.6 Livestock Depredation

Frequent loss of livestock to wild predator affects the economy of the herders. An analysis of the social survey report indicates that yak often falls prey to wild predators followed by sheep and Dzo/Dzoms (Figure 17).

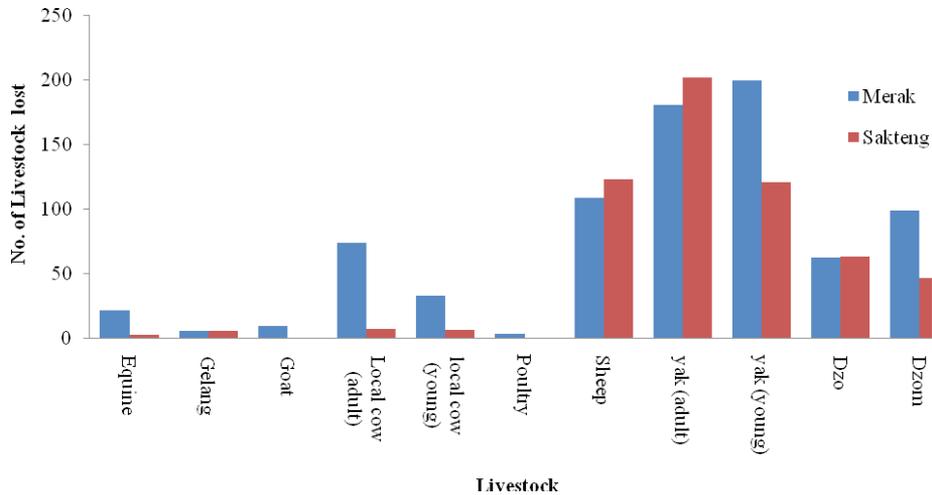


Figure 17: Average no. of livestock loss to wild predators in last 10 years

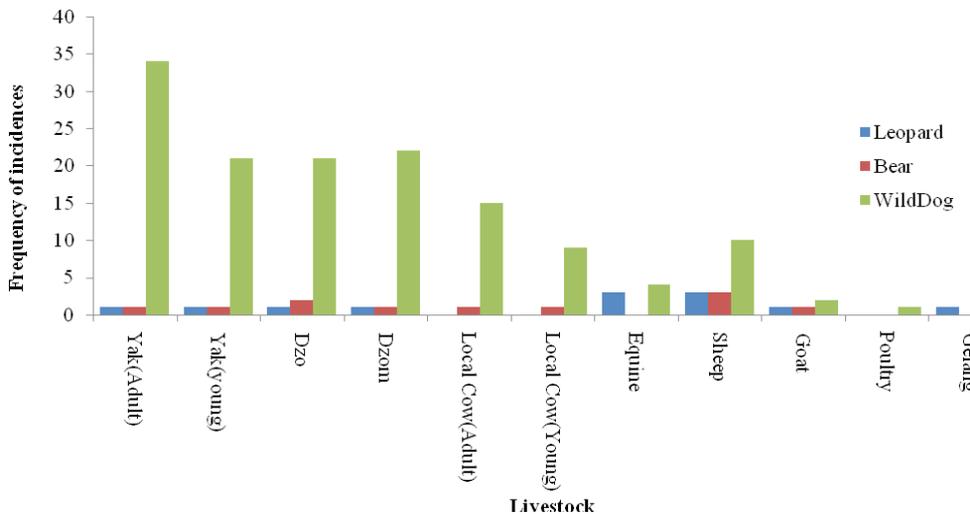


Figure 18: Common Wild Predator of Livestock

Wild Dog is the most prominent predators attacking the livestock in SWS followed by leopard and bear (figure 18). If this issue is not discussed and strategized on time, it will lead to serious human-wildlife confrontations and may suffer negative consequences.

2.1.7 Agriculture and Crop Depredation

Only about 8% of the area is agriculture land and most of this is located in the lower valleys such as Joenkhar, Thrakthri, Tholong, Dak, Khashiteng, Kheliphu and Murbee community. Agriculture land holdings by individual household are minimal compared to other communities of the same Dzongkhag who practice subsistence farming.

Despite small land holdings, people grow cereals such as maize, buckwheat, barley and dry land paddy for self-consumption. Additionally, they also grow seasonal vegetables like potato, cabbage, spinach, cauliflower, broccoli, radish, and pumpkin to be marketed (Figure 19). Those households owning little agriculture land in the higher altitude grow a few varieties of vegetables that cope with harsh climatic conditions. Apart from insufficient land to grow agricultural crops, significant damages from wild and domestic animals makes people reluctant to invest in agriculture (Figure 20).

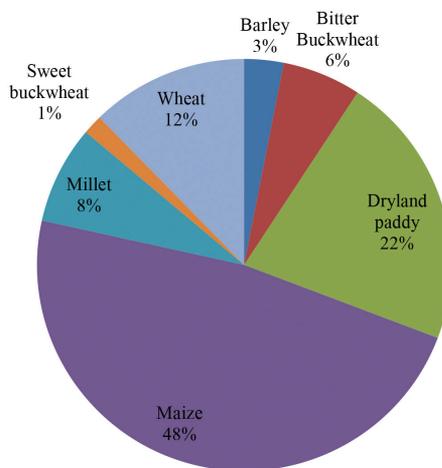


Figure 19: Cereals grown by the community

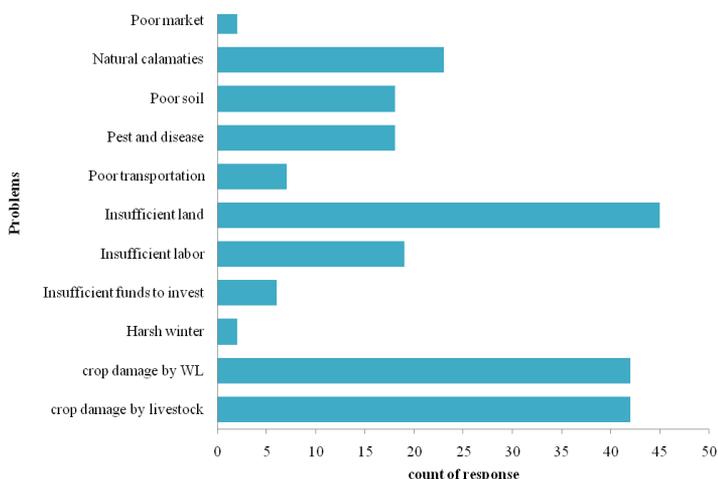


Figure 20: Major issues/problem with agriculture farming

The highest crop depredation by wild animal has been reported in villages under Sakteng. Merak receives minimal nuisance from wild animal to their agriculture crops and also very few HHs practice agriculture farming. Porcupine is reported as most destructive animal attacking their crops followed by monkey and wild boar (Figure 21).

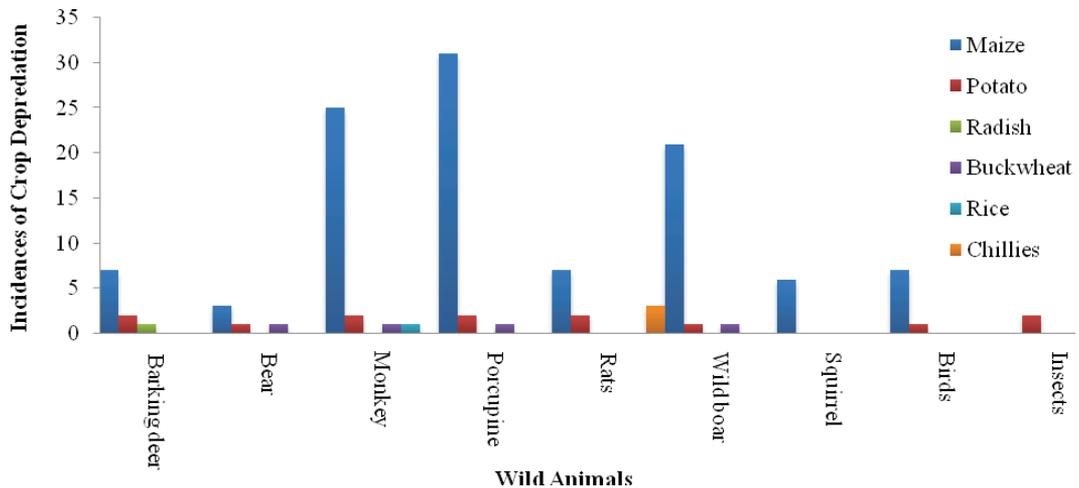


Figure 21: Crop Depredation, Preferred Crop and Problem Wildlife Species

2.1.8 Livestock Population

Figure 22 is generated based on the livestock statistics 2007-2015 published by the department of livestock, MoAF.

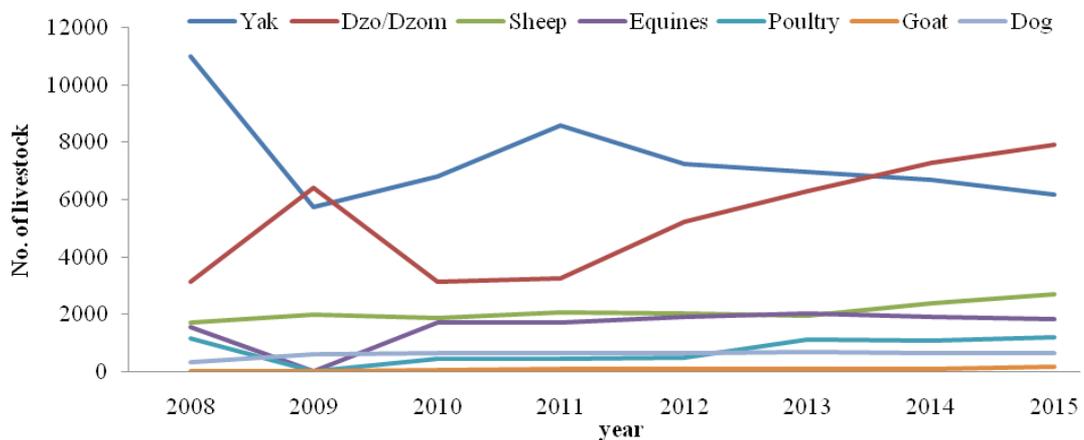


Figure 22: Livestock Population Trend in Merak & Sakteng

From the figure, it can be concluded that there is a decrease in the yak population where as the population of Dzo/Dzom has increased rapidly. The poultry population has also increased in both the Gewogs.

Specific studies need to be carried out to find the change in the livestock rearing pattern and trend by the people of Merak and Sakteng. The population dynamics of the livestock will help in proper management of the natural resources by studying the feeding habits and the migratory pattern to emphasize on coexistence of wild animals and human beings.

2.2 Environmental, Biodiversity and Species Conservation threats

2.2.1 Habitat Fragmentation

Habitat fragmentation is one of the most detrimental driving forces for loss of biodiversity. Livestock grazing, construction of road, hydropower transmission line, and over exploitation of forest produce are major factors contributing to habitat fragmentation in the Sanctuary.

2.2.1.1 Road and Hydropower Transmission Line

Roads and hydropower construction is inevitable for economic development. Numbers of farm roads have been constructed in the recent years passing right through the Sanctuary. Clearing of forests and dumping of muck and debris is a major cause of habitat fragmentation leading to restriction of wild animal movements and inbreeding.

Apart from habitat fragmentation, pressures on forest resources have increased drastically due to easy accessibility. Further, the timber demand from adjoining Gewogs has increased manifold leading to depletion of timber resources in the area.

2.2.2 Species

Lack of knowledge and information on species population and their habitat associations is the key factor that seriously hampers the implementation of species conservation initiatives.

Often policy strategy and conservation initiatives are flawed because of lack of insight into species and associated parameters. Species persistence and dispersal is the primary goal for any PAs. Tree species such as *Quercus semecarpifolia*, *Michelia* spp., *Pinus bhutanica*, *P. roxburghii*, *Picea spinulosa* and *Taxus baccata* are highly preferred timber and firewood species sought after by the people. However, these species have become major causes of concern for the SWS management.

Quercus semecarpifolia: Natural growth of this species is concentrated only along Gam-ri in the upper ridge of Sakteng valley. It is the most preferred firewood species for the local residents yet their regeneration ecology is poorly documented and understood.

Michelia spp.: Champ is considered as one of the finest timber species for furniture and house construction in Bhutan besides Teak. Its high timber value and extensive demand has led to over exploitation in the accessible natural habitat. The regeneration ecology and management aspect of this species is also limited especially for SWS area.

Picea spinulosa: Spruce in general is not a cause of concern for forest conservationist but in SWS, it is locally rare and endangered. Only countable numbers of immature Spruce trees can be seen around Pussa village under Sakteng Gewog.

Pinus bhutanica: Few stands of Bhutan pine is grown mostly in the lower altitude in the sloppy area. However, poor regeneration status was recorded.

Pinus roxburghii: Only a few patches of Chir pine forest are observed in the lower altitude in association with broadleaved species. This species is gradually being replaced by fast growing broadleaved species and may be extinct completely from the area. Appropriate management interventions can save the Chir pine from local extinction.

Taxus baccata: This totally protected plant species listed in Schedule-I of FNCA of Bhutan (1995) is a blessing to SWS. However, this species is categorized as least concerned in the IUCN red list of threaten species. The species is found in Europe up to northern Iran and in northern African countries of Morocco and Algeria (Farjon, A. 2013). On the other hand *Taxus wallichiana* (Himalayan Yew) native to Himalaya and parts of south-east Asia is listed as endangered in IUCN red list of threatened species (Thomas, P. & Farjon, A. 2011). Therefore, there is need to confirm specific epithet of the *Taxus* species found in SWS.

2.2.2.1 Poaching of Flora and Fauna

While offences trends indicate a decline, it is understood that poaching of flora and fauna still prevalent within SWS jurisdiction. It is mainly because of people's constant interaction with nature for daily sustenance. The majority of people remain in the forest with their livestock throughout the year and chances of their encounter with wild animal are exceedingly high. Additionally, emergence of lucrative unlawfull markets for animal and medicinal plant species encourages people to engage in poaching activities.

Medicinal plant species such as *Paris polyphylla*, *Aconitum* spp., *Rhododendron* spp., *Swertia chirata*, *Gentiana* spp. and *Panax pseudogensing* are rampantly poached for easy money. Similarly, the excessive collection of incense raw materials, wood burr and Daphne for traditional paper making pose significant threats to the sustainability of these NWFP species.

Chapter III

VISION AND OBJECTIVES

3.1 Vision

Conserve the assemblage of Eastern Himalayan Ecosystem and Unique Cultural Heritage to maintain Ecological Integrity and Social Wellbeing.

3.2 Mission

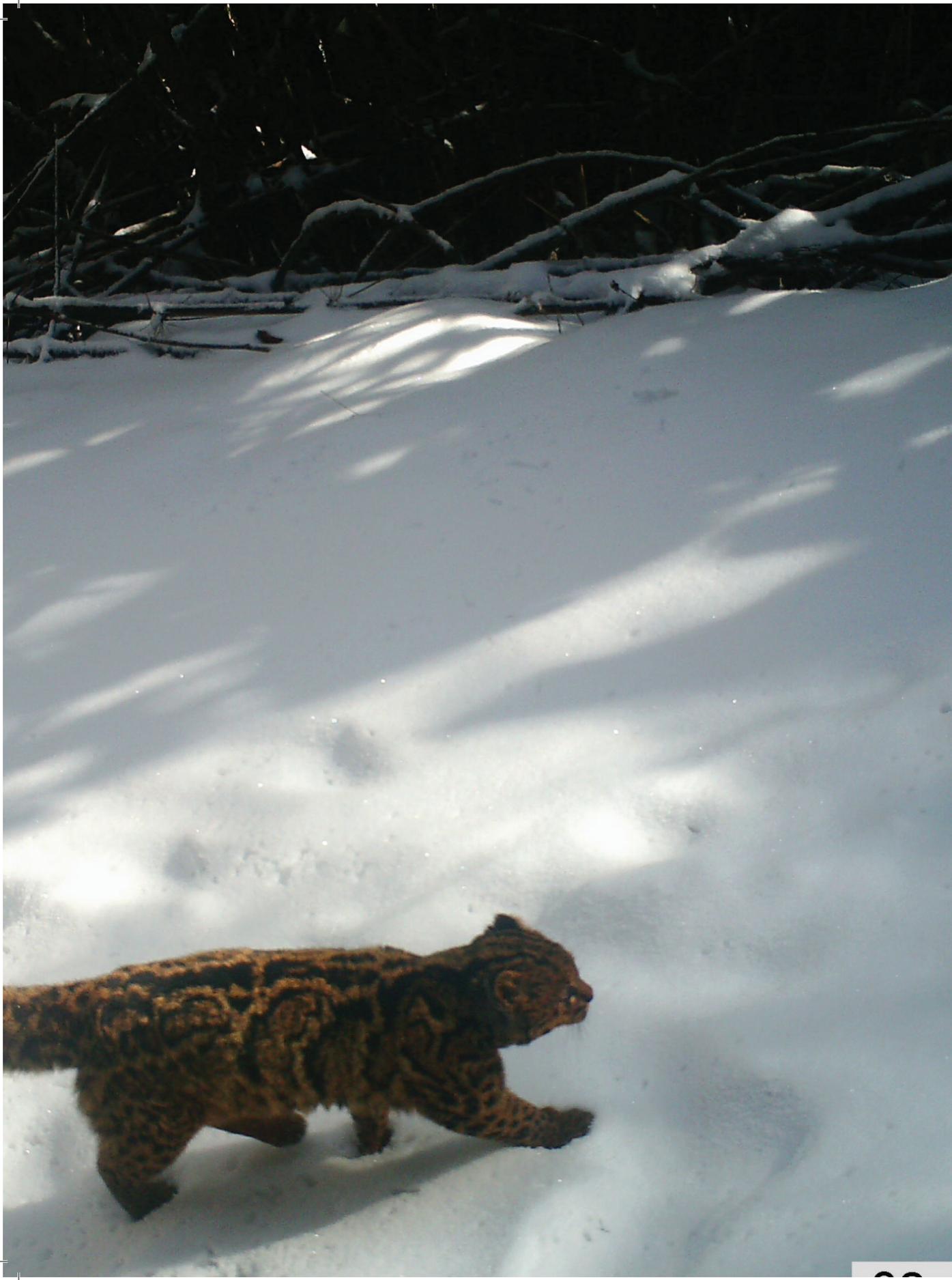
Maintain the representative biodiversity of Eastern Himalayan Ecosystem through scientific management and promotion of culture while enhancing local livelihoods through nature based enterprises and community ecotourism initiatives.

3.3 Goal

Ensure ecological integrity and enhance local economy with minimum impact on age old culture and tradition of local people.

3.4 Conservation Objectives

1. Protect and rehabilitate important habitats and watersheds including grazing lands.
2. Alleviate human wildlife conflict through strategic programs.
3. Promote unique culture and traditions of the local people.
4. Enhance livelihood of the local people without compromising age old culture and tradition.
5. Promote and facilitate research, education and awareness.
6. Provide maximum protection to representative ecosystems through building strategic conservation programs for keystone/flagship species.
7. Ensure sustainable utilization of natural resources through appropriate strategies and management plans.
8. Initiate climate change adaptation programs.
9. Enhance competency and the institutional capacity for efficient service delivery and Sanctuary management.
10. Monitoring and evaluation of programs and activities in line with Bhutan Management Effectiveness Tracking Tool Plus (METT+).



Chapter IV

ZONING AND IT'S OBJECTIVES

Considering the uniqueness of protected areas with people residing inside the park, participatory based zoning is considered an integral part of management tool to balance social and ecological aspects of the PA. Participatory zoning is not only restricted in designation of an area for specific use but rather it is an agreement on location, area user rights, duties and responsibilities of all stakeholders and serves as a clear division of roles and working agreements among all stakeholders.

The Sanctuary management has successfully conducted its participatory zoning in 2011 and demarcated core, multiple use and buffer zones to meet specific objectives (Figure 23).

In addition to three zones, the Sanctuary will further designate a special protection zone based on emerging needs to protect and conserve critical watershed areas and habitat of concerned species in future.

4.1 Core Zone

Core zone is an area where any kind of anthropogenic activities are strictly prohibited except regulated scientific studies for implementing successful conservation initiatives. The core zone represents all types of ecosystem primarily designated to protect, conserve and promote the ecological integrity of one or more ecosystems for present and future generations.

Participatory zoning for SWS (2011) has demarcated eight core zones covering 19.73% (146.08 km²) of the Sanctuary based on endemism, richness of biodiversity and pristine wild habitats for globally significant species of flora and fauna. Further, these core zones are clustered into three groups based on their ecological connectivity to each other (Table 6).

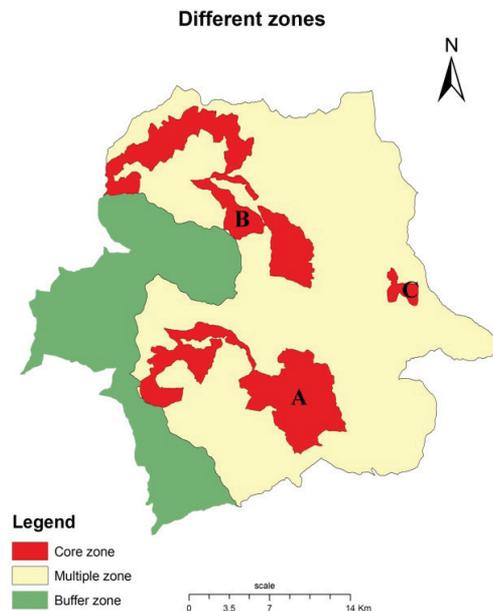


Figure 23: Zonation Map of SWS

4.2 Multiple Use Zone

These zones are intended to cater for all types of goods and services obtained from nature that contributes to local people’s livelihood on sustainable basis. Areas within the Sanctuary that are not included in core zones are designated as the multiple use zones (80.3%). Activities like recreation/eco-tourism, sustainable use of natural resource and grazing by the traditional right holders are permitted in this zone with constant monitoring from the Sanctuary management.

Table 6: Zone details

Clusters	Location of the zone	Vegetation type	Way forward
A	Yanglay-Yangchung	Cool broadleaved to Alpine forest	Ground verification works need to be carried out to redefine and re-designate specific objectives to respective core zones based on specific ecological importance of the locality.
	Merak	Conifer forest	
	Jomo Phodrang	Conifer to Alpine forest	
B	Dorbrok	Mixed conifer to Alpine forest with good growth of bamboo	
	Pherilock	Cool broadleaved, Conifer to Alpine forest	
	Baythangtse	Cool broadleaved to Mixed conifer forest	
C	Gelong phukpa	Warm broadleaved to Temperate forest	
	Dalam	Fir forest	

4.3 Buffer Zone

The buffer zone is a stretch of area adjacent to the legal boundaries of the established Sanctuary to provide extra layers of protection to minimize biotic pressure from outsiders. Participatory zoning (SWS, 2011) has demarcated the remaining portion of Merak and Sakteng Gewogs as a buffer zone. However, such zones were not designated to the northern and eastern part of the Sanctuary owing to international boundaries with Indian state of Arunachal Pradesh.

Monitoring and regulation of sustainable use of natural resources in such zones are conducted by the management of the Sanctuary although its area is not included into its legal jurisdiction.

The southern part of the SWS which falls within the jurisdiction of Samdrup Jongkhar district was left without buffer zone during the 2011 zoning despite the rich subtropical habitat.

4.4 Special Protection Zone

The primary objective of establishing the proposed special protection zones is to protect, conserve and promote biodiversity and wild habitats that are degraded. Such zone can be established in any part or within the multiple use and buffer zones to restore the degrading ecosystem and biodiversity.

Chapter V

THE CONSERVATION MANAGEMENT PLAN

5.1 Guiding Principles for Plan Implementation

1. This document is in addition and not substitute to all other Act, Rules and Regulation of the Royal Government of Bhutan and must be abide by any amendments and revision made thereof.
2. The Royal Government is already overburdened by priority development activities and meeting recurrent cost of the Government institutions. Hence, funds for the program prescribed in this plan should be as far as possible met from potential donors.
3. The plan has been formulated for ten years with intent to provide the managers with ample time for writing proposals, securing funding and timely implementation of plan prescriptions.
4. The prescribed programs should be reviewed and revised annually to accommodate any changes in policy, environment, overall Five Year Plan of the RGoB and Department.
5. In accordance to the programs outlined in this document, annual work plans should be prepared and review periodically in line with the Individual Work Plan (IWP) and Annual Performance Appraisal (APA) system adopted by the RGoB.
6. For effective implementation of the management plan and to fix accountability, SWS management should assign focal persons to monitor and evaluate the implementation of management plan prescriptions.

5.2 Legislation

This management plan draws its legal mandates from the Forests and Nature Conservation Act (1995), Forest Policy (2011) and subsequent Forest and Nature Conservation Rules (2006). By default, the management of the Sanctuary will be determined by subsequent changes in any of these above mentioned legislative tools. Furthermore, mandates and functions of the Sanctuary will also be drawn as per the relevant sections of the Land Act (2007).

5.3 Management Plan Prescription

In this section, we outline the strategic plan prescriptions to address social and conservation issues, and local people's expectation discussed in Chapter II to achieve the vision and overall goal of the SWS.

5.3.1 Insufficient Tsamdro (Pasture land)

5.3.1.1 Rationale

More than 85% of the Brokpa community are pastoralist herding their cattle in the open forest. Of the total Sanctuary area, only 38.5% is open pasture supporting an estimate of 16,941 cattle heads. Continuous grazing by livestock is considered as the main cause of Tsamdro degradation but there is no substantial data available to support the statement.

An analysis of past livestock records indicates an increasing population trend; however, authentication needs to be done as people never report the correct number of livestock during the time of census. On the other hand, the area of Tsamdro remains more or the less same and at times gets reduced due to invasion by unpalatable plant species. Livestock grazing has always been an important issue for the PA management. Generally, it has been observed that over grazing has a negative impact on the ecological stability and provides significant competition to the wild ungulates for food.

5.3.1.2 Policy Objectives

1. To rehabilitate degraded Tsamdro to enhance fodder production and promote fodder sustainability within SWS.
2. To encourage the local community to rear productive improved breeds of cattle to reduce impact on limited pasture land.

5.3.1.3 Implementation: Actions and Guidelines

1. Initiate the leasing of reverted Tsamdro/pasture land to communities of Merak and Sakteng.
2. Identify degraded leased Tsamdro and acquire user consensus to initiate silvopasture development.
3. Conduct grazing carrying capacity study and bring degraded rangeland under scientific management purview.
4. Rehabilitate degraded leased pasture land/rangeland through planting fodder trees, bamboo species and suitable grass species for improved fodder production.

5. In collaboration with DoL, supply of improved breed cattle will be initiated on pilot basis to reduce free forest grazing and increase diary production.
6. Initiate stall feeding and supply fodder trees to intensify on-farm cattle management and offset fodder shortages.
7. Initiate agroforestry on pilot basis in the leased pasture land to offset fodder shortages and intensify on-farm cattle management.

5.3.2 Human-Wildlife Conflict – Crop Depredation

5.3.2.1 Rationale

Maize is the main cereal crop grown in the lower part of the Sanctuary. Settlements are interspersed often by forested areas making it easy for the wild animal to raid crops. Because of the limited land holdings, even slight incidences of crop depredation cause serious problems of food insecurity to the community residing inside SWS. Wild Pig, Porcupine, Monkey and Asiatic Black Bear are the problematic wild animals that raid crops at regular intervals in addition to domestic animals.

The issue of human-wildlife conflict in the form of crop loss is gaining top priority at the national level. The loss of crops to wild animals is considerably high despite sleepless nights being spent guarding crops. Often strong conservation policy gets blamed by the rural farmers. Nevertheless, appropriate management interventions will not only help the local community to increase food self sufficiency but also ensure a resilient farming community who would steward our biodiversity and species conservation.

5.3.2.2 Policy Objectives

1. To minimize human-wildlife conflict to improve food security and decrease criticism of conservation efforts.
2. To consolidate conservation landscapes within the core and multiple use zones of the Sanctuary and promote species conservation through active involvement of local people and engagement of relevant stakeholders.

5.3.2.3 Implementation: Actions and Guidelines

1. In collaboration with Dzongkhag Agriculture Sector, identify suitable sites for installation of electric/solar and alarm fencing of the agriculture land on pilot basis.
2. Provide training on installation of electric/solar and alarm fencing to the local community.

3. Pilot crop insurance schemes in worst affected areas by organizing consultative stakeholder workshop involving all relevant stakeholders. Form groups and define by-laws and governance mechanisms to verify claims.
4. Where feasible, the SWS should source funding to provide seed money for such insurance schemes.
5. Conduct a feasibility study to grow additional crops with maize in collaboration with the agriculture sector.
6. Initiate pilot horticulture farming for sustainable production of agricultural products to meet food self-sufficiency.
7. Upscale the horticultural farming initiatives to rest of the communities inside the Sanctuary by engaging donors and actively sourcing the required funds.
8. Supply high yielding varieties of crops, fruit trees and vegetable seeds.
9. Supply polyhouses to high altitude community for growing vegetables.
10. Conduct ecological study of the problematic species to develop appropriate strategy and action plans.

5.3.3 Human-Wildlife Conflict – Livestock Depredation

5.3.3.1 Rationale

Protected areas are the cornerstone of biodiversity conservation and ecosystem management. PAs in Bhutan are considered very unique with people residing inside the core zone of parks and wildlife sanctuaries. The concept of PA management in Bhutan is supposedly derived from the Buddhist philosophy of living in harmony with nature ensuring mutual benefits in perpetuity. Esteem reverence to animal by people can be drawn from statues and many paintings engraved on walls of monasteries all across the country.

Over the time, the commencement of payment of financial compensation for livestock kill by few wild animals have jeopardized the long built reverence and harmonized coexistence concept in the Bhutanese society. Now, people have become less tolerant to livestock attack made by wild predators. Often the wild predators get killed in retaliatory responses.

Because of the grazing regime adopted by local people and their constant interaction with nature, the chances of human-wildlife conflict are exceedingly high. Prevalence of livestock kill by wild animals is enormous but people seldom report the case in absence of compensation schemes.

5.3.3.2 Policy Objectives

1. To ensure the harmonized coexistence of species and local community through minimization of human-wildlife conflicts.
2. To develop a suitable strategy and action plan to reduce human-wildlife conflict and enhance species conservation support from the local community.
3. To explore and support livestock product diversification, packaging and marketing to enhance income generation.
4. To build community appreciation of wildlife and biodiversity through sustained environmental education programs.

5.3.3.3 Implementation: Actions and Guidelines

1. Assess the seriousness of human-wildlife conflict in all the villages and species involved in livestock depredation.
2. Initiate pilot strategies to mitigate livestock depredation.
3. Initiate livestock insurance schemes in worst affected areas. Form village livestock insurance committee and define by-laws and governance mechanisms to verify claims.
4. Provide training on kill identification and verification in the field.
5. Where feasible, SWS should source funding to provide seed money for such insurance schemes.
6. Upscale successful initiatives by engaging donors and actively sourcing the required funds.
7. Conduct ecological study of problematic species to develop appropriate strategy and action plans.
8. Support the formation of livestock cooperatives, product development and packaging.
9. Provide training on livestock product development and packaging.
10. Upscale SMART patrolling with well-equipped hardware, software and equipment.
11. Construct check points at strategic locations.

5.3.4 Preservation and Promotion of Culture and Traditions

5.3.4.1 Rationale

Preservation and promotion of culture and traditions is one of the important pillars of Gross National Happiness. The strong upholding of rich culture and traditions by the Bhutanese so far has helped the kingdom of Bhutan maintain its sovereignty. Many foreigners visit Bhutan just to witness the unique culture and traditions of the Bhutanese society.

The unique culture and historical importance of the Brokpa community is described in Herdman's dilemma by Karma Ura (1999). Because of its breathtaking landscape and unique culture, SWS was proposed as a mixed world heritage site. It is one of the PAs in Bhutan that made it to the tentative list of UNESCO world heritage sites in 2013. Brokpas are distinct from the rest of the Bhutanese because of their unique costumes consists of (male) *Namcho yutangproe* (turquoise earrings), *Tshokha chuba* (red/black wool jacket), *Paktsa* (animals hide wear above *Tshokha chuba*), *Khupthen* (round woollen piece dangles from belt), *Kangho* (woollen half pant), *Pishup* (leather trousers) and *Pulham* (leather boots). Female dress is called *Shingka* (cotton gown), *Todung* (cotton shirt), *Lhemba* (woollen raincoat), *Meykem* (woollen cloth dangling below abdomen in back) and *Tshemlham* (boots made of leather and wool). The most distinctive part of the *Brokpa* outfit, however, is the unique *Tsetpu zham* (felt hat with five fingers like projections). These costumes are made from animal hides, sheep and yak wool.

PAs are not only responsible for landscape and species conservation but also entrusted to promote the preservation of culture and traditions of the local community. With the advent of modern facilities and cheap alternatives to traditional costumes, the unique culture of Brokpas is increasingly under threat. Therefore, we propose a number of activities gearing towards promotion of their unique culture and heritage that can be achieved in the next few years.

5.3.4.2 Policy Objectives

1. Promote local culture and traditions through providing support to restore important cultural and religious sites.
2. Ensure the promotion of traditional aesthetics of villages under SWS to encourage increased ecotourism.
3. Revive and stimulate the production of home made costumes through increased wool production.

5.3.4.3 Implementation: Actions and Guidelines

1. Assessment and mapping of important cultural and religious sites within SWS.
2. Documentation of local culture, folk tales and traditional knowledge in collaboration with local community and concerned authorities.
3. Support restoration of important cultural and religious sites by actively sourcing funds from potential donors.
4. Conduct awareness to local communities on the importance of preservation and promotion of traditional Bhutanese architect.
5. Carry out shingle/shinglep roofing over CGI sheet to restore the traditional aesthetic of the Merak and Sakteng villages.
6. Pilot the shingle/shinglep treatment with appropriate wood preservatives to enhance its durability.
7. Upscale the shingle/shinglep treatment initiatives to both the villages of Merak and Sakteng on cost sharing basis.
8. Actively source funds to support the supply of sheep and improved yak breeds for wool production.
9. Support a feral dog control program in collaboration with relevant stakeholders.
10. Identify site for construction of a Nature, Culture and Historical Museum to document and promote unique cultural and traditional heritage of the local community.
11. Support the construction of a Nature, Culture and Historical Museum by sourcing adequate funds.

5.3.5 Meeting Resource Needs Sustainably and Promote Conservation Stewardship

5.3.5.1 Rationale

Estimates of 5000 people live in 772 households in 13 villages of two Gewogs within the Sanctuary. These communities are predominantly semi-pastoralists and depend on the forest resources for food and energy. Only a few communities residing in the lower altitude practice subsistence farming owing to shortage of landholdings. Non-wood forest products such as *Paris polyphylla*, *Aconitum* spp., *Rhododendron* spp., *Swertia chirata*, *Gentiana* spp., Mushroom and Bamboo help to supplement their diet and incomes. Further, almost 37.5% of the total area is open pasture land and almost 75% of the total area is accessible to grazing. There is a need to ensure that forests and landscapes therein are utilized on a sustainable level.

Apart from significant demand of timber and firewood from the community within the Sanctuary, the demand for such products has also been steadily increasing from the adjoining communities.

5.3.5.2 Policy Objectives

1. Ensure and enhance access to natural resources for the rural communities inside the Sanctuary in a sustainable manner without harm to the health and integrity of ecosystem.
2. Ensure sustainable utilization of forest resources to guarantee a functional landscape for wild species.
3. Ensure the national goal of maintaining 60% forest cover for all times while resources needs of the local community are met.
4. Lobby and promote conservation stewardship in the mindset of the community through active involvement in livelihood enhancement initiatives.

5.3.5.3 Implementation: Actions and Guidelines

1. Assessment and mapping of timber and non-timber resources availability within SWS for developing sustainable utilization plan.
2. Conduct timber resource inventory and develop sustainable harvesting plan for the buffer and multiple use zones.
3. Explore appropriate wood treatment technology and initiate the wood treatment to increase wood durability.
4. Initiate solar water heating system for cooking and warming the houses.
5. Explore and pilot the biogas production for cooking.
6. Explore and initiate the wood briquette production on pilot basis for cooking and heating to reduce the fuel wood consumption.
7. Supply improved heating and cooking stove in conjunction with wood briquette.
8. Liaise, discuss and plan bi-annually with adjacent Divisional Forest Office on resource allocation sites and agree on resource allocation responsibilities and timetables.
9. Explore demand and availability of medicinal and aromatic plant (MAP) species in collaboration with the Institute of Traditional Medicine Services (ITMS).
10. Conduct awareness programs to educate local community on the harvesting methods and guidelines of NWFPs.
11. Support the formation of NWFP management groups to reduce illegal harvesting of NWFPs and promote its sustainability.

12. Rigorously promote NWFP-based and cottage industries through providing appropriate training on processing and packaging. Communities will be trained on making range of unique handicraft products from locally available materials and innovative marketing strategies will be developed.
13. Streamline marketing of NWFPs that are not consumed within Bhutan in coordination with relevant stakeholders.
14. Evaluate and revise an existing NWFP and community forestry management plan that is due for expiration in 2019.
15. Provide alternative cooking and heating equipment (electric pressure cookers & improved heating stoves) to schools and religious institutions to reduce pressure on forest resources.
16. Initiate Environmental Stewardship Award to recognize individuals or community for their extraordinary contribution towards conservation. Award will be bestowed based on developed criteria.

5.3.6 Promote Ecotourism and Recreation

5.3.6.1 Rationale

Bhutan is a much aspired destination to many affluent foreigners because of widely accepted environmental leadership, pristine ecosystem, unique cultural heritage and biodiversity hotspots. The majority of tourists visit Bhutan to witness cultural diversity and festivals. Only a handful of tourists come for nature based tourism to enjoy the unique landscapes, pristine ecosystem and species diversity. This is mainly because of poor packaging and marketing in regards to wildlife and nature based tourism by the tour operators.

Presence of spectacular beauty and fascinating wild flora and fauna makes the PAs, some of the finest destinations for tourists. Culturally significant sites and unique local communities add to this potential. Promoting this will not only help diversification of services offered by Bhutan's tourism sectors but also help distribute income from tourist to communities within and around PAs.

There is also increasing understanding of the need to make PAs in Bhutan self sustaining in the long run. Charging nominal usage fees from tourists for availing facilities and services inside the PAs will contribute towards fulfilling this objective. There is growing enthusiasm among the affluent and middle class Bhutanese to visit unexplored places for recreation. Such an initiative from the Sanctuary will also ensure the recreation requirements of these growing enthusiasts.

5.3.6.2 Policy Objectives

1. Provide high quality and innovative nature and community based tourist packages within the Sanctuary to diversify the services offered by Bhutan's tourism industry.
2. Contribute to the preservation and promotion of culturally and ecologically significant sites.
3. Contribute to enhancement of community and income through implementation of attractive tourist packages.

5.3.6.3 Implementation: Actions and Guidelines

1. Identify and institutionalize one local festival each for two Gewogs and package it into tourism products to be sold annually.
2. Conduct feasibility study for development of birding facility, hiking and biking trails and other adventurous tours.
3. Develop roughly 35 km of biking -cum- trekking trails connecting Merak and Sakteng via Nyakchungla pass.
4. Develop biking -cum-eco trail around the village of Merak and Sakteng for the visitors.
5. Develop ecological garden nearby the settlement of Merak and Sakteng and an amusement park with rhododendron garden at Sheytami.
6. Develop at least three birding and hiking trails within the SWS to promote nature based ecotourism.
7. Construct one Ecological and Biodiversity Educational Hub within SWS to promote environmental and species conservation education and awareness.
8. Provide support to organize annual festivals, biking and trekking cross country for first three years after the operation.
9. Install signage (at least 25) at every entry points for visitors' awareness and education.
10. Maintenance of existing trails and campsites with modern amenities will be developed to cater to the increasing visitors.
11. While developing campsites, low cost climate smart structures will be considered to showcase and create awareness to local communities on the importance of building climate resilient structures.
12. Initiate the introduction of snow trout into the high altitude lakes of SWS to explore the possibility of high end fishing.
13. Possibility of skiing, paragliding and high end fishing will be explored for affluent tourists visiting the country. Separate packages for this high end amusement travel will be developed based on the pilot experiences along with required infrastructures at the site.

14. Where feasible, treks and other tourist packages will be managed by the communities. For this, agreements and strong actionable by-laws will be drawn and developed for smooth functioning.
15. Trails and campsites handed to the local communities will have to be maintained by the community from the accumulated fees and benefits.
16. Campsites and other infrastructures (other than those managed by communities) will be regulated, maintained and managed by the SWS authority.
17. Climate smart sanitary facility with modern amenities will be developed along the trails and at the campsites.
18. Develop sauna facility at Merak and Sakteng for visitors as well for local communities.
19. The Sanctuary staff will monitor all trekking routes, biking trails and camping sites on regular basis to ensure rules compliance.
20. Garbage pits for organic waste will be constructed along trekking routes, biking trails and campsites but non-biodegradable waste should be carried out of the Sanctuary.

5.3.7 Ensuring Species Persistence

5.3.7.1 Rationale

The sole objective of declaring any protected area is to ensure species persistence in the landscape. However, the conservation should not override people's livelihood sustenance. An understanding of species, socio-economic conditions and landscapes along with threats from poachers and other factors should support strategies aimed at ensuring species survival.

5.3.7.2 Policy Objectives

1. Ensure species survival by maintaining ecological integrity and landscape productivity with vibrant support from local community.
2. Develop effective conservation strategy and action plans based on strong scientific database and complete understanding of species ecology.
3. Generate strong conservation support from local community through vigorous conservation education and developing citizen scientist by actively involving community in the species research.

5.3.7.3 Implementation: Actions and Guidelines

1. An ambitious research program will be initiated with the aim to understand species, landscapes and threats to conservation. The result of the research will be used for further refinement of zonation of the Sanctuary to define appropriate management intervention.
2. For the next ten years, we will focus our species research on:
 - a. Takin
 - b. Royal Bengal Tiger
 - c. Red Panda
 - d. Musk Deer
 - e. Blyth's Tragopan
 - f. Wild Dog
 - g. Himalayan Black Bear
3. Further, we will also conduct research on following tree species to understand their ecology and ensure sustainability within the Sanctuary.
 - a. *Pinus roxburghii*
 - b. *Pinus bhutanica*
 - c. *Quercus semecarpifolia*
 - d. *Picea spinulosa*
 - e. *Michelia* spp.
 - f. *Taxus baccata*
4. Research on small mammal, herpetofauna, butterfly and fresh water biodiversity
5. Habitat management such as creation of salt licks and waters holes, restoration of alpine lakes and ponds, restocking of alpine grasslands by clearing rhododendron bushes, and ecological thinning and sanitation felling in the core zones will be carried out.
6. Suitable fruit bearing tree species, bamboo species and banana species will be planted in the core zones and multiple use zones to improve the food availability for wild ungulates and avifauna.
7. Conduct regular forest fire awareness campaign and creation of fire lines in the fire risk areas.
8. Revision of zones and designation of special protection zones in the Sanctuary will be carried out based on the research results for effective management interventions.
9. Quantification of ecosystem services provided by conservation landscapes and the impact of climate change on such services.

10. Regular patrols will be conducted with improved technology (SMART patrolling) to curb the poaching of species.
11. Initiate Zero poaching programs (capacity development and strategy development for implementation).
12. Regular environmental education programmes will be carried out in the schools, religious institutions and communities within the Sanctuary.
13. Actively support nature clubs in the schools to conduct environmental education to students and communities.

5.3.8 Soil and Water Conservation

5.3.8.1 Rationale

Soil and water is vital for ecological and landscape productivity. Owing to fragile geological formation and steep slope, soil erosion and massive siltation along seasonal and perennial streams is a common feature in majority of the Sanctuary area. Further, continuous grazing and frequent migration of large herds of cattle adds severity to landslides and soil erosion. This has resulted in loss of already constrained grazing land and worsening of pasture quality especially in the alpine areas.

5.3.8.2 Policy Objectives

1. Minimize and reclaim eroded gullies through appropriate soil and water conservation interventions for sustained landscape productivity.
2. Ensure continuous water supply for local community and white water for hydropower generation to enhance livelihoods and income generation.

5.3.8.3 Implementation: Actions and Guidelines

1. Designate and declare critically degraded areas as special protection zones for certain period of time to regain its ecological vitality.
2. Construct check dams and carry out plantations in the severely eroded and landslide areas.
3. Carry out water source protection plantation and restrict people from harvesting forest resources in and around the water sources.
4. Assess critically eroded and landslide areas to understand the factors contributing to such degradation.
5. Conduct studies on the land management regimes to select and promote best practices.
6. Initiate payment for ecosystem services (PES) to upstream settlements from the settlements and upcoming hydropower projects in the downstream.

5.3.9 Ensuring Climate Resilient Community

5.3.9.1 Rationale

Extreme climatic condition fuelled by global warming is one of the major threats to food security and cause of poverty, diseases and migration. Communities of Merak and Sakteng will be worst affected, should the impact of extreme climate change be felt in Bhutan. The majority of the residents depend on livestock farming. Very small portions of the community practice sustenance farming and have very limited knowledge of climate change and adaptation resources. Hence, preparedness of local people to the climate change phenomenon is absolutely necessary to avoid extreme effects of climate disasters.

5.3.9.2 Policy Objectives

1. Develop climate resilient community through education and implementation of climate adaptative practices.
2. Ensure food security by engaging the community in alternative livelihood opportunities.

5.3.9.3 Implementation: Actions and Guidelines

1. Conduct climate change vulnerability assessment in the settlements in and around the SWS.
2. Conduct perception study on climate change and its causes and impact.
3. Conduct awareness education on the climate change and its impact and factors contributing to global warming.
4. Establish permanent monitoring plot and carry out regular monitoring to understand the climate change.
5. Support the formation of water user groups to promote community co-operation and dynamism.
6. Assess the quantity of solid waste and type of waste produced within the SWS.
7. Conduct awareness education on the negative effects of solid waste on surrounding environment and wild animal species in the forest.
8. Construction of garbage bins and waste dumping sites in all the villages under the SWS.
9. Conduct regular cleaning campaigns involving communities and schools.
10. Draw agreements and by-laws with local communities for proper management of waste in the area.
11. Support for ensuring good hygiene in the villages in collaboration with health sector.

5.3.10 Institutional Strengthening and Services Delivery

5.3.10.1 Rationale

We place high importance on institutional strengthening on the premise that institution needs to be vibrant, self sustaining and responsive to emerging challenges. People working in the institution must be competent, proactive and motivated to ensure effective service delivery. The need for continuous human resources development is pivotal in ensuring resilient institutions and dynamic implementation of conservation programs.

Additionally, the lessons learned from the implementation of past programs has educated that human resources are critical to ensure successful implementation of any conservation programs. While formulating the present management plan it has been realised that the protected area managers are in better position to plan for their area. Thus, we bestow maximum emphasize on capacity building of the staff. Furthermore, we have recognized the importance of proper, reliable and well maintained database as prerequisites for the formulation of appropriate policies and strategies.

5.3.10.2 Policy Objectives

1. Ensure sustained institutional development to provide maximum conservation impacts and deliver effective public services.
2. Develop adequate infrastructure and mobility facilities to ensure species protection and equitable resource allocation.
3. Ensure high quality research and information dissemination to develop action oriented strategy and plans.
4. Ensure sustained human resources development to champion the conservation by embracing newer challenges and technologies.

5.3.10.3 Implementation: Actions and Guidelines

1. Issuance of timber permits and marking of trees must be done within shorter time frame to ease the burden for the public. All range offices should ensure the strict compliance to Government to Citizen (G2C) services guidelines in delivering public services.
2. Periodic analysis of services provided by given number of forest personnel over a specific time frame should be conducted to rationalize the staff requirement and deployment.
3. A comprehensive human resources development plan will be proposed for endorsement by DoFPS to ensure availability of highly trained and motivated staff.

4. A comprehensive Geographical Information System (GIS) based on a spatial information system will be developed to monitor land allotment and forest cover loss.
5. Field staff should be provided with adequate facilities in terms of housing, field gears, mobility and capacity building opportunities to ensure motivation and output maximization.
6. Initiate Environmental Stewardship Award for extraordinary performers within the office annually. Criteria for selection of recipients will be developed and implemented.
7. A quarterly staff meeting should be convened to discuss pertinent issues and strategies to improve the management of the Sanctuary.

Chapter VI

FINANCIAL PROJECTION

Total fund projection for the plan period is Nu. 496,960,000.00 (Ngultrum four hundred ninety six million nine hundred sixty thousand). 48.21% of the total projected fund is to meet the recurrent expenses and 51.79% is proposed for capital expenses (Table 7). Recurrent expenses estimated under RGoB funding should be included in the yearly budget requisition to the Government. The recurrent cost have been calculated based on the number of staff approved by RCSC and yearly budget allocation endorsed by the RGoB.

The Sanctuary management have to source 51.79% (Nu. 257.36 million) of the projected fund from potential donors to implement proposed conservation programs to achieve the set vision and objectives of the plan. Therefore, strategic projects must be developed for potential donors based on common thematic areas addressing key conservation issues.

Table 7: Abstract of Projected Fund

Management Intervention	Yearly Work Plan and Financial Projection										Total
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Program 1: Rehabilitate degraded Tsamdrog and enhance livestock productivity	2.50	2.60	2.60	0.60	0.50	0.10	0.10	2.00	2.00	0.00	13.00
Program 2: Reduce crop depredations	0.15	1.30	3.70	3.05	3.50	3.58	0.00	0.10	0.00	0.10	15.48
Program 3: Alleviate Livestock Depredation and retaliatory killing	0.00	0.20	3.80	5.20	5.00	1.05	0.00	0.05	0.00	0.05	15.35
Program 4: Promote local culture and tradition	0.90	2.80	3.35	1.00	0.00	0.05	2.00	2.00	0.00	0.00	12.10
Program 5: Meeting Resource Needs Sustainably and Promote Conservation Stewardship	1.71	3.22	2.73	1.14	1.75	0.66	0.67	0.08	0.89	0.10	12.95
Program 6: Promote Ecotourism through showcasing local culture and tradition	0.15	7.67	8.69	9.13	10.97	9.91	2.15	4.69	4.23	2.27	59.86
Program 7: Ensuring Species Persistence	2.57	4.13	6.54	6.26	4.72	4.31	4.57	4.96	7.11	5.82	50.99
Program 8: Management of Soil and Water resources	0.00	0.10	1.05	2.60	2.30	0.00	0.35	0.05	0.37	0.10	6.92
Program 9: Ensuring Climate Resilient Community	0.90	3.00	3.92	1.29	0.36	0.36	0.45	0.45	0.59	0.54	11.86
Program 10: Institutional Strengthening and Services Delivery	19.21	22.53	30.77	27.25	35.51	25.61	38.57	30.88	30.33	37.79	298.45
Total	28.09	47.55	67.15	57.52	64.61	45.63	48.86	45.26	45.52	46.77	496.96



Chapter VII

MONITORING AND REVIEW

Monitoring and evaluation is a yardstick for measuring success of proposed program/activities at any stage and at the end of a project. It will provide guidance and feedback on project coherency and deliverables. The purpose of this is to identify whether the plan is being implemented effectively and the objectives are being met. Where implementation runs into problems, monitoring and review can be used to re-deploy resources and effort to improve implementation.

Further, a successful monitoring program will set standards and benchmarks for maintaining and assessing the health of the PAs. In natural resource management, monitoring is a critical component of an informed process for making decisions and to know the state of the PA before deciding on the appropriate course of action. The METT developed by the World Congress on Protected Areas-International Union for Conservation for Nature (WCPA-IUCN) to evaluate PAs has been recognized by global community. Accordingly, Bhutan has adopted the tool with minor modification in the assessing protocol and renamed as Bhutan METT plus. Bhutan METT plus is now a holistic approach to evaluate management effectiveness of PAs corresponding to its objectives. A logical framework for monitoring and review of the management plan implementation is prepared and attached as annexure (Annexure 10).

Bibliography

- Bajaj, M. (2015). *Apatani- Tribal Architecture*, Research and Documentation. Ahmedabad: Earthscapes Consultancy Pvt. Ltd.
- DoFPS (2012). *Field Manual*, National Forest Inventory of Bhutan. Thimphu: Bhutan
- Farjon, A. 2013. *Taxus baccata*. The IUCN Red List of Threatened Species 2013:e.T42546A2986660. <http://dx.doi.org/10.2305/IUCN.UK.20131.RLT.T42546A2986660.en>. 01 December 2016.
- Illiopoulou-Georgudaki, J., Khantzaris, V., Katharios, P., Kaspiris, P., Georgiadis, T., and Montesantou, B. (2003). An Application of Different Bioindicator for Assessing Water Quality. A Case Study in the Rivers Alfeios and Pineios (Peloponnisos, Greece). *Ecological Indicators*, **2 (4)**: 345-360
- MoAF (2015). *Bhutan RNR Statistics 2015*. Thimphu: RNR Statistics Coordination Section, Policy and Planning Division, Ministry of Agriculture and Forests.
- Pradhan, R. (1999). *Wild Rhododendrons of Bhutan*. Kathmandu: Quality Printers Pvt. Ltd.
- RGOB (1974). *National Forest policy 1974*. Thimphu: Ministry of Trade, Industry and Forests.
- RGOB (1995). *Forest and Nature Conservation Act 1995*. Thimphu: Ministry of Agriculture.
- RGOB (2011). *National Forest Policy 2011*. Thimphu: Ministry of Agriculture & Forests.
- SWS (2008). *Management Plan- Sakteng Wildlife Sanctuary (2008-2013) vol. I&II*. Thimphu: Department of Forest.
- Thomas, P. & Farjon, A. 2011. *Taxus wallichiana*. The IUCN Red List of Threatened Species 2011:e.T46171879A9730085. <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T46171879A9730085.en>. 01 December 2016.
- WII (2005). *Vegetation, Bird and Mammal Survey in Sakteng Wildlife Sanctuary*. Consultancy Report by Wildlife Institute of India, Dehradun. Thimphu: World Wildlife Fund Bhutan and Nature Conservation Division.
- WWF & SWS (2011). *Participatory Zoning for Sakteng Wildlife Sanctuary: Balancing Conservation and Development Goals*. Thimphu: World Wildlife Fund and Sakteng Wildlife Sanctuary.

112	<i>Bulbophyllum depressum</i>	Orchidaceae	141	<i>Cautleya spicata</i>	Zingiberaceae
113	<i>Bulbophyllum emarginatum</i>	Orchidaceae	142	<i>Celtis tetrandra</i>	Ulmaceae
114	<i>Bulbophyllum griffithii</i>	Orchidaceae	143	<i>Cephalanthera damasonium</i>	Orchidaceae
115	<i>Bulbophyllum gymnopus</i>	Orchidaceae	144	<i>Cerastium</i> sp	Caryophyllaceae
116	<i>Bulbophyllum hirtum</i>	Orchidaceae	145	<i>Ceratostylis himalaica</i>	Orchidaceae
117	<i>Bulbophyllum obrienianum</i>	Orchidaceae	146	<i>Ceropegia</i> sp	Asclepiadaceae
118	<i>Bulbophyllum odoratissimum</i>	Orchidaceae	147	<i>Cheirostylis griffithii</i>	Orchidaceae
119	<i>Bulbophyllum reptans</i>	Orchidaceae	148	<i>Chimonobambusa callosa</i>	Poaceae
120	<i>Bulbophyllum retusiusculum</i>	Orchidaceae	149	<i>Chirita urticifolia</i>	Gesneriaceae
121	<i>Bulbophyllum secundum</i>	Orchidaceae	150	<i>Chromolaena odorata</i>	Compositae
122	<i>Bulbophyllum</i> spp.	Orchidaceae	151	<i>Chrysoglossum ornatum</i>	Orchidaceae
123	<i>Bulbophyllum umbellatum</i>	Orchidaceae	152	<i>Chrysosplenium carnosum</i>	Saxifragaceae
124	<i>Caesalpinia decapetala</i>	Leguminosae	153	<i>Chrysosplenium nepalense</i>	Saxifragaceae
125	<i>Calamagrotis</i> sp	Poaceae	154	<i>Chusua pauciflora</i>	Orchidaceae
126	<i>Calanthe keshabii</i>	Orchidaceae	155	<i>Cinnamomum</i> sp	Lauraceae
127	<i>Calanthe mannii</i>	Orchidaceae	156	<i>Cinnamomum tamala</i>	Lauraceae
128	<i>Calanthe plantaginea</i>	Orchidaceae	157	<i>Cirsium eriophorooides</i>	Compositae
129	<i>Caltha palustris</i>	Ranunculaceae	158	<i>Cirsium falconeri</i>	Compositae
130	<i>Caltha scaposa</i>	Ranunculaceae	159	<i>Cirsium souliei</i>	Compositae
131	<i>Cannabis sativa</i>	Malvaceae	160	<i>Cleisostoma linearilobulatum</i>	Orchidaceae
132	<i>Cardamine griffithii</i>	Cruciferae	161	<i>Cleisostoma racemiferum</i>	Orchidaceae
133	<i>Cardamine macrophylla</i>	Cruciferae	162	<i>Cleisostoma williamsonii</i>	Orchidaceae
134	<i>Cardiocrinum giganteum</i>	Liliaceae	163	<i>Clematis acutangula</i>	Ranunculaceae
135	<i>Carex duthiei</i>	Cypraceae	164	<i>Clematis barbellata</i>	Ranunculaceae
136	<i>Cassia occidentalis</i>	Leguminosae	165	<i>Clematis buchananiana</i>	Ranunculaceae
137	<i>Cassiope fastigata</i>	Ericaceae	166	<i>Clematis montana</i>	Ranunculaceae
138	<i>Castanopsis hystrix</i>	Fagaceae	167	<i>Clematis tongluensis</i>	Ranunculaceae
139	<i>Castanopsis purpurella</i>	Fagaceae	168	<i>Clintonia udensis</i>	Uvulariaceae
140	<i>Castanopsis tribuloides</i>	Fagaceae	169	<i>Codonopsis</i> sp	Campanulaceae

CONSERVATION MANAGEMENT PLAN

170	<i>Coelogyne corymbosa</i>	Orchidaceae	199	<i>Cyananthus incanus</i>	Campanulaceae
171	<i>Coelogyne occultata</i>	Orchidaceae	200	<i>Cyananthus lobatus</i>	Campanulaceae
172	<i>Coelogyne ovalis</i>	Orchidaceae	201	<i>Cyanotis vaga</i>	Commelinaceae
173	<i>Coelogyne prolifera</i>	Orchidaceae	202	<i>Cymbidium bicolor</i>	Orchidaceae
174	<i>Coelogyne raizadae</i>	Orchidaceae	203	<i>Cymbidium elegans</i>	Orchidaceae
175	<i>Coelogyne schultesii</i>	Orchidaceae	204	<i>Cymbidium erythraeum</i>	Orchidaceae
176	<i>Colebrookea oppositifolia</i>	Labiatae	205	<i>Cymbidium hookerianum</i>	Orchidaceae
177	<i>Colocasia sp</i>	Araceae	206	<i>Cymbidium iridioides</i>	Orchidaceae
178	<i>Colquhounia coccinea</i>	Labiatae	207	<i>Cymbidium lancifolium</i>	Orchidaceae
179	<i>Combretum wallichii</i>	Combretaceae	208	<i>Cynoglossum furcatum</i>	Boraginaceae
180	<i>Commelina maculata</i>	Commelinaceae	209	<i>Cynoglossum spp</i>	Boraginaceae
181	<i>Conchidium muscicola</i>	Orchidaceae	210	<i>Cyperus difformis</i>	Cyperaceae
182	<i>Conchidium pusillum</i>	Orchidaceae	211	<i>Cyperus rotundus (grass)</i>	Cyperaceae
183	<i>Coniogramme pubescens</i>	Pteridaceae	212	<i>Cyperus sp (grass)</i>	Cyperaceae
184	<i>Coriaria nepalensis</i>	Coriariaceae	213	<i>Cypripedium sp</i>	Orchidaceae
185	<i>Cortella hookeri</i>	Umbelliferae	214	<i>Dactyloctenium aegyptium</i>	Orchidaceae
186	<i>Corydalis polygalina</i>	Fumariaceae	215	<i>Daphne bholua</i>	Thymelaeaceae
187	<i>Corydalis sp</i>	Fumariaceae	216	<i>Daphne retusa</i>	Thymelaeaceae
188	<i>Corydalis thyrsoiflora</i>	Fumariaceae	217	<i>Daphne sureii</i>	Thymelaeaceae
189	<i>Corylus ferox</i>	Betulaceae	218	<i>Daphniphyllum himalense</i>	Daphniphyllaceae
190	<i>Cotoneaster microphyllus</i>	Rosaceae	219	<i>Datura stramonium</i>	Solanaceae
191	<i>Crawfordia sp</i>	Gentianaceae	220	<i>Debregeasia longifolia</i>	Urticaceae
192	<i>Cremanthodium oblongatum</i>	Compositae	221	<i>Delphinium brunonianum</i>	Ranunculaceae
193	<i>Cremanthodium sp</i>	Compositae	222	<i>Delphinium spp</i>	Ranunculaceae
194	<i>Crepidium acuminatum</i>	Orchidaceae	223	<i>Dendrobium aphyllum</i>	Orchidaceae
195	<i>Crotalaria occulta</i>	Leguminosae	224	<i>Dendrobium candidum</i>	Orchidaceae
196	<i>Crotoms sp</i>	Euphorbiaceae	225	<i>Dendrobium chrysanthum</i>	Orchidaceae
197	<i>Cupressus corneyana</i>	Cupressaceae	226	<i>Dendrobium densiflorum</i>	Orchidaceae
198	<i>Cuscuta sp</i>	Cuscutaceae	227	<i>Dendrobium falconeri</i>	Orchidaceae

228	<i>Dendrobium fimbriatum</i>	Orchidaceae	257	<i>Eisholtzia</i> sp	Labiatae
229	<i>Dendrobium hookerianum</i>	Orchidaceae	258	<i>Eisholtzia strobilifera</i>	Labiatae
230	<i>Dendrobium longicornu</i>	Orchidaceae	259	<i>Embelia</i> sp	Myrsinaceae
231	<i>Dendrobium nobile</i>	Orchidaceae	260	<i>Engelhardia spicata</i>	Juglandaceae
232	<i>Dendrobium porphyrochilum</i>	Orchidaceae	261	<i>Enkianthus deflexus</i>	Ericaceae
233	<i>Dendrobium transparents</i>	Orchidaceae	262	<i>Ephedra Gerardiana</i>	Ephedraceae
234	<i>Desmodium elegans</i>	Leguminosae	263	<i>Epigenium fargesii</i>	Orchidaceae
235	<i>Desmodium</i> sp	Leguminosae	264	<i>Epigenium fuscescens</i>	Orchidaceae
236	<i>Deutzia compacta</i>	Philadelphaceae	265	<i>Epilobium royleanum</i>	Onagraceae
237	<i>Dichroa febrifuga</i>	Hydrangeaceae	266	<i>Epipogium roseum</i>	Orchidaceae
238	<i>Digitaria</i> sp	Poaceae	267	<i>Equisetum diffusum</i>	Equisetaceae
239	<i>Dioscorea bulbifera</i>	Dioscoreaceae	268	<i>Eria carinata</i>	Orchidaceae
240	<i>Diplazium esculentum</i>	Arthyriaceae	269	<i>Eria coronaria</i>	Orchidaceae
241	<i>Dipsacus inermis</i>	Dipsacaceae	270	<i>Erigeron multiradiatus</i>	Compositae
242	<i>Disporum cantoniense</i>	Uvulariaceae	271	<i>Erigeron</i> sp	Compositae
243	<i>Dracocephalum nutans</i>	Labiatae	272	<i>Erythrina arborescens</i>	Leguminosae
244	<i>Drosera peltata</i>	Droseraceae	273	<i>Erythrina stricta</i>	Leguminosae
245	<i>Dryopteris arguta</i>	Dryopteridaceae	274	<i>Esmeralda clarkei</i>	Orchidaceae
246	<i>Dryopteris</i> sp	Dryopteridaceae	275	<i>Euphorbia griffithii</i>	Euphorbiaceae
247	<i>Dubyaea hispida</i>	Compositae	276	<i>Euphorbia pulcherrima</i>	Euphorbiaceae
248	<i>Duchesnea indica</i>	Rosaceae	277	<i>Euphorbia sikkimensis</i>	Euphorbiaceae
249	<i>Echinochloa colona</i>	Poaceae	278	<i>Eurya acuminata</i>	Theaceae
250	<i>Edgeworthia gardneri</i>	Thymelaeaceae	279	<i>Eurya cerasifolia</i>	Theaceae
251	<i>Elaeagnus infundibularis</i>	Elaeagnaceae	280	<i>Eurya japonica</i>	Theaceae
252	<i>Elaeagnus parvifolia</i>	Elaeagnaceae	281	<i>Eurya serrata</i>	Theaceae
253	<i>Elaeocarpus sphaericus</i>	Elaeocarpaceae	282	<i>Eutrema primulifolium</i>	Cruciferae
254	<i>Elatostema platyphyllum</i>	Urticaceae	283	<i>Exbucklandia populnea</i>	Hamamelidaceae
255	<i>Elatostema sessile</i>	Urticaceae	284	<i>Fagopyrum</i> sp	Polygonaceae
256	<i>Eisholtzia fruticosa</i>	Labiatae	285	<i>Festuca</i> sp	Poaceae

CONSERVATION MANAGEMENT PLAN

286	<i>Ficus auriculata</i>	Moraceae	315	<i>Gentiana waltonii</i>	Gentianaceae
287	<i>Ficus nerifolia</i>	Moraceae	316	<i>Geranium donianum</i>	Geraniaceae
288	<i>Ficus semicordata</i>	Moraceae	317	<i>Geranium nakaonum</i>	Geraniaceae
289	<i>Ficus sp</i>	Moraceae	318	<i>Geranium nepalense</i>	Geraniaceae
290	<i>Fragaria daltoniana</i>	Rosaceae	319	<i>Geranium polyanthes</i>	Geraniaceae
291	<i>Fragaria nubicola</i>	Rosaceae	320	<i>Geranium pratense</i>	Geraniaceae
292	<i>Fragaria vesca</i>	Rosaceae	321	<i>Geranium procurrens</i>	Geraniaceae
293	<i>Fritillaria delavayi</i>	Liliaceae	322	<i>Geranium sp</i>	Geraniaceae
294	<i>Galeola lindleyana</i>	Orchidaceae	323	<i>Geranium wallichianum</i>	Geraniaceae
295	<i>Galinsoga ciliata</i>	Compositae	324	<i>Gesneria sp</i>	Gesneriaceae
296	<i>Galinsoga parviflora</i>	Compositae	325	<i>Geum elatum</i>	Rosaceae
297	<i>Galium affine</i>	Rubiaceae	326	<i>Geum sikkimense</i>	Rosaceae
298	<i>Galium rotundifolium</i>	Rubiaceae	327	<i>Girardinia diversifolia</i>	Urticaceae
299	<i>Gamblea ciliata</i>	Araliaceae	328	<i>Girardinia palmate</i>	Urticaceae
300	<i>Gastrochilus calceolaris</i>	Orchidaceae	329	<i>Gnaphalium affine</i>	Compositae
301	<i>Gastrochilus distichus</i>	Orchidaceae	330	<i>Gnaphalium sp</i>	Compositae
302	<i>Gaultheria fragrantissima</i>	Ericaceae	331	<i>Gonatanthus pumilus</i>	Araceae
303	<i>Gaultheria griffithiana</i>	Ericaceae	332	<i>Goodyera fusca</i>	Orchidaceae
304	<i>Gaultheria pyrolloides</i>	Ericaceae	333	<i>Goodyera repens</i>	Orchidaceae
305	<i>Gaultheria trichophylla</i>	Ericaceae	334	<i>Goodyera schlehtendaliana</i>	Orchidaceae
306	<i>Gentiana algida</i>	Gentianaceae	335	<i>Goodyera viridiflora</i>	Orchidaceae
307	<i>Gentiana capitata</i>	Gentianaceae	336	<i>Grewia optiva</i>	Tiliaceae
308	<i>Gentiana carinata</i>	Gentianaceae	337	<i>Gymnadenia orchidis</i>	Orchidaceae
309	<i>Gentiana depressa</i>	Gentianaceae	338	<i>Habenaria arifetina</i>	Orchidaceae
310	<i>Gentiana elwesii</i>	Gentianaceae	339	<i>Habenaria marginata</i>	Orchidaceae
311	<i>Gentiana emodi</i>	Gentianaceae	340	<i>Hackelia uncinata</i>	Boraginaceae
312	<i>Gentiana ornate</i>	Gentianaceae	341	<i>Halenia elliptica</i>	Gentianaceae
313	<i>Gentiana urnula</i>	Gentianaceae	342	<i>Hedera helix</i>	Araliaceae
314	<i>Gentiana veitchiorum</i>	Gentianaceae	343	<i>Hedera nepalensis</i>	Araliaceae

344	Hedychium ellipticum	Zingiberaceae	373	Inula racemosa	Compositae
345	Hedychium gardnerianum	Zingiberaceae	374	Ipomoea purpurea	Convolvulaceae
346	Hedychium spicatum	Zingiberaceae	375	Iris clarkei	Iridaceae
347	Helwingia himalaica	Cornaceae	376	Jasminum grandiflorum	Oleaceae
348	Hemiphragma heterophyllum	Scrophulariaceae	377	Juglans regia	Juglandaceae
349	Hemiphragma sp	Scrophulariaceae	378	Juncus leucanthus	Juncaceae
350	Heracleum lalli	Umbelliferae	379	Juncus thomsonii	Juncaceae
351	Heracleum nepalense	Umbelliferae	380	Juniperus communis	Cupressaceae
352	Heracleum obtusifolium	Umbelliferae	381	Juniperus indica	Cupressaceae
353	Heracleum wallichii	Umbelliferae	382	Juniperus pseudosabina	Cupressaceae
354	Herminium lanceum	Orchidaceae	383	Juniperus recurva	Cupressaceae
355	Himalayacalamus falconeri	Poaceae	384	Juniperus squamata	Cupressaceae
356	Holboellia latifolia	Lardizabalaceae	385	Jurinea dolomiaea	Compositae
357	Holcoglossum himalaicum	Orchidaceae	386	Justicia adhatoda	Acanthaceae
358	Houttuynia cordata	Saururaceae	387	Kyllinga squmulata	Cyperaceae
359	Hydrangea heteromalla	Hydrangeaceae	388	Larix griffithiana	Pinaceae
360	Hydrocotyle sp	Umbelliferae	389	Lecanthus peduncularis	Urticaceae
361	Hypericum hookerianum	Hypericaceae	390	Leontopodium himalayanum	Gnaphalieceae
362	Hypericum japonicum	Hypericaceae	391	Leontopodium jacotianum	Gnaphalieceae
363	Hypericum sp	Hypericaceae	392	Leptodermis lanceolata	Rubiaceae
364	Ilex dipyrena	Aquifoliaceae	393	Leptodermis stapfiana	Rubiaceae
365	Illicium griffithii	Illiciaceae	394	Leucas lanata	Labiatae
366	Impatiens cristata	Balsaminaceae	395	Leucas sp	Labiatae
367	Impatiens sulcata	Balsaminaceae	396	Ligularia amplexicaulis	Compositae
368	Indigofera sp	Leguminosae	397	Ligularia atkinsonii	Compositae
369	Innula sp	Compositae	398	Ligularia dentata	Compositae
370	Inula cappa	Compositae	399	Ligularia spp.	Compositae
371	Inula grandiflora	Compositae	400	Lilium nanum	Liliaceae
372	Inula hookeri	Compositae	401	Lilium spp	Liliaceae

CONSERVATION MANAGEMENT PLAN

402	<i>Lindera neesiana</i>	Lauraceae	431	<i>Maianthemum oleraceum</i> var. <i>Oleraceum</i>	Convallariaceae
403	<i>Lindera pulcherrima</i>	Lauraceae	432	<i>Malaxis muscifera</i>	Orchidaceae
404	<i>Lindera</i> sp	Lauraceae	433	<i>Mallotus philippensis</i>	Euphorbiaceae
405	<i>Lindernia procumbens</i>	Scrophulariaceae	434	<i>Malus baccata</i>	Rosaceae
406	<i>Liparis bootanensis</i>	Orchidaceae	435	<i>Mazus delavayi</i>	Scrophulariaceae
407	<i>Liparis cordifolia</i>	Orchidaceae	436	<i>Mazus pumilus</i>	Scrophulariaceae
408	<i>Liparis nervosa</i> var. <i> khasiana</i>	Orchidaceae	437	<i>Mazus surculosus</i>	Scrophulariaceae
409	<i>Liparis odorata</i>	Orchidaceae	438	<i>Meconopsis bella</i>	Papaveraceae
410	<i>Liparis resupinata</i>	Orchidaceae	439	<i>Meconopsis grandis</i>	Papaveraceae
411	<i>Lithocarpus elegans</i>	Fagaceae	440	<i>Meconopsis horridula</i>	Papaveraceae
412	<i>Lithocarpus</i> sp	Fagaceae	441	<i>Meconopsis nepalensis</i>	Papaveraceae
413	<i>Litsea</i> spp	Lauraceae	442	<i>Meconopsis paniculata</i>	Papaveraceae
414	<i>Lloydia flavonutans</i>	Liliaceae	443	<i>Meconopsis simplicifolia</i>	Papaveraceae
415	<i>Lobelia erectiuscula</i>	Campanulaceae	444	<i>Meconopsis villosa</i>	Papaveraceae
416	<i>Lone</i> sp	Orchidaceae	445	<i>Megacodon stylophorus</i>	Gentianaceae
417	<i>Lonicera purpurascens</i>	Caprifoliaceae	446	<i>Mentha</i> sp	Labiatae
418	<i>Lonicera quinquelocularis</i>	Caprifoliaceae	447	<i>Michelia champaca</i>	Magnoliaceae
419	<i>Luculia gratissima</i>	Rubiaceae	448	<i>Michelia doltsopa</i>	Magnoliaceae
420	<i>Lycopodium</i> sp	Lycopodiaceae	449	<i>Monachosorum henryi</i>	Dennstaedtiaceae
421	<i>Lyonia ovalifolia</i>	Ericaceae	450	<i>Morina nepalensis</i>	Morinaceae
422	<i>Lyonia villosa</i>	Ericaceae	451	<i>Morina polyphylla</i>	Morinaceae
423	<i>Lysimachia prolifera</i>	Primulaceae	452	<i>Morus</i> sp	Moraceae
424	<i>Macaranga denticulata</i>	Euphorbiaceae	453	<i>Mulgedium bracteatum</i>	Compositae
425	<i>Macaranga indica</i>	Euphorbiaceae	454	<i>Mussaenda roxburghii</i>	Rubiaceae
426	<i>Maesa chisia</i>	Myrsinaceae	455	<i>Mycaranthes floribunda</i>	Orchidaceae
427	<i>Magnolia campbellii</i>	Magnoliaceae	456	<i>Myriactis wallichii</i>	Compositae
428	<i>Magnolia globosa</i>	Magnoliaceae	457	<i>Myrica esculenta</i>	Myricaceae
429	<i>Magnolia</i> sp	Magnoliaceae	458	<i>Myricaria rosea</i>	Tamaricaceae
430	<i>Mahonia napaulensis</i>	Berberidaceae	459	<i>Nardostachys grandiflora</i>	Valerianaceae

460	<i>Nasturtium officinale</i>	Cruciferae	489	<i>Otochilus lancilabius</i>	Orchidaceae
461	<i>Nasturtium sp</i>	Cruciferae	490	<i>Oxalis acetosella</i>	Oxalidaceae
462	<i>Neillia rubiflora</i>	Rosaceae	491	<i>Oxalis sp</i>	Oxalidaceae
463	<i>Neogyna gardneriana</i>	Orchidaceae	492	<i>Oxygraphis endlicheri</i>	Ranunculaceae
464	<i>Neopicrohiza scrophulariiflora</i>	Scrophulariaceae	493	<i>Oxyria digyna</i>	Polygonaceae
465	<i>Neottia acuminata</i> (orchid)	Orchidaceae	494	<i>Oxyspora paniculata</i>	Melastomataceae
466	<i>Neottia listeroides</i>	Orchidaceae	495	<i>Panax pseudo-ginseng</i>	Araliaceae
467	<i>Neottia pinetorum</i>	Orchidaceae	496	<i>Papilionanthe vandarum</i>	Orchidaceae
468	<i>Nepeta laevigata</i>	Labiatae	497	<i>Paris polyphylla</i>	Trilliaceae
469	<i>Nephrolepis cordifolia</i>	Lomariopsidaceae	498	<i>Parnassia delavayi</i>	Parnassiaceae
470	<i>Nervilia falcata</i>	Orchidaceae	499	<i>Parnassia nubicola</i>	Parnassiaceae
471	<i>Notholirion thomsonianum</i>	Liliaceae	500	<i>Paroetus communis</i>	Leguminosae
472	<i>Nyssa javanica</i>	Nyssaceae	501	<i>Paspalum distichum</i>	Poaceae
473	<i>Oberonia acaulis</i>	Orchidaceae	502	<i>Paspalum spp</i>	Poaceae
474	<i>Oberonia falcata</i>	Orchidaceae	503	<i>Pedicularis siphonantha</i>	Scrophulariaceae
475	<i>Odontochilus lanceolatus</i>	Orchidaceae	504	<i>Pedicularis cornigera</i>	Scrophulariaceae
476	<i>Odontochilus poilanei</i>	Orchidaceae	505	<i>Pedicularis longiflora</i>	Scrophulariaceae
477	<i>Oleandra pistillaris</i>	Oleandraceae	506	<i>Pedicularis longissima</i>	Scrophulariaceae
478	<i>Omphalogramma</i>	Primulaceae	507	<i>Pedicularis megalantha</i>	Scrophulariaceae
479	<i>Onopordum acanthium</i>	Compositae	508	<i>Pedicularis oliveriana</i>	Scrophulariaceae
480	<i>Onosma hookeri</i>	Boraginaceae	509	<i>Pedicularis scullyana</i>	Scrophulariaceae
481	<i>Oreorchis foliosa var. foliosa</i>	Orchidaceae	510	<i>Pedicularis siphonantha</i>	Scrophulariaceae
482	<i>Oreosolen watti</i>	Scrophulariaceae	511	<i>Pedicularis sp</i>	Scrophulariaceae
483	<i>Oreosolen williamsii</i>	Scrophulariaceae	512	<i>Pennisetum elandestinum</i>	Poaceae
484	<i>Ornithochilus difformis</i>	Orchidaceae	513	<i>Persea clarkeana</i>	Lauraceae
485	<i>Orabanchae sp</i>	Orabanchaceae	514	<i>Persea odoratissima</i>	Lauraceae
486	<i>Osbeckia nepalensis</i>	Melastomataceae	515	<i>Persicaria capitata</i>	Polygonaceae
487	<i>Osmanthus suavis</i>	Oleaceae	516	<i>Persicaria humilis</i>	Polygonaceae
488	<i>Otochilus fuscus</i>	Orchidaceae	517	<i>Persicaria nepalensis</i>	Polygonaceae

518	<i>Persicaria polystachya</i>	Polygonaceae	547	<i>Platanthera bakeriana</i>	Orchidaceae
519	<i>Persicaria runcinata</i>	Polygonaceae	548	<i>Platanthera clavigera</i>	Orchidaceae
520	<i>Persicaria sp (runner)</i>	Polygonaceae	549	<i>Platanthera dyeriana</i>	Orchidaceae
521	<i>Petasites tricholobus</i>	Compositae	550	<i>Platanthera edgeworthii</i>	Orchidaceae
522	<i>Phalaenopsis taenialis</i>	Orchidaceae	551	<i>Platanthera sikkimensis</i>	Orchidaceae
523	<i>Philadelphus tomentosus</i>	Philadelphaceae	552	<i>Platanthera urceolata</i>	Orchidaceae
524	<i>Phlomis bracteosa</i>	Labiatae	553	<i>Platystemma volloides</i>	Gesneriaceae
525	<i>Phlomis breviflora</i>	Labiatae	554	<i>Plectocomia himalayana</i>	Areaceae
526	<i>Phlomis rotata</i>	Labiatae	555	<i>Pleione hookeriana</i>	Orchidaceae
527	<i>Phlomis tibetica</i>	Labiatae	556	<i>Pleione humilis</i>	Orchidaceae
528	<i>Pholidota articulata</i>	Orchidaceae	557	<i>Pleurospermum amabile</i>	Umbelliferae
529	<i>Pholidota pallida</i>	Orchidaceae	558	<i>Poa sp</i>	Poaceae
530	<i>Phreatia elegans</i>	Orchidaceae	559	<i>Podophyllum hexandrum var. chinensis</i>	Podophyllaceae
531	<i>Phytolacca acinosa</i>	Phytolaccaceae	560	<i>Podophyllum hexandrum</i>	Podophyllaceae
532	<i>Picea spinulosa</i>	Pinaceae	561	<i>Podophyllum sikkimense</i>	Podophyllaceae
533	<i>Pieris formosa</i>	Ericaceae	562	<i>Polygala arillata</i>	Polygalaceae
534	<i>Pilea scripta</i>	Urticaceae	563	<i>Polygonatum hookeri</i>	Convallariaceae
535	<i>Pilea umbrosa</i>	Urticaceae	564	<i>Polygonatum kansuense</i>	Convallariaceae
536	<i>Pinalia amica</i>	Orchidaceae	565	<i>Polygonatum multiflorum</i>	Convallariaceae
537	<i>Pinalia graminifolia</i>	Orchidaceae	566	<i>Polygonum amplexicaule</i>	Polygonaceae
538	<i>Pinalia spicata</i>	Orchidaceae	567	<i>Polygonum chinense</i>	Polygonaceae
539	<i>Pinus bhutanica</i>	Pinaceae	568	<i>Polygonum convolvulus</i>	Polygonaceae
540	<i>Pinus roxburghii</i>	Pinaceae	569	<i>Polygonum molle</i>	Polygonaceae
541	<i>Piper sp</i>	Piperaceae	570	<i>Polygonum nepalense</i>	Polygonaceae
542	<i>Piptanithus nepalensis</i>	Leguminosae	571	<i>Polygonum strigosum</i>	Polygonaceae
543	<i>Pittosporum nepaulense</i>	Pittosporaceae	572	<i>Polygonum vivipara</i>	Polygonaceae
544	<i>Plantago depressa</i>	Plantaginaceae	573	<i>Polystichum sp</i>	Dryopteridaceae
545	<i>Plantago major</i>	Plantaginaceae	574	<i>Populus ciliata</i>	Salicaceae
546	<i>Plantago sp</i>	Plantaginaceae	575	<i>Potentilla anserina</i>	Rosaceae

576	Potentilla arbuscula	Rosaceae	605	Primula stuartii	Primulaceae
577	Potentilla coriandrifolia	Rosaceae	606	Primula uniflora	Primulaceae
578	Potentilla cuneata	Rosaceae	607	Primula wollastonii	Primulaceae
579	Potentilla eriocarpa	Rosaceae	608	Prunella vulgaris	Labiatae
580	Potentilla fulgens	Rosaceae	609	Prunus cerasoides	Rosaceae
581	Potentilla griffithii	Rosaceae	610	Prunus sp	Rosaceae
582	Potentilla microphylla	Rosaceae	611	Brassaiopsis mitis	Araliaceae
583	Potentilla peduncularis	Rosaceae	612	Pseudomontensia sp	Scrophulariaceae
584	Potentilla plurijuga	Rosaceae	613	Pteridium aquilinum	Dennstaedtiaceae
585	Pouzolzia sp	Urticaceae	614	Pteridium sp	Dennstaedtiaceae
586	Primula buryana	Primulaceae	615	Pteris quadriaurita	Pteridaceae
587	Primula calderiana	Primulaceae	616	Pterocephalodes hookeri	Dipsacaceae
588	Primula caveana	Primulaceae	617	Ptilotus sp	Amaranthaceae
589	Primula denticulata	Primulaceae	618	Pycnoplinthopsis bhutanica	Cruciferae
590	Primula edgeworthii	Primulaceae	619	Pyrola bicolori	Pyrolaceae
591	Primula glabra	Primulaceae	620	Pyrosia boothii	Polypodaceae
592	Primula glomerata	Primulaceae	621	Pyrosia sp	Polypodaceae
593	Primula gracilipes	Primulaceae	622	Pyrus sp	Rosaceae
594	Primula griffithii	Primulaceae	623	Quercus glauca	Fagaceae
595	Primula involucrata	Primulaceae	624	Quercus griffithii	Fagaceae
596	Primula irregularis	Primulaceae	625	Quercus lamellose	Fagaceae
597	Primula macrophylla	Primulaceae	626	Quercus lanata	Fagaceae
598	Primula microphylla	Primulaceae	627	Quercus semecarpifolia	Fagaceae
599	Primula minuta	Primulaceae	628	Rabdosia rugosa	Lamiaceae
600	Primula potaninii	Primulaceae	629	Ranunculus brotherusii	Ranunculaceae
601	Primula primulina	Primulaceae	630	Ranunculus chinensis	Ranunculaceae
602	Primula reidii	Primulaceae	631	Ranunculus hirtellus	Ranunculaceae
603	Primula reptans	Primulaceae	632	Remusatia hookeriana	Araceae
604	Primula sikkimensis	Primulaceae	633	Rhaphidophora decursiva	Araceae

CONSERVATION MANAGEMENT PLAN

634	Rhaphidophora glauca	Araceae		
635	Rheum acuminatum	Polygonaceae		
636	Rheum australe	Polygonaceae		
637	Rhodiola crenulata	Crassulaceae		
638	Rhodiola heterodonta	Crassulaceae		
639	Rhodiola himalensis	Crassulaceae		
640	Rhododendron aeruginosum	Ericaceae		
641	Rhododendron anthopogon	Ericaceae		
642	Rhododendron arboreum	Ericaceae		
643	Rhododendron argipeplum	Ericaceae		
644	Rhododendron barbatum	Ericaceae		
645	Rhododendron bhutanense	Ericaceae		
646	Rhododendron camelliflorum	Ericaceae		
647	Rhododendron campanulatum	Ericaceae		
648	Rhododendron campylocarpum	Ericaceae		
649	Rhododendron ciliatum	Ericaceae		
650	Rhododendron cinnabarinum	Ericaceae		
651	Rhododendron dalhousiae	Ericaceae		
652	Rhododendron dalhousiae var. rhabdotum	Ericaceae		
653	Rhododendron edgeworthii	Ericaceae		
654	Rhododendron falconeri	Ericaceae		
655	Rhododendron flinckii	Ericaceae		
656	Rhododendron fulgens	Ericaceae		
657	Rhododendron glaucophyllum	Ericaceae		
658	Rhododendron grande	Ericaceae		
659	Rhododendron griffithianum	Ericaceae		
660	Rhododendron hodgsonii	Ericaceae		
661	Rhododendron kendrickii	Ericaceae		
662	Rhododendron kesangiae	Ericaceae		
663	Rhododendron keysii	Ericaceae		
664	Rhododendron lanatum	Ericaceae		
665	Rhododendron lepidotum	Ericaceae		
666	Rhododendron leptocarpum	Ericaceae		
667	Rhododendron lindleyi	Ericaceae		
668	Rhododendron maddenii	Ericaceae		
669	Rhododendron neriiflorum	Ericaceae		
670	Rhododendron nivale	Ericaceae		
671	Rhododendron niveum	Ericaceae		
672	Rhododendron papillatum	Ericaceae		
673	Rhododendron pendulum	Ericaceae		
674	Rhododendron setosum	Ericaceae		
675	Rhododendron succothii	Ericaceae		
676	Rhododendron thomsonii	Ericaceae		
677	Rhododendron triflorum	Ericaceae		
678	Rhododendron tsariense	Ericaceae		
679	Rhododendron virgatum	Ericaceae		
680	Rhododendron wallichii	Ericaceae		
681	Rhododendron wightii	Ericaceae		
682	Rhus chinensis	Anacardiaceae		
683	Rhus hookeri	Anacardiaceae		
684	Rhus paniculata	Anacardiaceae		
685	Rhus succedanea	Anacardiaceae		
686	Ribes glaciale	Grossulariaceae		
687	Ribes griffithii	Grossulariaceae		
688	Ribes laciniatum	Grossulariaceae		
689	Ribes orientale	Grossulariaceae		
690	Ribes takare	Grossulariaceae		
691	Ricinus communis	Euphorbiaceae		

692	Rosa brunonii	Rosaceae	721	Satyrium nepalense	Orchidaceae
693	Rosa macrophylla	Rosaceae	722	Satyrium nepalense var. ciliatum	Orchidaceae
694	Rosa sericea	Rosaceae	723	Saurauja napaulensis	Actinidiaceae
695	Roscoea alpina	Zingiberaceae	724	Saussurea atkinsonii	Compositae
696	Roscoea auriculata	Zingiberaceae	725	Saussurea gossypiphora	Compositae
697	Roscoea purpurea	Zingiberaceae	726	Saussurea graminifolia	Compositae
698	Rubia cordifolia	Rubiaceae	727	Saussurea obvallata	Compositae
699	Rubia manjith	Rubiaceae	728	Saussurea roylei	Compositae
700	Rubus acuminatus	Rosaceae	729	Saussurea simpsoniana	Compositae
701	Rubus biflorus	Rosaceae	730	Saussurea sughoo	Compositae
702	Rubus ellipticus	Rosaceae	731	Saussurea tridactyla	Compositae
703	Rubus fragarioides	Rosaceae	732	Saxifraga parnassifolia	Saxifragaceae
704	Rubus hoffmeisterianus	Rosaceae	733	Saxifraga pulvinaria	Saxifragaceae
705	Rubus hypargyurus	Rosaceae	734	Schefflera impressa	Araliaceae
706	Rubus indotibetanus	Rosaceae	735	Schefflera sp	Araliaceae
707	Rubus nepalensis	Rosaceae	736	Schima khasiana	Theaceae
708	Rubus paniculatus	Rosaceae	737	Schima wallichii	Theaceae
709	Rubus splendidiissimus	Rosaceae	738	Schoenoplectus juncooides	Cyperaceae
710	Rumex nepalensis	Polygonaceae	739	Schoenorchis gemmata	Orchidaceae
711	Rumex patientia	Polygonaceae	740	Scrophularia sp	Scrophulariaceae
712	Salix babylonica	Salicaceae	741	Scutellaria scandens	Lamiaceae
713	Salix calyculata	Salicaceae	742	Selaginella sp	Selaginellaceae
714	Salix serpyllum	Salicaceae	743	Selinum sp	Umbelliferae
715	Salix sikkimensis	Salicaceae	744	Selinum tenuifolium	Umbelliferae
716	Salix wallichii	Salicaceae	745	Selinum wallichianum	Umbelliferae
717	Salvia nubicola	Labiatae	746	Senecio chrysanthemoides	Compositae
718	Sambucus adnata	Caprifoliaceae	747	Senecio diversifolius	Compositae
719	Saptium insigne	Euphorbiaceae	748	Senecio laetus	Compositae
720	Sarcococca wallichii	Buxaceae	749	Senecio scandens	Compositae

CONSERVATION MANAGEMENT PLAN

750	<i>Senecio wallichii</i>	Compositae					
751	<i>Sibbaldia</i> sp	Rosaceae					
752	<i>Silene nigrescens</i>	Caryophyllaceae					
753	<i>Smilacina oleracea</i>	Liliaceae					
754	<i>Smilacina purpurea</i>	Liliaceae					
755	<i>Smilax orthoptera</i>	Smilacaceae					
756	<i>Smilax</i> sp	Smilacaceae					
757	<i>solanum</i> sp (similar to <i>S.nigrum</i>)	Solanaceae					
758	<i>Solanum verbascifolium</i>	Solanaceae					
759	<i>Solanum viarum</i> Dunal	Solanaceae					
760	<i>Sonchus asper</i>	Compositae					
761	<i>Sorbus cuspidata</i>	Rosaceae					
762	<i>Sorbus foliolosa</i>	Rosaceae					
763	<i>Sorbus microphylla</i>	Rosaceae					
764	<i>Sorbus tibetanus</i>	Rosaceae					
765	<i>Sorbus wallichii</i>	Rosaceae					
766	<i>Soroseris hookeriana</i>	Compositae					
767	<i>Spathoglottis ixioides</i>	Orchidaceae					
768	<i>Spermaceo</i> sp	Rubiaceae					
769	<i>Spiraea arcuata</i>	Rosaceae					
770	<i>Spiraea bella</i>	Rosaceae					
771	<i>Spiraea canescens</i>	Rosaceae					
772	<i>Spiraea scandens</i>	Rosaceae					
773	<i>Spiranthes sinensis</i>	Orchidaceae					
774	<i>Stachys melissaefolia</i>	Labiatae					
775	<i>Stachys tibetica</i>	Labiatae					
776	<i>Stellaria</i> sp	Caryophyllaceae					
777	<i>Stellaria vestita</i>	Caryophyllaceae					
778	<i>Stellera chamaejasme</i>	Rutaceae					
779	<i>Stephania glabra</i>						Menispermaceae
780	<i>Sterculia villosa</i>						Sterculiaceae
781	<i>Stereochilus hirtus</i>						Orchidaceae
782	<i>Stipa</i> sp						Poaceae
783	<i>Streptopus simplex</i>						Uvulariaceae
784	<i>Streptopus</i> sp						Uvulariaceae
785	<i>Strobilanthes atropurpureus</i>						Acanthaceae
786	<i>Strobilanthes</i> sp						Acanthaceae
787	<i>Sunipia bicolor</i>						Orchidaceae
788	<i>Sunipia nepalensis</i>						Orchidaceae
789	<i>Swertia bimaculata</i>						Gentianaceae
790	<i>Swertia chirata</i>						Gentianaceae
791	<i>Swertia cuneata</i>						Gentianaceae
792	<i>Swertia hookeri</i>						Gentianaceae
793	<i>Swertia pseudohookeri</i>						Gentianaceae
794	<i>Swida macrophylla</i>						Cornaceae
795	<i>Swida</i> sp						Cornaceae
796	<i>Symplocos paniculata</i>						Symplocaceae
797	<i>symplocos racemosa</i>						Symplocaceae
798	<i>Symplocos</i> sp						Symplocaceae
799	<i>Syzygium cumini</i>						Myrtaceae
800	<i>Taeniophyllum retrospiculatum</i>						Orchidaceae
801	<i>Tagetes minuta</i>						Compositae
802	<i>Tanacetum gracile</i>						Compositae
803	<i>Tanacetum nubigenum</i>						Compositae
804	<i>Tanacetum</i> sp						Compositae
805	<i>Taraxacum eriopodium</i>						Compositae
806	<i>Taraxacum</i> sp						Compositae
807	<i>Taraxacum mitali</i>						Compositae

837	<i>Veronica persica</i>	Veronica persica	Scrophulariaceae
838	<i>Viburnum cotinifolium</i>	Viburnum cotinifolium	Caprifoliaceae
839	<i>Viburnum cylindricum</i>	Viburnum cylindricum	Caprifoliaceae
840	<i>Viburnum erubescens</i>	Viburnum erubescens	Caprifoliaceae
841	<i>Viburnum mullaha</i>	Viburnum mullaha	Caprifoliaceae
842	<i>Viburnum nervosum</i>	Viburnum nervosum	Caprifoliaceae
843	<i>Viola bhutanica</i>	Viola bhutanica	Violaceae
844	<i>Viola biflora</i>	Viola biflora	Violaceae
845	<i>Viola diffusa</i>	Viola diffusa	Violaceae
846	<i>Viola wallichiana</i>	Viola wallichiana	Violaceae
847	<i>Woodfordia fruticosa</i>	Woodfordia fruticosa	Lythraceae
848	<i>Woodwardia sp</i>	Woodwardia sp	Blechnaceae
849	<i>Wulfenia sp</i>	Wulfenia sp	Plantaginaceae
850	<i>Xanthium indicum</i>	Xanthium indicum	Compositae
851	<i>Xylosma longifolium</i>	Xylosma longifolium	Salicaceae
852	<i>Youngia depressa</i>	Youngia depressa	Compositae
853	<i>Youngia sp</i>	Youngia sp	Compositae
854	<i>Yushania maling</i>	Yushania maling	Poaceae
855	<i>Yushania microphylla</i>	Yushania microphylla	Poaceae
856	<i>Zanthoxylum spp</i>	Zanthoxylum spp	Rutaceae
857	<i>Zeuxine flava</i>	Zeuxine flava	Orchidaceae
858	<i>Zeuxine goodyeroides</i>	Zeuxine goodyeroides	Orchidaceae

808	<i>Taxus baccata</i>	Taxaceae	Taxaceae
809	<i>Tectaria polymorpha</i>	Tectariaceae	Tectariaceae
810	<i>Tectaria sp</i>	Tectariaceae	Tectariaceae
811	<i>Terminalia spp.</i>	Combretaceae	Combretaceae
812	<i>Tetragium sp</i>	Vitaceae	Vitaceae
813	<i>Thalictrum sp</i>	Ranunculaceae	Ranunculaceae
814	<i>Thamnocalamus sp</i>	Poaceae	Poaceae
815	<i>Thladiantha cordifolia</i>	Cucurbitaceae	Cucurbitaceae
816	<i>Toona ciliata</i>	Meliaceae	Meliaceae
817	<i>Toricellia tilifolia</i>	Cornaceae	Cornaceae
818	<i>Trachydium royle</i>	Apiaceae	Apiaceae
819	<i>Tricholepis furcata</i>	Compositae	Compositae
820	<i>Trifolium repens</i>	Leguminosae	Leguminosae
821	<i>Trifolium sp</i>	Leguminosae	Leguminosae
822	<i>Trigonotis sp</i>	Boraginaceae	Boraginaceae
823	<i>Tsuga dumosa</i>	Pinaceae	Pinaceae
824	<i>Ulmus sp</i>	Ulmaceae	Ulmaceae
825	<i>Urtica dioica</i>	Urticaceae	Urticaceae
826	<i>Urtica sp</i>	Urticaceae	Urticaceae
827	<i>Vaccinium nummularia</i>	Ericaceae	Ericaceae
828	<i>Vaccinium sikkimense</i>	Ericaceae	Ericaceae
829	<i>Vaccinium spp</i>	Ericaceae	Ericaceae
830	<i>Valeriana jatamansi</i>	Valerianaceae	Valerianaceae
831	<i>Vanda alpine</i>	Orchidaceae	Orchidaceae
832	<i>Vanda bicolor</i>	Orchidaceae	Orchidaceae
833	<i>Vanda cristata</i>	Orchidaceae	Orchidaceae
834	<i>Vandopsis undulata</i>	Orchidaceae	Orchidaceae
835	<i>Verbascum thapsus</i>	Scrophulariaceae	Scrophulariaceae
836	<i>Veronica himalensis</i>	Scrophulariaceae	Scrophulariaceae

Annexure 2: Important Value Index (IVI) of tree species

Sl#	Species	Encounter	Nos.	Frequency	Density	Basal Area (m ² /ha)	Relative Frequency	Relative Density	Relative Dominance	IVI
1	<i>Abies densa</i>	37	458	35.24	0.87	106.283	11.859	26.023	40.188	78.070
2	<i>Tsuga dumosa</i>	16	123	15.24	0.23	59.210	5.128	6.989	22.389	34.506
3	<i>Rhododendron hodgsonii</i>	13	14	12.38	0.27	3.091	4.167	8.068	1.169	13.404
4	<i>Juniperus recurva</i>	12	96	11.43	0.18	8.796	3.846	5.455	3.326	12.627
5	<i>Rhododendron arboretum</i>	11	128	10.48	0.24	3.982	3.526	7.273	1.506	12.304
6	<i>Acer campbellii</i>	10	43	9.52	0.08	11.840	3.205	2.443	4.477	10.125
7	<i>Alnus nepalensis</i>	7	22	6.67	0.04	8.567	2.244	1.250	3.239	6.733
8	<i>Betula utilis</i>	8	21	7.62	0.04	6.860	2.564	1.193	2.594	6.351
9	<i>Juniperus squamata</i>	6	39	5.71	0.07	2.598	1.923	2.216	0.982	5.122
10	<i>Acer sp</i>	9	29	8.57	0.06	1.166	2.885	1.648	0.441	4.973
11	<i>Lyonia ovalifolia</i>	6	41	5.71	0.08	1.518	1.923	2.330	0.574	4.827
12	<i>Rhododendron kesangiae</i>	6	40	5.71	0.08	1.170	1.923	2.273	0.442	4.638
13	<i>Quercus lamellose</i>	3	25	2.86	0.05	5.941	0.962	1.420	2.246	4.628
14	<i>Betula alnoides</i>	4	39	3.81	0.07	2.800	1.282	2.216	1.059	4.557
15	<i>Rhododendron falconeri</i>	5	40	4.76	0.08	1.146	1.603	2.273	0.433	4.309
16	<i>Rhododendron thomsonii</i>	5	41	4.76	0.08	0.600	1.603	2.330	0.227	4.159
17	<i>Quercus glauca</i>	5	23	4.76	0.04	3.017	1.603	1.307	1.141	4.050
18	<i>Sorbus sp</i>	7	25	6.67	0.05	0.803	2.244	1.420	0.304	3.968
19	<i>Larix griffithiana</i>	5	24	4.76	0.05	1.140	1.603	1.364	0.431	3.397
20	<i>Pinus bhutanica</i>	4	18	3.81	0.03	1.660	1.282	1.023	0.628	2.932
21	<i>Persea clarkeana</i>	5	13	4.76	0.02	1.031	1.603	0.739	0.390	2.731
22	<i>Prunus sp</i>	5	10	4.76	0.02	0.810	1.603	0.568	0.306	2.477
23	<i>Symplocos sp</i>	6	7	5.71	0.01	0.260	1.923	0.398	0.098	2.419
24	<i>Rhododendron cinnabarinum</i>	4	18	3.81	0.03	0.259	1.282	1.023	0.098	2.403
25	<i>Persea sp</i>	5	7	4.76	0.01	0.910	1.603	0.398	0.344	2.344
26	<i>Rhododendron lanatum</i>	4	16	3.81	0.03	0.305	1.282	0.909	0.115	2.306

27	<i>Rhododendron wallichii</i>	5	11	4.76	0.02	0.132	1.603	0.625	0.050	2.277
28	<i>Lithocarpus</i> sp	2	3	1.90	0.01	3.778	0.641	0.170	1.429	2.240
29	<i>Quercus griffithii</i>	3	14	2.86	0.03	1.219	0.962	0.795	0.461	2.218
30	<i>Quercus semecarpifolia</i>	1	4	0.95	0.01	4.283	0.321	0.227	1.620	2.167
31	<i>Rhododendron grande</i>	4	12	3.81	0.02	0.500	1.282	0.682	0.189	2.153
32	<i>Lyonia villosa</i>	4	8	3.81	0.02	0.765	1.282	0.455	0.289	2.026
33	<i>Acer acuminatum</i>	3	14	2.86	0.03	0.511	0.962	0.795	0.193	1.950
34	<i>Michelia champaca</i>	2	3	1.90	0.01	2.977	0.641	0.170	1.126	1.937
35	<i>Sorbus mycrophylla</i>	1	22	0.95	0.04	0.560	0.321	1.250	0.212	1.782
36	<i>Quercus lanata</i>	3	9	2.86	0.02	0.750	0.962	0.511	0.284	1.757
37	<i>Rhododendron keyssii</i>	4	7	3.81	0.01	0.094	1.282	0.398	0.036	1.715
38	<i>Pinus roxburghii</i>	2	7	1.90	0.01	1.760	0.641	0.398	0.665	1.704
39	<i>Lithocarpus elegans</i>	2	2	1.90	0.00	2.132	0.641	0.114	0.806	1.561
40	<i>Rhododendron barbatum</i>	3	8	2.86	0.015	0.228	0.962	0.455	0.086	1.502
41	<i>Salix sikkimensis</i>	2	13	1.90	0.025	0.283	0.641	0.739	0.107	1.487
42	<i>Eurya serrata</i>	3	7	2.86	0.013	0.101	0.962	0.398	0.038	1.397
43	<i>Eurya</i> sp	3	5	2.86	0.010	0.150	0.962	0.284	0.057	1.302
44	<i>Taxus baccata</i>	2	2	1.90	0.004	1.415	0.641	0.114	0.535	1.290
45	<i>Sorbus wallichii</i>	3	3	2.86	0.006	0.350	0.962	0.170	0.132	1.264
46	<i>symplocos racemosa</i>	1	11	0.95	0.021	0.793	0.321	0.625	0.300	1.245
47	<i>Acer pectinatum</i>	2	2	1.90	0.004	1.005	0.641	0.114	0.380	1.135
48	<i>Rhododendron griffithianum</i>	2	7	1.90	0.013	0.149	0.641	0.398	0.056	1.095
49	<i>Brassaiopsis mitis</i>	2	6	1.90	0.011	0.176	0.641	0.341	0.067	1.049
50	<i>Rhododendron fulgens</i>	2	6	1.90	0.011	0.120	0.641	0.341	0.045	1.027
51	<i>Debregeasia</i> sp	2	5	1.90	0.010	0.249	0.641	0.284	0.094	1.019
52	<i>Rhododendron kindrickii</i>	2	5	1.90	0.010	0.080	0.641	0.284	0.030	0.955
53	<i>Brassaiopsis</i> sp	2	3	1.90	0.006	0.342	0.641	0.170	0.129	0.941
54	<i>Juglans regia</i>	2	2	1.90	0.004	0.300	0.641	0.114	0.113	0.868
55	<i>Cinnamomum</i> sp	2	3	1.90	0.006	0.125	0.641	0.170	0.047	0.859
56	<i>Rhododendron</i> sp	1	7	0.95	0.013	0.365	0.321	0.398	0.138	0.856

CONSERVATION MANAGEMENT PLAN

57	<i>Rhododendron campylocarpum</i>	2	3	1.90	0.006	0.090	0.641	0.170	0.034	0.846
58	<i>Schefflera impressa</i>	2	2	1.90	0.004	0.080	0.641	0.114	0.030	0.785
59	<i>Hydrangea heteromalla</i>	2	2	1.90	0.004	0.057	0.641	0.114	0.022	0.776
60	<i>Magnolia campbellii</i>	1	2	0.95	0.004	0.556	0.321	0.114	0.210	0.644
61	<i>Pyrus sp</i>	1	2	0.95	0.004	0.507	0.321	0.114	0.192	0.626
62	<i>Viburnum cotinifolium</i>	1	4	0.95	0.008	0.198	0.321	0.227	0.075	0.623
63	<i>Symplocos paniculata</i>	1	4	0.95	0.008	0.145	0.321	0.227	0.055	0.603
64	<i>Ilex sp</i>	1	4	0.95	0.008	0.088	0.321	0.227	0.033	0.581
65	<i>Sorbus foliolosa</i>	1	3	0.95	0.006	0.132	0.321	0.170	0.050	0.541
66	<i>Juniperus pseudosabina</i>	1	3	0.95	0.006	0.065	0.321	0.170	0.025	0.516
67	<i>Schima wallichii</i>	1	2	0.95	0.004	0.209	0.321	0.114	0.079	0.513
68	<i>Morus sp</i>	1	2	0.95	0.004	0.199	0.321	0.114	0.075	0.509
69	<i>Rhododendron wightii</i>	1	3	0.95	0.006	0.040	0.321	0.170	0.015	0.506
70	<i>Enkianthus deflexus</i>	1	3	0.95	0.006	0.038	0.321	0.170	0.014	0.505
71	<i>Litsea sp</i>	1	2	0.95	0.004	0.076	0.321	0.114	0.029	0.463
72	<i>Swida macrophylla</i>	1	2	0.95	0.004	0.040	0.321	0.114	0.015	0.449
73	<i>Marma shing(brokpa)</i>	1	2	0.95	0.004	0.033	0.321	0.114	0.013	0.447
74	<i>lindera neesiana</i>	1	2	0.95	0.004	0.029	0.321	0.114	0.011	0.445
75	<i>Rhododendron tsariense</i>	1	2	0.95	0.004	0.026	0.321	0.114	0.010	0.444
76	<i>Rhododendron argioplum</i>	1	2	0.95	0.004	0.025	0.321	0.114	0.009	0.444
77	<i>Betula sp</i>	1	1	0.95	0.002	0.173	0.321	0.057	0.065	0.443
78	<i>Ulmus spp</i>	1	2	0.95	0.004	0.008	0.321	0.114	0.003	0.437
79	<i>Viburnum nervosum</i>	1	1	0.95	0.002	0.096	0.321	0.057	0.036	0.414
80	<i>Myrica esculenta</i>	1	1	0.95	0.002	0.035	0.321	0.057	0.013	0.390
81	<i>Ramshimh</i>	1	1	0.95	0.002	0.019	0.321	0.057	0.007	0.385
82	<i>Pieris formosa</i>	1	1	0.95	0.002	0.018	0.321	0.057	0.007	0.384
83	<i>Rhododendron campanulatum</i>	1	1	0.95	0.002	0.013	0.321	0.057	0.005	0.382
84	<i>Rhododendron neivium</i>	1	1	0.95	0.002	0.010	0.321	0.057	0.004	0.381
85	<i>Rhus sp</i>	1	1	0.95	0.002	0.01	0.32	0.06	0.00	0.38
	Total		1760.00	297.14	3.35	264.47	100.00	100.00	100.00	300.00

Annexure 3: Checklist of Rhododendron Species of SWS

SI #	Scientific Name	SI #	Scientific Name
1	<i>Rhododendron aeruginosum</i>	22	<i>Rhododendron kesangiae</i>
2	<i>Rhododendron anthopogon</i>	23	<i>Rhododendron keysii</i>
3	<i>Rhododendron arboreum</i>	24	<i>Rhododendron lanatum</i>
4	<i>Rhododendron argipeplum</i>	25	<i>Rhododendron lepidotum</i>
5	<i>Rhododendron barbatum</i>	26	<i>Rhododendron leptocarpum</i>
6	<i>Rhododendron bhutanense</i>	27	<i>Rhododendron lindleyi</i>
7	<i>Rhododendron camelliiflorum</i>	28	<i>Rhododendron maddenii</i>
8	<i>Rhododendron campanulatum</i>	29	<i>Rhododendron neriiflorum</i>
9	<i>Rhododendron campylocarpum</i>	30	<i>Rhododendron nivale</i>
10	<i>Rhododendron ciliatum</i>	31	<i>Rhododendron niveum</i>
11	<i>Rhododendron cinnabarinum</i>	32	<i>Rhododendron papillatum</i>
12	<i>Rhododendron dalhousiae</i>	33	<i>Rhododendron pendulum</i>
13	<i>Rhododendron edgeworthii</i>	34	<i>Rhododendron setosum</i>
14	<i>Rhododendron falconeri</i>	35	<i>Rhododendron succothii</i>
15	<i>Rhododendron flinckii</i>	36	<i>Rhododendron thomsonii</i>
16	<i>Rhododendron fulgens</i>	37	<i>Rhododendron triflorum</i>
17	<i>Rhododendron glaucophyllum</i>	38	<i>Rhododendron tsariense</i>
18	<i>Rhododendron grande</i>	39	<i>Rhododendron virgatum</i>
19	<i>Rhododendron griffithianum</i>	40	<i>Rhododendron wallichii</i>
20	<i>Rhododendron hodgsonii</i>	41	<i>Rhododendron wightii</i>
21	<i>Rhododendron kendrickii</i>		

Annexure 4: Checklist of Orchid Species of SWS

Sl#	Scientific Name
1	<i>Agrostophyllum callosum</i>
2	<i>Androcorys josephi</i>
3	<i>Androcorys monophyllum</i>
4	<i>Anoectochilus brevilabris</i>
5	<i>Anthogonium gracile</i>
6	<i>Aorchis spathulata</i>
7	<i>Arundina graminifolia</i>
8	<i>Bulbophyllum affine</i>
9	<i>Bulbophyllum cornu-cervi</i>
10	<i>Bulbophyllum cylindraceum</i>
11	<i>Bulbophyllum depressum</i>
12	<i>Bulbophyllum emarginatum</i>
13	<i>Bulbophyllum griffithii</i>
14	<i>Bulbophyllum gymnopus</i>
15	<i>Bulbophyllum hirtum</i>
16	<i>Bulbophyllum obrienianum</i>
17	<i>Bulbophyllum odoratissimum</i>
18	<i>Bulbophyllum reptans</i>
19	<i>Bulbophyllum retusiusculum</i>
20	<i>Bulbophyllum secundum</i>
21	<i>Bulbophyllum spp.</i>
22	<i>Bulbophyllum umbellatum</i>
23	<i>Calanthe keshabii</i>
24	<i>Calanthe mannii</i>
25	<i>Calanthe plantaginea</i>
26	<i>Cephalanthera damasonium</i>
27	<i>Ceratostylis himalaica</i>
28	<i>Cheirostylis griffithii</i>
29	<i>Chrysoglossum ornatum</i>
30	<i>Chusua pauciflora</i>
31	<i>Cleisostoma linearilobulatum</i>
32	<i>Cleisostoma racemiferum</i>
33	<i>Cleisostoma williamsonii</i>
34	<i>Coelogyne corymbosa</i>
35	<i>Coelogyne occultata</i>
36	<i>Coelogyne ovalis</i>
37	<i>Coelogyne prolifera</i>
38	<i>Coelogyne raizadae</i>
39	<i>Coelogyne schultesii</i>
40	<i>Conchidium muscicola</i>
41	<i>Conchidium pusillum</i>
42	<i>Crepidium acuminatum</i>
43	<i>Cymbidium bicolor</i>
44	<i>Cymbidium elegans</i>
45	<i>Cymbidium erythraeum</i>
46	<i>Cymbidium hookerianum</i>
47	<i>Cymbidium iridioides</i>
48	<i>Cymbidium lancifolium</i>
49	<i>Cypripedium sp</i>
50	<i>Dactylorhiza hatagirea</i>
51	<i>Dendrobium aphyllum</i>
52	<i>Dendrobium candidum</i>
53	<i>Dendrobium chrysanthum</i>
54	<i>Dendrobium densiflorum</i>
55	<i>Dendrobium falconeri</i>
56	<i>Dendrobium fimbriatum</i>
57	<i>Dendrobium hookerianum</i>
58	<i>Dendrobium longicornu</i>
59	<i>Dendrobium nobile</i>
60	<i>Dendrobium porphyrochilum</i>
61	<i>Dendrobium transparens</i>
62	<i>Epigenium fargesii</i>
63	<i>Epigenium fuscescens</i>
64	<i>Epipogium roseum</i>
65	<i>Eria carinata</i>
66	<i>Eria coronaria</i>
67	<i>Esmeralda clarkei</i>
68	<i>Galeola lindleyana</i>
69	<i>Gastrochilus calceolaris</i>
70	<i>Gastrochilus distichus</i>
71	<i>Goodyera fusca</i>
72	<i>Goodyera repens</i>
73	<i>Goodyera schlechtendaliana</i>
74	<i>Goodyera viridiflora</i>
75	<i>Gymnadenia orchidis</i>
76	<i>Habenaria arietina</i>

77	<i>Habenaria marginata</i>
78	<i>Herminium lanceum</i>
79	<i>Holcoglossum himalaicum</i>
80	<i>Liparis bootanensis</i>
81	<i>Liparis cordifolia</i>
82	<i>Liparis nervosa</i> var. <i>khasiana</i>
83	<i>Liparis odorata</i>
84	<i>Liparis resupinata</i>
85	<i>Malaxis muscifera</i>
86	<i>Mycaranthes floribunda</i>
87	<i>Neogyna gardneriana</i>
88	<i>Neottia acuminata</i> (orchid)
89	<i>Neottia listeroides</i>
90	<i>Neottia pinetorum</i>
91	<i>Nervilia falcata</i>
92	<i>Oberonia acaulis</i>
93	<i>Oberonia falcata</i>
94	<i>Odontochilus lanceolatus</i>
95	<i>Odontochilus poilanei</i>
96	<i>Oreorchis foliosa</i> var. <i>foliosa</i>
97	<i>Ornithochilus difformis</i>
98	<i>Otochilus fuscus</i>
99	<i>Otochilus lancilabius</i>
100	<i>Papilionanthe vandarum</i>
101	<i>Phalaenopsis taenialis</i>
102	<i>Pholidota articulata</i>
103	<i>Pholidota pallida</i>
104	<i>Phreatia elegans</i>
105	<i>Pinalia amica</i>
106	<i>Pinalia graminifolia</i>
107	<i>Pinalia spicata</i>
108	<i>Platanthera bakeriana</i>
109	<i>Platanthera clavigera</i>
110	<i>Platanthera dyeriana</i>
111	<i>Platanthera edgeworthii</i>
112	<i>Platanthera sikkimensis</i>
113	<i>Platanthera urceolata</i>
114	<i>Pleione hookeriana</i>
115	<i>Pleione humilis</i>
116	<i>Satyrium nepalense</i>

117	<i>Satyrium nepalense</i> var. <i>ciliatum</i>
118	<i>Schoenorchis gemmata</i>
119	<i>Spathoglottis ixioides</i>
120	<i>Spiranthes sinensis</i>
121	<i>Stereochilus hirtus</i>
122	<i>Sunipia bicolor</i>
123	<i>Sunipia nepalensis</i>
124	<i>Taeniophyllum retrospiculatum</i>
125	<i>Vanda alpine</i>
126	<i>Vanda bicolor</i>
127	<i>Vanda cristata</i>
128	<i>Vandopsis undulata</i>
129	<i>Zeuxine flava</i>
130	<i>Zeuxine goodyeroides</i>

Annexure 5: Checklist of Mammal Species of SWS

Sl#	Common Name	Scientific Name	Family	Order
1	Musk Deer	<i>Moschus</i> sp	Moschidae	Cetartiodactyla
2	Gaur	<i>Bos gaurus</i>	Bovidae	Artiodactyla
3	Himalayan Goral	<i>Naemorhedus goral</i>	Bovidae	Artiodactyla
4	Himalayan Serow	<i>Capricornis thar</i>	Bovidae	Artiodactyla
5	Barking Deer	<i>Muntiacus muntjak</i>	Cervidae	Artiodactyla
6	Sambar	<i>Cervus unicolor</i>	Cervidae	Artiodactyla
7	Wild Pig	<i>Sus scrofa</i>	Suidae	Artiodactyla
8	Red Panda	<i>Ailurus fulgens</i>	Ailuridae	Carnivora
9	Red Fox	<i>Vulpes vulpes</i>	Canidae	Carnivora
10	Wild Dog	<i>Cuon alpinus</i>	Canidae	Carnivora
11	Common Leopard (Black Panther)	<i>Panthera pardus</i>	Felidae	Carnivora
12	Clouded Leopard	<i>Neofelis nebulosa</i>	Felidae	Carnivora
13	Common Leopard	<i>Panthera pardus</i>	Felidae	Carnivora
14	Himalayan Jungle Cat	<i>Felis chaus</i>	Felidae	Carnivora
15	Leopard Cat	<i>Prionailurus bengalensis</i>	Felidae	Carnivora
16	Royal Bengal Tiger	<i>Panthera tigris tigris</i>	Felidae	Carnivora
17	Marbled Cat	<i>Pardofelis marmorata</i>	Felidae	Carnivora
18	Asiatic Golden Cat	<i>Catopuma temminckii</i>	Felidae	Carnivora
19	Siberian Weasel	<i>Mustela sibirica</i>	Mustelidae	Carnivora
20	Yellow-throated Marten	<i>Martes flavigula</i>	Mustelidae	Carnivora
21	Asiatic Black Bear	<i>Ursus thibetanus</i>	Ursidae	Carnivora
22	Masked Palm Civet	<i>Paguma larvata</i>	Viverridae	Carnivora
23	Himalayan Water Shrew	<i>Chimarrogale himalayica</i>	Soricidae	Eulipotyphla
24	Himalayan Mole	<i>Euroscaptor micrura</i>	Talpidae	Eulipotyphla
25	Forrest's Pika	<i>Ochotona forresti</i>	Ochotonidae	Lagomorpha
26	Large-eared Pika	<i>Ochotona macrotis</i>	Ochotonidae	Lagomorpha
27	Moupin's Pika	<i>Ochotona thibetana</i>	Ochotonidae	Lagomorpha
28	Assamese Macaque	<i>Macaca assamensis</i>	Cercopithecidae	Primates
29	Capped Langur	<i>Trachypithecus pileatus</i>	Cercopithecidae	Primates
30	Sikkim Mountain Vole	<i>Neodon sikimensis</i>	Cricetidae	Rodentia
31	Himalayan Crestless Porcupine	<i>Hystrix brachyura</i>	Hystricidae	Rodentia
32	Sikkim Mouse	<i>Mus pahari</i>	Muridae	Rodentia
33	Bhutan Giant Flying Squirrel	<i>Petaurista nobilis</i>	Sciuridae	Rodentia
34	Black Giant Squirrel	<i>Ratufa bicolor</i>	Sciuridae	Rodentia
35	Himalayan Stripped Squirrel	<i>Tamiops maccllellandi</i>	Sciuridae	Rodentia
36	Orange-bellied Himalayan Squirrel	<i>Dremomys lokriah</i>	Sciuridae	Rodentia
37	Pallas squirrel/Red-bellied Tree squirrel	<i>Callosciurus erythraeus</i>	Sciuridae	Rodentia

Annexure 6: Checklist of Bird Species of SWS

Sl#	Common Name	Scientific Name
1	Alpine Accentor	<i>Prunella collaris</i>
2	Altai Accentor	<i>Prunella himalayana</i>
3	Robin Accentor	<i>Prunella rubeculoides</i>
4	Rufous-breasted Accentor	<i>Prunella strophiaata</i>
5	Eurasian Sparrowhawk	<i>Accipiter nisus</i>
6	Black-headed Shrike Babbler	<i>Pteruthius rufiventer</i>
7	Slender-billed Scimitar Babbler	<i>Xiphirhynchus superciljaris</i>
8	Black-chinned Yuhina	<i>Yuhina nigrimenta</i>
9	Brown Parrotbill	<i>Paradoxornis unicolor</i>
10	Brown-throated Fulvetta	<i>Alcippe ludlowi</i>
11	Chestnut-tailed Minlia	<i>Minlia strigula</i>
12	Golden Babbler	<i>Stachyris chrysaea</i>
13	Golden-breasted Fulvetta	<i>Alcippe chrysofis</i>
14	Green Shrike Babbler	<i>Pteruthius xanthochlorus</i>
15	Long-tailed Sibia	<i>Heterophasia picaoides</i>
16	Pygmy Wren Babbler	<i>Pnoepyga pusilla</i>
17	Rufous Sibia	<i>Heterophasia capistrata</i>
18	Rufous-backed Sibia	<i>Heterophasia annectens</i>
19	Rufous-capped Babbler	<i>Stachyris ruficeps</i>
20	Rufous-vented Yuhina	<i>Yuhina occipitalis</i>
21	Rufous-winged Fulvetta	<i>Alcippe castaneiceps</i>
22	Rusty-cheeked Scimitar Babbler	<i>Pomatorhinus erythrogenys</i>
23	Streak-breasted Scimitar Babbler	<i>Pomatorhinus ruficollis</i>
24	Stripe-throated Yuhina	<i>Yuhina gularis</i>
25	Whiskered Yuhina	<i>Yuhina flavicollis</i>
26	White-browed Shrike Babbler	<i>Pteruthius flaviscapis</i>
27	Yellow-throated Fulvetta	<i>Alcippe cinerea</i>
28	Blue-throated Barbet	<i>Megalaima asiatica</i>
29	Crimson-fronted Barbet	<i>Megalaima rubricapilla</i>
30	Golden-throated Barbet	<i>Megalaima franklinii</i>
31	Great Barbet	<i>Megalaima virens</i>
32	Hoary-throated Barwing	<i>Actinodura nipalensis</i>
33	Rusty-fronted Barwing	<i>Actinodura egertoni</i>
34	Grey-winged Blackbird	<i>Turdus boubolou</i>
35	White-collared Blackbird	<i>Turdus albocinctus</i>
36	Long-tailed Broadbill	<i>Psarismorus dalhousiae</i>
37	Black Bulbul	<i>Hypsipetes leucocephalus</i>
38	Himalayan Bulbul	<i>Pycnonotus leucogenys</i>
39	Mountain Bulbul	<i>Hypsipetes maclellandii</i>
40	Red-vented Bulbul	<i>Pycnonotus cafer</i>
41	Striated Bulbul	<i>Pycnonotus striatus</i>
42	Brown Bullfinch	<i>Pyrrhula nipalensis</i>
43	Red-headed Bullfinch	<i>Pyrrhula erythrocephala</i>
44	Crested Bunting	<i>Melophus lathami</i>
45	Grey Bushchat	<i>Sexicola ferrea</i>
46	Common Buzzard	<i>Buteo buteo</i>
47	Red-billed Chough	<i>Pyrrhocorax pyrrhocorax</i>
48	Yellow-billed Chough	<i>Pyrrhocorax graculus</i>
49	Collared Treepie	<i>Dendrocitta frontalis</i>
50	Common Green Magpie	<i>Cissa chinensis</i>
51	Grey Treepie	<i>Dendrocitta formosae</i>
52	Large-billed Crow	<i>Corvus macrorhynchos</i>
53	Rufous Treepie	<i>Dendrocitta vagabunda</i>
54	Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>
55	Black-tailed Crane	<i>Porzana bicolor</i>
56	Asian Emerald Cuckoo	<i>Chrysococcyx maculatus</i>

CONSERVATION MANAGEMENT PLAN

57	Drongo Cuckoo	<i>Surniculus lugubris</i>		88	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>
58	Eurasian Cuckoo	<i>Cuculus canorus</i>		89	Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>
59	Grey-bellied Cuckoo	<i>Cacomantis passerines</i>		90	Dark-sided Flycatcher	<i>Muscicapa sibirica</i>
60	Hodgson's Hawk Cuckoo	<i>Hierococcyx fugax</i>		91	Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>
61	Indian Cuckoo	<i>Cuculus micropterus</i>		92	Little Pied Flycatcher	<i>Ficedula westermanni</i>
62	Large Hawk Cuckoo	<i>Hierococcyx sparveriooides</i>		93	Pale Blue Flycatcher	<i>Cyornis unicolor</i>
63	Lesser Cuckoo	<i>Cuculus poliocephalus</i>		94	Red-throated Flycatcher	<i>Ficedula parva</i>
64	Oriental Cuckoo	<i>Cuculus saturates</i>		95	Rufous-gorgeted Flycatcher	<i>Ficedula strophata</i>
65	Plaintive Cuckoo	<i>Cacomantis merulinus</i>		96	Rufous-backed Flycatcher	<i>Ficedula hodgsonii</i>
66	Black-winged Cuckooshrike	<i>Coracina melaschistos</i>		97	Slaty-blue Flycatcher	<i>Ficedula tricolor</i>
67	Cutia	<i>Cutia nipalensis</i>		98	Ultramarine Flycatcher	<i>Ficedula supercilialis</i>
68	Brown Dipper	<i>Cinclus pallasi</i>		99	Verditer Flycatcher	<i>Eumyias thalassina</i>
69	White-throated Dipper	<i>Cinclus cinclus</i>		100	Little Forktail	<i>Enicurus scouleri</i>
70	Ashy Drongo	<i>Dicrurus leucophaeus</i>		101	Slaty-backed Forktail	<i>Enicurus schistaceus</i>
71	Black Drongo	<i>Dicrurus macrocerus</i>		102	Spotted Forktail	<i>Enicurus maculatus</i>
72	Bronzed Drongo	<i>Dicrurus aeneus</i>		103	Satyra Tragopan	<i>Tragopan satyra</i>
73	Crow-billed Drongo	<i>Dicrurus annectans</i>		104	Rufous-bellied Woodpecker	<i>Dendrocopos hyperythrus</i>
74	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>		105	Blood Pheasant	<i>Ithaginis cruentus</i>
75	Spangled Drongo	<i>Dicrurus hottentottus</i>		106	Hill Partridge	<i>Arborophila torqueola</i>
76	Ruddy Shelduck	<i>Tadorna ferruginea</i>		107	Himalayan Monal	<i>Lophophorus impejanus</i>
77	Black Eagle	<i>Ictinactus malayensis</i>		108	Kalij Pheasant	<i>Lophura leucomelanos</i>
78	Crested Serpent Eagle	<i>Spilornis cheela</i>		109	Rufous-throated Partridge	<i>Arborophila rufogularis</i>
79	Mountain Hawk Eagle	<i>Spizaetus nipalensis</i>		110	Snow Partridge	<i>Lenwa lenwa</i>
80	Common Kestrel	<i>Falco tinnunculus</i>		111	Tibetan Snowcock	<i>Tetraogallus tibetanus</i>
81	White-throated Fantail	<i>Rhipidura albicollis</i>		112	Crested Goshawk	<i>Accipiter trivirgatus</i>
82	Yellow-bellied Fantail	<i>Rhipidura hypoxantha</i>		113	Northern Goshawk	<i>Accipiter gentilis</i>
83	Crimson-browed Finch	<i>Propryhula subhimachalus</i>		114	Yellow-breasted Greenfinch	<i>Carduelis spinoides</i>
84	Gold-naped Finch	<i>Pyrrhula aurantiaca</i>		115	Himalayan Griffon	<i>Gyps himalayensis</i>
85	Scarlet Finch	<i>Haematospiza sipahi</i>		116	Collared Grosbeak	<i>Mycerobas affinis</i>
86	Fire-breasted Flowerpecker	<i>Dicaeum ignipectus</i>		117	Spot-winged Grosbeak	<i>Mycerobas melanozanthos</i>
87	Yellow-vented Flowerpecker	<i>Dicaeum chrysorrheum</i>		118	White-winged Grosbeak	<i>Mycerobas carripes</i>

119	Hen Harrier	<i>Circus cyaneus</i>	150	Common Myna	<i>Acridotheres tristis</i>
120	Chinese Pond Heron	<i>Ardeola bacchus</i>	151	Fire-tailed Myzornis	<i>Myzornis pyrhoura</i>
121	Yellow-rumped Honeyguide	<i>Indicator xanthonotus</i>	152	White-throated Needletail	<i>Hirundapus caudacutus</i>
122	Common Hoopoe	<i>Upupa epops</i>	153	Grey Nightjar	<i>Caprimulgus indicus</i>
123	Ibisbill	<i>Ibidorhyncha struthersii</i>	154	Large-tailed Nightjar	<i>Caprimulgus macurus</i>
124	Eurasian Jay	<i>Garrulus glandarius</i>	155	Large Niltava	<i>Niltava grandis</i>
125	Crested Kingfisher	<i>Megaceryle lugubris</i>	156	Rufous-bellied Niltava	<i>Niltava sundara</i>
126	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	157	Small Niltava	<i>Niltava macgrigoriae</i>
127	Black Kite	<i>Milvus migrans</i>	158	Spotted Nutcracker	<i>Nucifraga caryocatactes</i>
128	Black-faced Laughingthrush	<i>Garrulax affinis</i>	159	Chestnut-bellied Nuthatch	<i>Sitta castanea</i>
129	Blue-winged Laughingthrush	<i>Garrulax squamatus</i>	160	White-tailed Nuthatch	<i>Sitta himalayensis</i>
130	Chestnut-crowned Laughingthrush	<i>Garrulax erythrocephalus</i>	161	Maroon Oriole	<i>Oriolus traillii</i>
131	Lesser Necklaced Laughingthrush	<i>Garrulax monileger</i>	162	Collared Scops Owl	<i>Otus bakkamoena</i>
132	Rufous-chinned Laughingthrush	<i>Garrulax rufogularis</i>	163	Mountain Scops Owl	<i>Otus spilocephalus</i>
133	Spotted Laughingthrush	<i>Garrulax ocellatus</i>	164	Spot-bellied Eagle Owl	<i>Bubo nipalensis</i>
134	Streaked Laughingthrush	<i>Garrulax lineatus</i>	165	Asian Barred Owlet	<i>Glaucidium cuculoides</i>
135	Striated Laughingthrush	<i>Garrulax striatus</i>	166	Collared Owlet	<i>Glaucidium brodiei</i>
136	White-crested Laughingthrush	<i>Garrulax leucolophus</i>	167	Slaty-headed Parakeet	<i>Psittacula himalayana</i>
137	White-throated Laughingthrush	<i>Garrulax albogularis</i>	168	Speckled Piculet	<i>Picumnus innominatus</i>
138	Orange-bellied Leafbird	<i>Chloropsis hardwickii</i>	169	Barred Cuckoo Dove	<i>Macropygia unchall</i>
139	Red-billed Leiothrix	<i>Leiothrix lutea</i>	170	Mountain Imperial Pigeon	<i>Ducula badia</i>
140	Red-faced Liocichla	<i>Liocichla phoenicea</i>	171	Oriental Turtle Dove	<i>Streptopelia orientalis</i>
141	Asian House Martin	<i>Delichon dasyous</i>	172	Rock Pigeon	<i>Columba livia</i>
142	Eurasian Crag Martin	<i>Hirundo rupestris</i>	173	Snow Pigeon	<i>Columba leuconota</i>
143	Nepal House Martin	<i>Delichon nipalensis</i>	174	Speckled Wood Pigeon	<i>Columba hodgsonii</i>
144	Silver-eared Mesia	<i>Leiothrix argenteauris</i>	175	Spotted Dove	<i>Streptopelia chinensis</i>
145	Long-tailed Minivet	<i>Pericrocotus ethologus</i>	176	Wedge-tailed Green Pigeon	<i>Treron sphenura</i>
146	Scarlet Minivet	<i>Pericrocotus flammeus</i>	177	Olive-backed Pipit	<i>Anthus hodgsoni</i>
147	Short-billed Minivet	<i>Pericrocotus brevirostris</i>	178	Rosy Pipit	<i>Anthus roseatus</i>
148	Red-tailed Minla	<i>Minla ignotincta</i>	179	Striated Primia	<i>Prinia criniger</i>
149	Plain Mountain Finch	<i>Leucosticte nemoricola</i>	180	Black Redstart	<i>Phoenicurus ochruros</i>

CONSERVATION MANAGEMENT PLAN

181	Blue-fronted Redstart	<i>Phoenicurus frontalis</i>	212	Crimson Sunbird	<i>Aethopyga siparaja</i>
182	Hodgson's Redstart	<i>Phoenicurus hodgsoni</i>	213	Fire-tailed Sunbird	<i>Aethopyga ignicauda</i>
183	Plumbeous Water Redstart	<i>Rhyacornis fuliginosus</i>	214	Green-tailed Sunbird	<i>Aethopyga nipalensis</i>
184	White-bellied Redstart	<i>Hodgsonius phaenicuroides</i>	215	Mrs Gould's Sunbird	<i>Aethopyga gouldiae</i>
185	White-capped Water Redstart	<i>Chaimarrornis leucocephalus</i>	216	Fork-tailed Swift	<i>Apus pacificus</i>
186	White-winged Redstart	<i>Phoenicurus erythrogaster</i>	217	House Swift	<i>Apus affinis</i>
187	Indian Blue Robin	<i>Luscinia burmea</i>	218	Himalayan Swiftlet	<i>Collocalia brevirostris</i>
188	Orange-flanked Bush Robin	<i>Tarsiger cyanurus</i>	219	Common Tailorbird	<i>Orthotomus sutorius</i>
189	Oriental Magpie Robin	<i>Copsychus saularis</i>	220	Chestnut-headed Tesia	<i>Tesia castaneocoronata</i>
190	Rufous-breasted Bush Robin	<i>Tarsiger hyperythrus</i>	221	Blue Rock Thrush	<i>Monticola solitarius</i>
191	White-tailed Robin	<i>Myiomela leucura</i>	222	Blue Whistling Thrush	<i>Myophonus caeruleus</i>
192	Indian Roller	<i>Coracias benghalensis</i>	223	Blue-capped Rock Thrush	<i>Monticola cinclorhynchus</i>
193	Beautiful Rosefinch	<i>Carpodacus pulcherimus</i>	224	Chestnut-bellied Rock Thrush	<i>Monticola rufiventris</i>
194	Common Rosefinch	<i>Carpodacus erythrinus</i>	225	Long-tailed Thrush	<i>Zoothera dixoni</i>
195	Dark-breasted Rosefinch	<i>Carpodacus nipalensis</i>	226	Plain-backed Thrush	<i>Zoothera mollissima</i>
196	Dark-rumped Rosefinch	<i>Carpodacus edwardsii</i>	227	Scaly Thrush	<i>Zoothera dauma</i>
197	Pink-browed Rosefinch	<i>Carpodacus rodochrous</i>	228	Black-throated Tit	<i>Aegithalos concinnus</i>
198	Red-fronted Rosefinch	<i>Carpodacus puniceus</i>	229	Coal Tit	<i>Parus ater</i>
199	Streaked Rosefinch	<i>Carpodacus rubicilioides</i>	230	Fire-capped Tit	<i>Cephalopyrus flammiceps</i>
200	White-browed Rosefinch	<i>Carpodacus thura</i>	231	Green-backed tit	<i>Parus monticolus</i>
201	Green Sandpiper	<i>Tringa ochropus</i>	232	Grey-crested Tit	<i>Parus dichrous</i>
202	White-browed Shortwing	<i>Brachypteryx montana</i>	233	Rufous-vented Tit	<i>Parus</i>
203	Grey-backed Shrike	<i>Lanius tephronotus</i>	234	Rufous-vented Tit	<i>Parus rubidiventris</i>
204	Long-tailed Shrike	<i>Lanius schach</i>	235	Sultan Tit	<i>Melanochlora sultanea</i>
205	Wood Snipe	<i>Gallinago nemoricola</i>	236	Yellow-cheeked Tit	<i>Parus spilonotus</i>
206	Solitary Snipe	<i>Gallinago solitaria</i>	237	Brown-throated Treecreeper	<i>Certhia discolor</i>
207	Eurasian Tree Sparrow	<i>Passer montanus</i>	238	Eurasian Treecreeper	<i>Certhia familiaris</i>
208	House Sparrow	<i>Passer domesticus</i>	239	Rusty-flanked Treecreeper	<i>Certhia nipalensis</i>
209	Russet Sparrow	<i>Passer rutilans</i>	240	Ward's Trogon	<i>Harpactes wardi</i>
210	Streaked Spiderhunter	<i>Arachnothera magna</i>	241	Red-headed Trogon	<i>Harpactes erythrocephalus</i>
211	Black-throated Sunbird	<i>Aethopyga saturate</i>	242	Grey Wagtail	<i>Motacilla cinerea</i>

243	White Wagtail	<i>Motacilla alba</i>			
244	White-browed Wagtail	<i>Motacilla maderaspatensis</i>			
245	Wallcreeper	<i>Tichodroma muraria</i>			
246	Yellow-vented Warbler	<i>Phylloscopus collybita</i>			
247	Aberrant Bush Warbler	<i>Cettia flavovivacea</i>			
248	Ashy-throated Warbler	<i>Phylloscopus maculipennis</i>			
249	Black-faced Warbler	<i>Abruscoptes schisticeps</i>			
250	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>			
251	Brown Bush Warbler	<i>Bradypterus luteoventris</i>			
252	Brown-flanked Bush Warbler	<i>Cettia fortipes</i>			
253	Buff-barred Warbler	<i>Phylloscopus pulcher</i>			
254	Chestnut-crowned Bush Warbler	<i>Cettia major</i>			
255	Chestnut-crowned Warbler	<i>Seiurus castaneiceps</i>			
256	Dusky Warbler	<i>Phylloscopus fuscatus</i>			
257	Golden-spectacled Warbler	<i>Seiurus burkii</i>			
258	Greenish Warbler	<i>Phylloscopus trochiloides</i>			
259	Grey-cheeked Warbler	<i>Seiurus poliogenys</i>			
260	Grey-hooded Warbler	<i>Seiurus xanthoschistos</i>			
261	Grey-sided Bush Warbler	<i>Cettia burnifrons</i>			
262	Hume's Warbler	<i>Phylloscopus humei</i>			
263	Lemon-rumped Warbler	<i>Phylloscopus chloronotus</i>			
264	Pale-footed Bush Warbler	<i>Cettia pallidipes</i>			
265	Russet Bush Warbler	<i>Bradypterus mandelli</i>			
266	Smoky Warbler	<i>Phylloscopus fulgiventis</i>			
267	Spotted Bush Warbler	<i>Bradypterus thoracicus</i>			
268	Tickell's leaf warbler	<i>Phylloscopus affinis</i>			
269	Whistler's Warbler	<i>Seiurus whistleri</i>			
270	Yellow-bellied Warbler	<i>Abruscoptes superciliosus</i>			
271	Yellow-browed Warbler	<i>Phylloscopus inornatus</i>			
272	Yellowish-bellied Bush Warbler	<i>Cettia acanthizoides</i>			
273	Winter Wren	<i>Troglodytes troglodytes</i>			
274	Oriental White-eye				<i>Zosterops palpebrosus</i>
275	Bay Woodpecker				<i>Blythipicus pyrrhotis</i>
276	Crimson-breasted Woodpecker				<i>Dendrocopos cathpharius</i>
277	Darjeeling Woodpecker				<i>Dendrocopos darjellensis</i>
278	Greater Yellownappe				<i>Picus flavinucha</i>
279	Grey-capped Pygmy Woodpecker				<i>Dendrocopos canicapillus</i>
280	Grey-headed Woodpecker				<i>Picus canus</i>

Annexure 7: Checklist of Butterfly Species of SWS

SI	Common Name	Scientific Name	SI	Common Name	Scientific Name	SI	Common Name	Scientific Name
1	Dark Judy	<i>Abisara fylla</i>	22	Common Hedge Blue	<i>Acytolepis pupsa</i>	43	Common Castor	<i>Ariadne merione</i>
2	Yellow Coster	<i>Acraea issoria</i>	23	Indian Tortoiseshell	<i>Aglais cashmirensis</i>	44	Common Maplet	<i>Chersonesia risa</i>
3	Hill Sergeant	<i>Athyma opalina</i>	24	Chocolate Albatross	<i>Appias lycida</i>	45	Red-base Jezebel	<i>Delias pasithoe</i>
4	Common Satyr	<i>Aulocera Swaha</i>	25	Indian Fritillary	<i>Argyreus hyperbius</i>	46	Pale jezebel	<i>Delias sanaca</i>
5	Pallid Argus	<i>Callerebia scanda</i>	26	Great Windmill	<i>Atrophaneura dasarada</i>	47	Lesser Punch	<i>Dodona dipoea</i>
6	Red Lacewing	<i>Cethosia biblis</i>	27	Mottled Emigrant	<i>Catopsilia pyranthe</i>	48	Striped Punch	<i>Dodona ouida</i>
7	Blue Tit	<i>Chilaria kina</i>	28	Dark Clouded Yellow	<i>Colias croceus</i>	49	Yellow Orangetip	<i>Ixias pyrene</i>
8	Common Map	<i>Cyrestis thyodamas</i>	29	Yellow Jezebel	<i>Delias agostina agostina</i>	50	Lemon Pansy	<i>Junonia orithya</i>
9	Plain Tiger	<i>Danaus chrysippus</i>	30	White-Edged Blue Baron	<i>Euthalia phemius</i>	51	Common Sailor	<i>Neptis hylas</i>
10	Common Tiger	<i>Danaus genutia</i>	31	Azure Sapphire	<i>Heliophorus androcles</i>	52	Common Peacock	<i>Papilio polyctor</i>
11	Hill Jezebel	<i>Delias belladonna</i>	32	Common Woodbrown	<i>Lethe sidonis</i>	53	Stately Nawab	<i>Poltura dolon</i>
12	Blue Duchess	<i>Euthalia duda</i>	33	Straight Banded Treebrown	<i>Lethe verma</i>	54	Common Nawab	<i>Precis athamas</i>
13	Crice	<i>Hestina nama</i>	34	Moore's Bushbrown	<i>Mycalasis heri</i>	55	Chocolate Soldier	<i>Precis iphita</i>
14	Lilacfork	<i>Lethe sura</i>	35	Restricted Demon	<i>Notocrypta curvifascia</i>	56	Blue Pancy	<i>Precis orithya</i>
15	Red Helen	<i>Menelaides helenus</i>	36	Tailed Redbreast	<i>Papilio bootes</i>	57	Common Flash	<i>Rapala nissa</i>
16	Bush Brown	<i>Mycalasis sp</i>	37	White commondore	<i>Parasarpa dudu</i>	58	Eastern Courtier	<i>Sephis chandra</i>
17	Yellow sailer	<i>Neptis ananta</i>	38	Bicolour Commondore	<i>Parasarpa zayla</i>	59	Graham's Ace	<i>Sovia grahami</i>
18	Red Breast	<i>Papilio alcmenor</i>	39	Large Cabbage White	<i>Pieris brassicae</i>	60	Grass Demon	<i>Udaspes folus</i>
19	Tabby	<i>Pseudergolis wedah</i>	40	Indian Cabbage White	<i>Pieris canidia</i>	61	Painted Lady	<i>Vanessa cardui</i>
20	Popinjay	<i>Stibochiona nicea</i>	41	Small Tawany Wall	<i>Rhaphicera moorei</i>	62	Indian Red Admiral	<i>Vanessa indica</i>
21	Punchiello	<i>Zemoros flegyas</i>	42	Three Spot grass Yellow	<i>Terias blanda</i>	63	Himalayan Fivering	<i>Ypthima sakra</i>

Annexure 8: Financial Projection for Plan Period (Recurrent)

Budget Code	Title	Year Wise Budget Projection (Nu. in million)										Total
		Y 1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10	
1.01	Pay and Allowances	8.78	9.52	10.30	11.40	12.90	13.74	14.85	15.00	15.15	15.30	126.94
2.01	Other Personnel Emolument	0.46	0.46	0.47	0.47	0.48	0.48	0.49	0.49	0.50	0.50	4.80
11.01	Travel-In-country & LTC	5.87	6.26	6.65	7.23	8.21	8.54	9.10	9.67	10.24	10.80	82.57
12.01	Utilities-Telephone, Telex	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00
12.02	Utilities-Telegram, Postage	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.95
12.03	Utilities-Electricity, Water, Sewerage	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	1.05
12.05	Utilities-Fuel-wood	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	1.05
13.01	Rental of Properties-Buildings	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.35
14.01	Office Supplies, Printing, Publication	0.17	0.17	0.18	0.18	0.19	0.02	0.20	0.20	0.21	0.21	1.73
14.06	Uniform, Extension Kits, Linens	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.57
15.01	Maintenance of Property-Building	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	2.40
15.02	Maintenance of Property-Vehicle	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	1.55
15.05	Maintenance of Property-Equipment	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.95
15.07	Maintenance of Property-Computers	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.85
15.09	Maintenance of Property-water supply, Sewerage	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.55
17.01	Op.Exp- Advertising	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.59
17.02	Op.Exp- Bank Charges ,Royalties, Duties	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.35
17.03	Op.Exp- Transportation	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.60
17.08	Op.Exp- In-country Meeting & Celebration	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.85
24.03	Contribution-Provident Fund	0.70	0.75	0.80	0.85	0.90	0.95	0.95	1.00	1.00	1.00	8.90
Total		17.01	18.30	19.61	21.46	24.09	25.26	27.19	28.07	28.89	29.72	239.60

Annexure 9: Work Plan and Financial Projection for Plan Period (Capital)

Objective	Issues/ Problems	Management Intervention	
Protect and rehabilitate important habitats and watersheds including grazing lands	Insufficient Tsamdro (Pasture land)	Program 1: Rehabilitate degraded Tsamdro and enhance livestock productivity	
		Strategic Action 1: Initiate scientific management of degraded Tsamdro	
		Activity 1: Initiate the leasing of reverted Tsamdro/pasture land to communities of Merak and Sakteng	
		Activity 2: Identify degraded leased Tsamdro and acquire user consensus to initiate silvopasture development	
		Activity 3: Conduct grazing carrying capacity study and bring degraded rangeland under scientific management purview	
		Activity 4: Rehabilitate degraded leased pasture land/ rangeland through planting fodder trees, bamboo species and suitable grass species for improved fodder production	
		Activity 5: In collaboration with DoL, supply of improved breed cattle will be initiated on pilot basis to reduce free forest grazing and increase diary production	
Enhance livelihood of the local people without compromising age old culture and tradition.		Activity 6: Initiate stall feeding and supply fodder trees to intensify on-farm cattle management and offset fodder shortages	
		Activity 7: Initiate agroforestry on pilot basis in the leased pasture land to offset fodder shortages and intensify on-farm cattle management	
		Program 2: Reduce crop deprecations	
		Strategic Action 1: Supply of electric/solar or alarm fencing on cost sharing basis	
Alleviate human wildlife conflict through strategic programs	Human-Wildlife Conflict (Crop Depredation)	Activity 1: In collaboration with Dzongkhag Agriculture Sector, identify suitable site for installation of electric/solar and alarm fencing of the agriculture land on pilot basis	
		Activity 2: Provide training on installation of electric/solar and alarm fencing to the local community	
		Activity 3: Replicate fencing program throughout sanctuary jurisdiction on cost sharing basis	
		Activity 4: Monitoring and evaluation of fencing program	
		Strategic Action 2: Initiate Crop Insurance Scheme	
		Activity 1: Pilot crop insurance schemes in worst affected areas by organizing consultative stakeholder workshop involving all relevant stakeholders. Form groups and define by-laws and governance mechanisms to verify claims	
		Activity 2: Where feasible, the SWS should source funding to provide seed money for such insurance schemes	
		Strategic Action 3: Initiation of Mixed Cropping Practice	
		Activity 1: Conduct feasibility study to grow additional crop with maize in collaboration with agriculture sector	
		Activity 2: Initiate pilot horticulture farming for sustainable production of agricultural products to meet food self-sufficiency	

Yearly Work Plan and Financial Projection

Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
	0.10	0.10								0.20
					0.10	0.10				0.20
			0.10							0.10
2.00	1.00	0.50					1.00	1.00		5.50
	1.00	0.50					0.50	0.50		2.50
0.50	0.50	1.00					0.50	0.50		3.00
		0.50	0.50	0.50						1.50
0.05										0.05
	0.20	0.50								0.70
			1.00	1.00	1.00					3.00
			0.05		0.08		0.10		0.10	0.33
	0.50									0.50
		0.20								0.20
0.10	0.10									0.20
	0.50	0.50								1.00

CONSERVATION MANAGEMENT PLAN

		Activity 3: Upscale the horticultural farming initiatives to rest of the communities inside the Sanctuary by engaging donors and actively sourcing the required funds		
		Activity 4: Supply high yielding varieties of crops, fruit trees and vegetable seeds		
Activity 5: Supply polyhouse to high altitude community for growing vegetables				
Enhance livelihood of the local people without compromising age old culture and tradition		Strategic Action 4: Determine Causes of Crop Depredation		
		Activity 1: Conduct ecological study of the problematic species to develop appropriate strategy and action plans		
	Human-Wildlife Conflict (Livestock Depredation)	Program 3: Alleviate Livestock Depredation and retaliatory killing		
		Strategic Action 1: Determine Causes of Livestock Depredation		
			Activity 1: Assess the seriousness of human-wildlife conflict in all the villages and species involved in livestock depredation.	
			Activity 2: Initiate pilot strategies to mitigate livestock depredation	
		Strategic Action 2: Livestock Insurance Scheme		
			Activity 1: Initiate livestock insurance schemes in worst affected areas. Form village livestock insurance committee and define by-laws and governance mechanisms to verify claims	
			Activity 2: Provide training on kill identification and verification in the field	
			Activity 3: Where feasible, SWS should source funding to provide seed money for such insurance schemes	
			Activity 4: Upscale successful initiatives by engaging donors and actively sourcing the required funds	
		Strategic Action 3: Livestock product diversification, packaging and marketing		
			Activity 1: Support the formation of livestock cooperatives, product development and packaging	
			Activity 2: Provide training on livestock product development and packaging	
		Strategic Action 4: Reduce poaching and retaliatory killing of wildlife species		
			Activity 1: Conduct ecological study of problematic species to develop appropriate strategy and action plans	
			Activity 2: Upscale SMART patrolling with well-equipped hardware, software and equipment	
	Activity 3: Construction of check post at strategic locations			

		0.50	0.50							1.00
				1.00	1.00					2.00
		1.50	1.50	1.50	1.50					6.00
		0.50								0.50
		0.50	0.50							1.00
				1.00	1.00					2.00
		0.80								0.80
			0.20							0.20
				2.00						2.00
					0.05		0.05		0.05	0.15
	0.20									0.20
		0.50								0.50
		0.50	0.50							1.00
		1.50	2.00							3.50
			2.00	2.00						4.00

CONSERVATION MANAGEMENT PLAN

Promote unique culture and traditions of the local people	Loss of culture and traditions	Program 4: Promote local culture and tradition	
		Strategic Action 1: Support local community to restore important cultural and religious sites	
		Activity 1: Assessment and mapping of important cultural and religious sites within SWS	
		Activity 2: Documentation of local culture, folk tales and traditional knowledge in collaboration with local community and concerned authorities	
		Activity 3: Support restoration of important cultural and religious sites by actively sourcing fund from potential donors	
Activity 4: Conduct awareness to local communities on the importance of preservation and promotion of traditional Bhutanese architect			
Strategic Action 2: Promote traditional aesthetics of villages under SWS			
Activity 1: Carry out shingle/shinglep roofing over CGI sheet to restore the traditional aesthetic of the Merak and Sakteng villages			
Activity 2: Pilot the shingle/shinglep treatment with appropriate wood preservatives to enhance its durability			
Activity 3: Upscale the shingle/shinglep treatment initiatives to both the villages of Merak and Sakteng on cost sharing basis			
Enhance livelihood of the local people without compromising age old culture and tradition	Strategic Action 3: Revival of decreasing Sheep and Yak population to increase wool production		
	Activity 1: Actively source fund to support the supply of sheep and improved yak breed for wool production		
	Activity 2: Supply improved Sheep and Yak breed in collaboration with relevant stakeholder		
	Activity 3: Support feral dog control program in collaboration with relevant stakeholders		
	Strategic Action 4: Establish natural and cultural history museum		
Promote and facilitate research, education and awareness	Activity 1: Identify site for construction of Nature, Culture and Historical Museum to document and promote unique cultural and traditional heritage of the local community		
	Activity 2: Support the construction of Nature, Culture and Historical Museum by sourcing adequate funds		
	Program 5: Meeting Resource Needs Sustainably and Promote Conservation Stewardship		
Promote and facilitate research, education and awareness	Irrational collection of natural resources	Strategic Action 1: Bring buffer and multiple use zones areas under scientific management with written management plan	
		Activity 1: Procurement of field equipment and gears	
		Activity 2: Assessment and mapping of timber and non-timber resources availability within SWS for developing sustainable harvesting guideline	

0.10	0.15									0.25
	0.10	0.15								0.25
		0.70	1.00							1.70
		0.60								0.60
0.60	0.80									1.40
0.20										0.20
	0.40	0.40								0.80
	0.05									0.05
	0.80	1.00								1.80
	0.50	0.50								1.00
					0.05					0.05
						2.00	2.00			4.00
0.70										0.70
	0.40									0.40

CONSERVATION MANAGEMENT PLAN

	Activity 3: Conduct timber resource inventory and develop sustainable harvest Guideline for the buffer and multiple use zones	
	Activity 4: Explore appropriate wood treatment technology and initiate the wood treatment to increase wood durability	
	Activity 5: Initiate solar water heating system for cooking and warming the houses	
	Activity 6: Explore and pilot the biogas production for cooking	
	Activity 7: Explore and initiate the wood briquette production on pilot basis for cooking and heating to reduce the fuel wood consumption	
	Activity 8: Supply improved heating and cooking stove in conjunction with wood briquette	
	Activity 9: Liaise, discuss and plan bi-annually with adjacent Divisional Forest Office on resource allocation sites and agree on resource allocation responsibilities and timetables	
	Strategic Action 2: Development of natural resources base economic opportunity	
	Activity 1: Explore demand and availability of medicinal and aromatic plant (MAP) species in collaboration with the Institute of Traditional Medicine Services (ITMS)	
Activity 3: Conduct awareness programs to educate local community on the harvesting methods and guidelines of NWFPs		
Ensure sustainable utilization of natural resources through appropriate strategies and management plans	Activity 4: Support the formation of NWFP management groups to reduce illegal harvesting of NWFPs and promote its sustainability	
	Activity 5: Rigorously promote NWFP-based and cottage industries through providing appropriate training on processing and packaging. Communities will be trained on making range of unique handicraft products from locally available materials and innovative marketing strategies will be developed	
	Activity 6: Streamline marketing of NWFPs that are not consumed within Bhutan in coordination with relevant stakeholders	
	Activity 7: Evaluate and revise an existing NWFP and community forestry management plan that is due for expiration in 2019	
	Activity 8: Provide alternative cooking and heating equipment to schools and religious institutions to reduce pressure on forest resources	
	Activity 9: Initiate Environmental Stewardship Award to recognize individuals or community for their extraordinary contribution towards conservation. Award will be bestowed based on developed criteria	

	0.30									0.30	
		0.10								0.10	
		0.50	0.60	0.70						1.80	
		0.40								0.40	
			0.50							0.50	
				0.50	0.60					1.10	
		0.40								0.40	
		0.10								0.10	
	0.20	0.20								0.40	
	1.00	1.00								2.00	
				0.50		0.60		0.80		1.90	
	0.10									0.10	
	0.20									0.20	
	1.00	1.00								2.00	
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.55

Enhance livelihood of the local people without compromising age old culture and tradition	Poverty, limited employment opportunity and apathetic towards conservation	Program 6: Promote Ecotourism through showcasing local culture and tradition	
		Strategic Action 1: Support to develop cultural ecotourism program	
		Activity 1: Identify and institutionalized one local festival each for two Gewogs and package it into tourism products to be sold annually	
		Activity 2: Provide support to organize annual festivals, biking and trekking cross country for first three years after the operation	
		Strategic Action 2: Development of birding facility, hiking and biking trail	
		Activity 1 Conduct feasibility study for development of birding facility, hiking and biking trails and other adventurous tours	
		Activity 2: Develop roughly 35 km biking -cum- trekking trail connecting Merak and Sakteng via Nyakchungla pass	
		Activity 3: Develop biking -cum-eco trail around the village of Merak and Sakteng for the visitors	
		Activity 4: Develop ecological garden nearby the settlement of Merak and Sakteng and an amusement park with rhododendron garden at Sheteymi	
		Activity 5: Develop at least three birding and hiking trails within the SWS to promote nature based ecotourism	
		Activity 6: Install signage (at least 25) at every entry points for visitors' awareness and education	
		Activity 7: Maintenance of existing trails and campsites will be done to cater to the increasing visitors	
		Activity 8: While developing campsites, low cost climate smart structures will be considered to showcase and create awareness to local communities on the importance of building climate resilient structures	
Promote unique culture and traditions of the local people	Poverty, limited employment opportunity and apathetic towards conservation	Activity 9: Initiate the introduction of snow trout into the high altitude lakes of SWS to explore the possibility of high end fishing	
		Activity 10: Possibility of skiing, paragliding and high end fishing will be explored for affluent tourists visiting the country. Separate packages for this high end amusement travel will be developed based on the pilot experiences along with required infrastructures at the site	
		Activity 11: Where feasible, treks and other tourist packages will be managed by the communities. For this, agreements and strong actionable by-laws will be drawn and developed for smooth functioning	
		Activity 12: Trails and campsites handed to the local communities will have to be maintained by the community from the accumulated fees and benefits	
		Activity 13: Monitoring of trails and campsites managed and maintained by the community through accumulated fees and benefits	

	0.40									0.40
			2.00	1.50	1.00	0.60	0.60	0.60	0.60	6.90
	0.20									0.20
	5.00	5.00								10.00
			0.50		0.70					1.20
		1.00		1.50			2.50			5.00
			1.00	1.50	2.00					4.50
		0.50	0.70							1.20
					0.20	0.20	0.20	0.20	0.20	1.00
										0.00
				0.50	0.60					1.10
				0.20	0.10					0.30
			0.20							0.20
										0.00
0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	1.40

CONSERVATION MANAGEMENT PLAN

Promote and facilitate research, education and awareness		Activity 14: Campsites and other infrastructures (other than those managed by communities) will be regulated, maintained and managed by the SWS authority		
		Activity 15: Climate smart sanitary facility with modern amenities will be developed along the trails and at the campsites		
		Activity 16: Develop sauna facility at Merak and Sakteng for visitors as well for local communities		
		Activity 17: The Sanctuary staff will monitor all trekking routes, biking trails and camping sites on regular basis to ensure rules compliance		
		Activity 18: Garbage pits for organic waste will be constructed along trekking routes, biking trails and campsites but non-biodegradable waste should be carried out of the Sanctuary		
		Strategic Action 3: Develop ecological and biodiversity hub		
		Activity 1: Feasibility study on establishment of ecological and biodiversity hub		
		Activity 2: Planning and designing (consultancy)		
		Activity 3: Construct one Ecological and Biodiversity Hub within SWS to promote environmental and species conservation education and awareness		
		Activity 4: Landscaping and plantation		
		Activity 5: Promotion activities		
Activity 6: Development of additional amenities				
Provide maximum protection to representative ecosystems through building strategic conservation programs for keystone/flagship species	Conserve Representative Ecosystem and Social Wellbeing	Program 7: Ensuring Species Persistence		
		Strategic Action 1: Initiate research program to understand species, landscapes and threats to conservation		
		Activity 1: Assessment of threats to biodiversity conservation		
		Activity 2: Determine significance of core zone		
		Activity 3: Develop monitoring and management program		
		Strategic Action 2: Conservation and management of endangered and problem wildlife species		
		a) Takin (<i>Budorcas taxicolor whitei</i>)		
		Activity 1: Determine habitat range and behaviour differences between the introduced Takin		
		Activity 2: Create artificial salt licks		
		Activity 3: Conduct regular monitoring		
		b). Royal Bengal Tiger (<i>Panthera tigris</i>)		
		Activity 1: Habitat mapping and determination of population		
		Activity 2: Develop strategy and monitoring plan		
		c) Red Pand (<i>Ailurus fulgens</i>)		
		Activity 1: Habitat mapping and determination of population		
Activity 2: Develop strategy and monitoring plan				
d) Musk Deer (<i>Moschus sp.</i>)				

	1.00			1.50				2.00		4.50
		2.00			2.00				1.00	5.00
			0.50							0.50
		0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	1.36
			1.00	1.00	1.00					3.00
0.10										0.10
	1.00									1.00
			3.00	3.00						6.00
					2.00					2.00
						1.00				1.00
							1.00	1.00		2.00
0.50										0.50
	0.50									0.50
	0.05									0.05
	0.30	0.30								0.60
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.20
0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	1.90
	0.20				0.40				0.60	1.20
		0.10				0.20			0.30	0.60
0.20			0.30			0.40			0.50	1.40
	0.10			0.15			0.20		0.25	0.70

CONSERVATION MANAGEMENT PLAN

		Activity 1: Determine distribution, status and specific epithet of the Musk Deer	
		Activity 2: Regular monitoring	
Ensure sustainable utilization of natural resources through appropriate strategies and management plans		e) Wild Dog (<i>Cuon alpinus</i>)	
		Activity 1: Habitat mapping and determination of population	
		Activity 2: Determine ecology of Wild Dog and livestock depredation pattern	
		f) Asiatic Black Bear (<i>Ursus thibetanus</i>)	
		Activity 1: Habitat mapping and determination of population	
		Activity 2: Study on ecology and status of the species	
		g) Blyth's Tragopan (<i>Tragopan blythii</i>)	
		Activity 1: Determine existence of the species	
		Activity 2: Mapping of habitat and distribution of the species.	
		Strategic action 3: Conservation of Chir pine (<i>Pinus roxburghii</i>) and Bhutan pine (<i>Pinus bhutanica</i>)	
	Activity 1: Conduct study on the status of regeneration of Chir pine and Bhutan pine		
	Activity 2: In accordance to the study result initiate habitat manipulation (control burning in Chir pine and thinning/clearing in Bhutan pine forest) work if required		
	Activity 3: Monitoring		
	Strategic action 4: Conservation and management of <i>Quercus semecarpifolia</i> and <i>Picea spinulosa</i>		
	Activity 1: Conduct study on the status of <i>Quercus semecarpifolia</i> and <i>Picea spinulosa</i>		
	Activity 2: Obtain public endorsement to protect this species		
	Activity 3: Initiate preservation activity for and formulate monitoring guidelines for these species		
	Strategic action 5: Conservation of Champ (<i>Michelia</i> sp) and Himalaya Yew (<i>Taxus</i> sp)		
	Activity 1: Ecological study of Champ and Himalayan Yew		
	Activity 2: Define specific epithet of Himalayan Yew		
Activity 3: Prescribe management prescription for these species			
Strategic Action 6: Determine status of small mammal, herpetofauna, butterfly and fresh water biodiversity			
Activity 1: Conduct study			
Activity 2: Publication and monitoring			
Strategic Action 7: Habitat Management			
Activity 1: Creation of salt licks and water holes			
Activity 2: Assessment of wetlands			
Activity 3: Restoration of wetlands			
Activity 4: Restocking of alpine grasslands through clearing of bushes			

0.70										0.70
	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	1.62
	0.10									0.10
		0.15								0.15
		0.20								0.20
			0.20							0.20
			0.20							0.20
				0.20						0.20
	0.10			0.10			0.10			0.30
		0.50			0.20			0.20		0.90
			0.10	0.12	0.14	0.16	0.18	0.20	0.22	1.12
	0.20	0.20								0.40
	0.10	0.10								0.20
		0.50	0.50							1.00
					0.10					0.10
					0.10					0.10
						0.05				0.05
			0.30	0.20						0.50
				0.05	0.05					0.10
		0.50						0.50		1.00
	0.20									0.20
		1.00				0.80				1.80
			0.50	0.50					0.80	1.80

CONSERVATION MANAGEMENT PLAN

		Activity 5: Carryout ecological thinning & sanitation of dead, dying and fallen trees	
		Strategic Action 8: Habitat Improvement	
		Activity 1: Plantation of Bamboo, fruit bearing trees and banana	
		Strategic Action 9: Forest Fire Prevention	
		Activity 1: Awareness program	
		Activity 2: Creation of fire line	
		Activity 3: Maintenance of fire lines	
		Strategic Action 10: Revision of Management Zones	
		Activity 1: Determine functionality of designated zones and revision of management zone accordingly	
		Activity 2: Assessment of critically eroded/landslide/degraded areas and designate such zones as special protection zone	
		Activity 3: Assessment of areas with special ecological importance	
		Strategic Action 11: Quantification of ecosystem services	
		Activity 1: Quantification of ecosystem services provided by conservation landscapes and the impact of climate change on such services	
		Strategic Action 9: Prevent in-country and cross-border illegal activity	
		Activity 1: Conduct regular patrolling with improved technology (SMART patrolling) to curb the poaching of species	
		Activity 2: Initiate coordination meeting with Indian counterpart	
		Activity 3: Initiate Zero poaching programs (capacity development and strategy development for implementation)	
		Strategic Action 13: Environmental Education and Advocacy	
		Activity 1: Regular environmental education programmes will be carried out in the schools, religious institutions and communities within the Sanctuary	
		Activity 2: Support nature clubs in the schools to conduct environmental education to students and communities	
		Program 8: Management of Soil and Water Erosion	
		Strategic Action 1: Designation of critically degraded area as special protection zone	
		Activity 1: Assessment of critically degraded area	
		Activity 2: Acquire public endorsement to designate the area as special protection zone	
		Activity 3: Develop strategic plan of the area	
		Activity 4: Conduct land management campaign	
		Activity 5: Carry out water source protection plantation and restrict people from harvesting forest resources in and around the water sources	
		Activity 6: Assess critically eroded and landslide areas to understand the factors contributing to such degradation	
Protect and rehabilitate important habitats and watersheds including grazing lands	Soil and water conservation		

					0.60			0.70		1.30
			0.60					0.80		1.40
0.20		0.30		0.40		0.50		0.60		2.00
	0.50	0.50								1.00
			0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.57
			1.00					2.00		3.00
				0.50						0.50
		0.10	0.10							0.20
				0.50	0.50					1.00
0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	9.50
0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	2.40
	0.50	0.60	0.70				1.00			2.80
0.10	0.12	0.15	0.17	0.20	0.22	0.25	0.27	0.30	0.32	2.10
0.10	0.15	0.17	0.21	0.25	0.28	0.32	0.35	0.38	0.42	2.63
		0.15								0.15
		0.20								0.20
			1.00							1.00
			1.50	1.50						3.00
		0.20		0.20		0.25		0.30		0.95
	0.10		0.10							0.20

CONSERVATION MANAGEMENT PLAN

		Activity 7: Conduct studies on the land management regimes to select and promote best practices	
		Activity 8: Initiate payment for ecosystem services (PES) from the settlements and upcoming hydropower projects in the downstream	
Initiate climate change adaptation programs	Climate change vulnerability	Program 9: Ensuring Climate Resilient Community	
		Strategic Action 1: Monitor impact of climate change	
		Activity 1: Conduct climate change vulnerability assessment in the settlements in and around the SWS	
		Activity 2: Conduct perception study on climate change and its causes and impact	
		Activity 3: Conduct awareness education on the climate change and its impact and factors contributing to global warming	
		Action 4: Establish permanent monitoring plot	
		Action 5: Develop monitoring protocol	
		Action 6: Periodic assessment of monitoring plot	
		Action 7: Monitoring data repository	
Promote and facilitate research, education and awareness	Climate change vulnerability	Activity 3: Formation of water user group	
		Activity 4: Support to protect and enrich drinking water source	
		Activity 5: Conduct climate change adaptation workshop	
		Activity 6: Initiate climate change adaptation programs	
		Strategic Action 3: Health and Hygiene	
		Action 1: Assess the quantity of solid waste and type of waste produced within the SWS	
		Activity 2: Conduct awareness education on the negative effects of solid waste on surrounding environment and wild animal species in the forest	
		Activity 3: Conduct regular cleaning campaigns involving communities and school	
		Activity 4: Construction of garbage bins and waste dumping sites in all the villages under the SWS	
		Activity 5: Draw agreements and by-laws with local communities for proper management of waste.	
		Activity 6: Support for ensuring good hygiene in the villages in collaboration with health sector	

		0.50		0.60		0.10				1.20
							0.05	0.07	0.10	0.22
0.90		0.40								1.30
	0.50									0.50
	0.10		0.12		0.15		0.20		0.25	0.82
	0.20									0.20
		0.10								0.10
		0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	1.36
			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.35
	0.40									0.40
	0.50	0.50								1.00
	0.50	0.50								1.00
		1.00	1.00							2.00
	0.10									0.10
	0.50									0.50
	0.20									0.20
		1.00								1.00
		0.20								0.20
		0.12		0.17		0.22		0.32		0.83

CONSERVATION MANAGEMENT PLAN

Enhance competency and the institutional capacity for efficient service delivery and Sanctuary management	Self-reliance Sanctuary Officials	Program 10: Institutional Strengthening and Services Delivery	
		Strategic Action 1: Enhanced service delivery	
		Activity 1: Strict compliance of G2C guidelines	
		Activity 2: Periodic analysis of staff strength	
		Activity 3: Development of HRD plan	
		Activity 4: Development of GIS base spatial information system to monitor forest cover loss	
		Strategic action 2: Improve mobility and accommodation for sanctuary officials	
		Activity 1: Procurement of field bikes and additional utility vehicle	
		Activity 2: Construction of staff quarter (Merak, Sakteng and Joenkhar Range)	
		Activity 3: Upgrade and provide field equipment and gears	
Monitoring and evaluation of programs and activities in line with Bhutan Management Effectiveness Tracking Tool Plus (METT+)	Self-reliance Sanctuary Officials	Strategic action 3: Capacity development of sanctuary officials	
		Activity 1: Arrange and seek for short term training programs on various aspect of protected area management	
		Activity 2: Support staff up gradation program – Diploma, B.Sc, M.Sc and Ph.D study	
		Activity 3: Study visit of sanctuary officials in and ex-country.	
		Activity 4: Local stakeholder study tour	
		Activity 5: Awarding of environmental Stewardship Award for extraordinary performers in SWS	
		Activity 6: Conduct quarterly staff coordination meeting	
		Strategic action 4: Develop sanctuary information facility	
		Activity 1: Construction of information centre	
		Activity 2: Operationalization of information centre.	
Total			

										0.00
										0.00
										0.00
										0.00
0.30	1.00									1.30
		5.00		5.00		5.00				15.00
0.70		0.90		1.10			1.40		1.60	5.70
1.00		1.00		1.00		1.00		1.00		5.00
	2.00		2.50	3.00		5.00			5.00	17.50
		1.00		1.00			1.00		1.00	4.00
	1.00		1.00							2.00
0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.95
0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	2.40
		3.00								3.00
			2.00							2.00
11.08	29.25	47.54	36.06	40.52	20.37	21.67	17.19	16.63	17.05	257.36

Annexure 10: Logical Framework for Monitoring and Evaluation of Plan Program

Design and Planning			Inputs and Process		
Context	Planning		Inputs		
Status	Management Program	Baseline	Strategic Action	Objectively Verifiable Indicator	
Insufficient Tsamdro (Pasture land)	Program 1: Rehabilitate degraded Tsamdro and enhance livestock productivity	Grazing right and calendar	1. Initiate scientific management of degraded Tsamdro	1. Leasing of reverted Tsamdro/pasture land to communities of Merak and Sakteng completed	
				2. Degraded Tsamdro identified & user consensus to initiate rangeland management program acquired	
				3. Grazing carrying capacity study conducted & degraded rangeland under scientific management	
				4. Degraded leased pasture land/ rangeland rehabilitated through planting fodder trees, bamboo species and suitable grass species for improved fodder production	
				5. Improved cattle breed supplied on pilot basis. Free forest grazing reduced & diary production increased	
				6. Stall feeding initiated & supply of fodder trees intensified.	
				7. Agroforestry on pilot basis in the leased pasture land to offset fodder shortages and intensify on-farm cattle management initiated	
Human-Wildlife Conflict (Crop Depredation)	Program 2: Reduce crop depredations	Crop depredation reports	1. Supply of electric/solar or alarm fencing on cost sharing basis	1. Suitable site for installation of electric/solar and alarm fencing on pilot basis identified	
				2. Community well trained to install electric/solar and alarm fencing	
				3. Fencing program replicated throughout sanctuary jurisdiction on cost sharing basis	
				4. Timely monitoring & evaluation of fencing program conducted	
			2. Initiate Crop Insurance Scheme	1. Pilot crop insurance schemes in worst affected areas initiated through defined by-laws & governance mechanisms to verify claims	
				2. Seed money provided for to initiate crop insurance scheme	

Process	Process		Outputs and Outcomes		Program Risk
	Implementing Agency	Location	Outputs	Outcomes	
			Means of Verification	Objective fulfilled	
	Dzongkhag & SWS	Leased Tsamdro area	Tsamdro allotted as per leased rule	1,7&8	
	SWS & herders	Degraded areas	Area of degraded Tsamdro identified for rehabilitation	1,7&8	User consensus
	"	Most degraded areas	Report & area covered under land management	1,5,7&8	User consensus & fund
	DoL, SWS & Herders	"	Quantity planted	1,4&7	Availability of suitable fodder & grass seeds
	SWS	SWS	Nos. of improved breed supplied	1,4&7	Mortality
	SWS & herders	"	On-farm cattle management & increased fodder production	1&7	Land holding
	"	"	"	1,2,5,&7	User consensus
	SWS & DAO	Most problematic areas	Area under fencing program	2,4&5	Fund
	SWS & community	Agrarian villages in SWS	Community able to install fencing	"	Peoples interest
	"	"	Crop depredation reduced by 50%	2&4	Fund
	"	"	Crop depredation reduced & fencing maintained	"	
	SWS & community in collaboration with relevant stakeholder	Pilot villages	Nos. of groups formed & by-laws developed	2	Fund
	SWS	Agrarian villages in SWS	Amount provided as seed money	2	Fund

CONSERVATION MANAGEMENT PLAN

			3. Initiation of Mixed Cropping Practice	1. Feasibility study to grow additional crop with maize in collaboration with agriculture sector conducted.	
				2. Pilot horticulture farming for sustainable production of agricultural products to meet food self-sufficiency initiated	
				3. Horticultural farming initiatives upscale to rest of the communities inside the Sanctuary by engaging donors and actively sourcing the required funds	
				4. High yielding varieties of crops, fruit trees and vegetable seeds supplied	
				5. Polyhouse supplied	
Human-Wildlife Conflict (Livestock Depredation)	Program 3: Alleviate Livestock Depredation and retaliatory killing	Livestock depredation reports	1. Determine Causes of Livestock Depredation	1. Status of human-wildlife conflict in all the villages & species involved in livestock depredation determined	
				2. Strategies to mitigate livestock depredation initiated	
			2. Livestock Insurance Scheme	1. Livestock insurance schemes in worst affected areas initiated through village livestock insurance committee with define by-laws & governance mechanisms to verify claims	
				2. SWS staff well-versed to identify predators by verifying carcass of livestock	
				3. Adequate seed money to fund insurance schemes	
				4. Insurance scheme covers total SWS area	
			3. Livestock product diversification, packaging and marketing	1. Livestock cooperatives formed & products are in high demand	
				2. High quality livestock product available in the area	
			4. Reduce poaching and retaliatory killing of wildlife species	1. Ecological study of problematic species to develop appropriate strategy & action plans conducted	
				2. SMART patrolling implemented	
				3. Check post constructed.	

	SWS & DAO	"	Mixed crops identified	2,4&5	Cooperation from DAO
	"	Pilot villages	Harvesting additional crop	2,4&5	"
	"	Agrarian villages in SWS	Mixed cropping practice coverage	2&4	Fund
	"	"	Quantity supplied	2&4	Fund
	SWS	high altitude community	Nos. supplied	2&4	Fund
	"	SWS	Reports, strategy & action plans	2&5	
	"	"	Reports	2&5	
	"	"	Livestock depredation reduced by 50%	2&4	
	SWS & relevant stakeholder	Worse affected areas	Livestock depredation cases compensated	2&6	Fund
	SWS	SWS	Staff confident to verify livestock depredation case	2&5	Herder reports all depredation cases
	"	"	Compensation disbursed fairly	2	Fund
	"	"	"	2	Fund
	SWS & herders	"	Nos. of cooperatives & product sold	2&3	
	"	"	High demand	2&3	
	SWS	"	Study report & action plan	2&5	
	SWS	SWS	Well-equipped hardware & software	5&6	
	SWS	Strategic location	Illegal transection reduced by 50%	6&7	Fund

CONSERVATION MANAGEMENT PLAN

Loss of culture and traditions	Program 4: Promote local culture and tradition	Rich culture & tradition	1. Support local community to restore important cultural and religious sites	1. Important cultural and religious sites within SWS assessed & mapped	
				2. Local culture, folk tales & traditional knowledge documented	
				3. Important cultural & religious sites restored	
				4. Book on local culture, folk tales & traditional knowledge available	
			2. Promote traditional aesthetics of villages under SWS	1. Traditional look of wooden shingle restored	
				2. Pilot of shingle/shinglep treatment with appropriate wood preservatives to enhance its durability succeeded	
				3. People using treated Shingle/ shinglep	
			3. Revival of decreasing Sheep and Yak population to increase wool production	1. Sourced fund to support the supply of sheep and improved yak breed for wool production	
				2. Supply sufficient nos. of improved Sheep and Yak breed in collaboration with relevant stakeholder	
				3 Program to control feral dog population control in collaboration with relevant stakeholders completed	
			4. Establish natural and cultural history museum	1. Site for construction of Nature, Culture and Historical Museum to document and promote unique cultural and traditional heritage of the local community identified	
				2. Nature, Culture and Historical Museum constructed	
Irrational collection of natural resources	Program 5: Meeting Resource Needs Sustainably and Promote Conservation Stewardship	Assemblage of rich biodiversity	1. Bring buffer and multiple use zones areas under scientific management with written management plan	1. Necessary field equipment and gears procured	
				2. Assessment and mapping of timber and non-timber resources availability within SWS for developing sustainable utilization plan completed	
				3. Timber resource inventory for development sustainable resource use guideline developed	
				4. Wood treatment technology developed	
				5. People adopted to use solar water heating system for cooking and warming	

	SWS	SWS	Reports	3,4&5	
	SWS in collaboration with local authorities	"	Documents	3&5	
	"	SWS	Well managed cultural & religious sites	3&4	Fund
	"	"	Documents	3	Fund
	SWS	"	CGI sheet covered with wooden shingle	3	Community cooperation
	SWS	"	Restoration of traditional aesthetic of village	3	
	SWS	"	Restoration of traditional aesthetic of village & durability of shingleps increased to two fold	3	Fund
	"	"	Nos. of improved breed supplied	3&4	Fund
	SWS & DLO	"	Nos. of improved breed supplied	3&4	
	"	"	Incidence of sheep killed by feral dog reduced	3&4	Fund
	SWS	Strategic location	Centrally located site	3&4	
	SWS	"	Operationalization of museum	3,4&5	Fund
	SWS	"	SWS staff well equipped	5,6&9	Fund
	SWS	SWS	Resource map	5,6&9	
	SWS	multiple & buffer zones	Inventory report & harvest guideline	5,6&7	Fund
	SWS & Community	"	Pressure on timber resources reduced	7	
	SWS	Settlements	Pressure on timber resources reduced	4,5&7	

CONSERVATION MANAGEMENT PLAN

				6. Piloting of biogas production initiated				
				7. Wood briquette production on pilot basis initiated				
				8. Sufficient nos. Of improved heating and cooking stove in conjunction with wood briquette supplied				
				9. Liaise, discuss and plan bi-annually with adjacent Divisional Forest Office on resource allocation sites and agreement on resource allocation responsibilities and timetables finalized				
			2. Development of natural resources base economic opportunity				1. Traditionally, economically and commercially valuable NWFP species found in SWS jurisdiction determined	
							2. Habitat mapping of important NWFPs completed	
							3. Demand and availability of medicinal and aromatic plant (MAP) species in collaboration with the Institute of Traditional Medicine Services (ITMS) determined	
							4. Awareness programs to educate local community on the harvesting methods and guidelines of NWFPs conducted	
							5. NWFP-based and cottage industries through providing appropriate training on processing and packaging promoted. Communities trained on making range of unique handicraft products from locally available materials and innovative marketing strategies developed	
							6. Sustainable collection of NWFP initiated	
							7. Marketing of NWFPs that are not consumed within Bhutan streamlined	
							8. Evaluation & revision of existing NWFP and community forestry management plan completed	
							9. Alternative cooking and heating equipment to schools & religious institutions supplied	
							10. Environmental Stewardship Award to recognize individuals or community for their extraordinary contribution towards conservation initiated	

	SWS & relevant agency	"	"	"	
	"	"	Pressure for firewood demand reduced by 50%	4&7	
	SWS	"	"	"	
	"	"	MoU developed	5,6&7	
	SWS	"	Reports	4,5&7	
	"	"	Reports	4,5&7	
	SWS & ITMS	"	Reports	4,5&7	
	SWS	"	Nos. of awareness program conducted	7	Fund
	SWS	"	Nos. Of cottage industries and outlets	3,4&7	
	SWS	"	Nos. of NWFP group	4&7	
	SWS	"	Marketing formalized	4&7	
	SWS & community	"	Nos. of plan evaluated & revised	4,5,6&7	
	SWS	Schools & religious institutions	Reduced pressure on firewood	6&7	
	SWS & community	SWS	Staff & community encourage towards conservation	6&7	Fund

CONSERVATION MANAGEMENT PLAN

Poverty, limited employment opportunity and apathetic towards conservation	Program 6: Promote Ecotourism through showcasing local culture and tradition	Rich culture, tradition & biodiversity	1. Support to develop cultural ecotourism program	1. Identified & institutionalized one local festival each for two Gewogs & packaged it into tourism product	
				2. Donor(s) support acquired to organize festival	
				3. Annual festivals, biking and trekking cross country organized	
			2. Development of birding facility, hiking and biking trail	1. Feasibility study to develop birding facility, hiking & biking trail, other adventurous tour etc. conducted	
				2. Write proposal to develop the facilities	
				3. Biking -cum- trekking trail connecting Merak and Sakteng via Nyakchungla pass constructed	
				4. Ecological garden nearby the settlement of Merak and Sakteng and an amusement park with rhododendron garden at Sheteymi developed	
				5. Birding and hiking trails within the SWS developed to promote nature based ecotourism	
				6. Install signage (at least 25) at every entry points for visitors' awareness and education	
				7. Well maintained trails & campsites	
				8. Low cost climate smart structures campsite constructed	
				9. Snow trout introduced into the high altitude lakes of SWS	
				10. Possibility of skiing, paragliding and high end fishing will be explored	
				11. Treks & other tourist packages managed by the communities.	
				12. Trails & campsites managed by the community functioning well.	
				13. SWS managing campsites & other tourism infrastructures (other than those managed by communities).	
				14. Regular monitoring of trekking routes, biking trails and camping sites conducted	
15. Climate smart sanitary facility with modern amenities developed along the trails and at the campsites					
16. Sauna facility at Merak and Sakteng for visitors as well for local communities developed					

	"	"	Festivals packaged to be showcase	3&4	Community cooperation
	SWS	"	No. of festival organized	3&4	Fund
	SWS & community	"	Community organizing the events with minimum support	3&4	Community cooperation
	"	"	Nos. of trails identified	3,4&5	
	SWS	"	Proposal	5	
	SWS & community	"	Trail length	4	Fund
	"	SWS	Functionality	3,4,&5	Fund
	"	"	Nos. of trails	4	Fund
	SWS	"	Nos. of signages	5	
	SWS & community	"	Increasing no. of visitors	3&4	Public support
	"	:	Informed local people	3,5,&8	
	SWS	"	Fish survived and tourist engaged in fishing sport	4&5	
	SWS & community	"	Commencement of skiing and paragliding	"	
	SWS & community	"	Agreements & strong actionable by-laws	3&4	Community cooperation
	"	"	Well managed facilities	3,4&5	
	SWS	"	Intact tourism facilities	3&4	
	SWS & community	"	All tourism related rules are adhered	3&5	
	"	"	Clean SWS	3&5	fund
	"	"	Tourist availing the facility	"	Fund and peoples cooperation

CONSERVATION MANAGEMENT PLAN

Conserve Representative Ecosystem and Social Wellbeing	Program 7: Ensuring Species Persistence	2015 biodiversity data	3. Develop ecological and biodiversity hub	17. Garbage pits for organic waste along trekking routes, biking trails & campsites constructed					
				1. Feasibility study to establishment of ecological & biodiversity hub conducted					
				2. Planning and designing of ecological & biodiversity hub completed					
				3. Proposal for the construction developed					
				4. Ecological & biodiversity educational hub constructed					
				5. Landscaping & plantation completed					
				6. Promotion activities completed					
				7. Additional amenities constructed					
	Conserve Representative Ecosystem and Social Wellbeing	Program 7: Ensuring Species Persistence	2015 biodiversity data	1. Scientific management of designated core zone	1. Threats to biodiversity conservation assessed				
					2. Determine significance of core zone				
					3. Monitoring and management program developed				
				Conserve Representative Ecosystem and Social Wellbeing	Program 7: Ensuring Species Persistence	2015 biodiversity data	2. Conservation and management of endangered and problem wildlife species	Takin (<i>Budorcas taxicolor whitei</i>)	
								1. Habitat range and behaviour differences between the introduced Takin determined	
								2. Artificial salt licks created	
								3. Conduct regular monitoring	
								Royal Bengal Tiger (<i>Panthera tigris</i>)	
								1. Habitat mapping & determination of population completed	
2. Strategy & monitoring plan developed									
Red Pand (<i>Ailurus fulgens</i>)									
1. Habitat mapping & determination of population completed									
2. Strategy & monitoring plan developed									
Musk Deer (<i>Moschus sp.</i>)									
1. Distribution, status & specific epithet of the Musk Deer ascertained									
2. Regular monitoring plan developed									
Wild Dog (<i>Cuon alpinus</i>)									
1. Habitat mapping & population determination completed									

	"	"	Clean routes	5&8	Fund
	SWS	SWS	Study report	5&9	
	"	"	Consultancy report	5	
	"	"	Proposal	5	
	"	"	Environmental, species conservation education & awareness	5&9	Fund
	"	"	Conducive environment	5&9	Fund
	SWS & DoFPS	"	Visitor flow	5&9	
	SWS	SWS	Accommodation facilities	5&9	Fund
	SWS	"	Report	5,6&10	
	"	"	Significance of corezone determined	5,6&10	
	"	"	Monitoring plan	5,6&10	
	"	"	Report	5,6&10	
	"	"	Healthy Takin	5,6&10	
	"	"	Takin locations	5,6&10	
	"	"	Report	2,5,6&10	
	"	"	Population & habitat status	5,6&10	
	"	"	Reports	5,6&10	
	"	"	Monitoring plan	5,6&10	
	"	"	Reports	5,6&10	Fund
	"	"	Poaching reduced	5,6&10	
	"	"	HWC hotspot mapped	2,5,6&10	Fund

			2. Ecology of Wild Dog and livestock depredation pattern determined		
				Asiatic Black Bear (<i>Ursus thibetanus</i>)	
				1. Habitat mapping & determination of population completed	
				2. Study on ecology & status of the species completed	
				Blyth's Tragopan (<i>Tragopan blythii</i>)	
				1. Study on existence of the species conducted	
			3. Conservation of Chir pine (<i>Pinus roxburghii</i>) and Bhutan pine (<i>Pinus bhutanica</i>)	2. Mapping of habitat and distribution of the species completed	
				1. Study on the status of regeneration of Chir and Bhutan pine conducted	
				2. In accordance to the study result habitat manipulation exercise initiated	
			4. Conservation and management of <i>Quercus semecarpifolia</i> and <i>Picea spinulosa</i>	3. Monitoring	
				1. Study on the status of <i>Quercus semecarpifolia</i> and <i>Picea spinulosa</i> conducted	
				2. Public endorsement for protecting of these species obtained	
			5. Conservation of Champ (<i>Michelia</i> sp) and Himalaya Yew (<i>Taxus baccaata</i>)	3. Preservation activity & monitoring guidelines for these species formulated	
				1. Ecological study of Champ & Himalayan Yew conducted	
				2. Specific epithet of Himalayan Yew confirmed	
			6. Determine status of small mammal, herpetofauna, butterfly and fresh water biodiversity	3. Management prescription for these species developed	
				1. Study conducted	
7. Habitat Management	2. Report & monitoring developed				
	1. Natural and artificial salt licks and water holes maintained				
	2. Wet lands around SWS assessed and restoration of dried and degraded wet land restored				
			3. Alpine grassland managed		

	"	"	HWC reduced	2,5,6,9&10	
	"	"	HWC hotspot mapped	2,5,6&10	Fund
	"	"	HWC reduced	2,5,6&10	
	"	"	Report	5,6,9&10	Fund
	"	"	Report	5,6,9&10	
	"	"	Reports	5,6,7,9&10	
	"	"	Control burning in Chir pine & thinning/clearing in Bhutan pine forest		
	"	"	Forest reviving	5,6,7,9&10	
	"	"	Report	5,6,7,9&10	
	"	"	MoU developed	5,6,7&9	
	"	"	Preservation plots	5,6,7,9&10	Community cooperation
	"	"	Report	5,6,7,&10	
	"	"	Report & evidence	5,6&7	
	"	"	Plan	5,6&7	
	"	"	Report	5,6&10	Fund
	"	"	Plan	5,6&10	
	SWS	SWS	Animals attracted	5&6	
	SWS	SWS	"	"	
	SWS	"	Wildlife population increased	2,5&6	

CONSERVATION MANAGEMENT PLAN

				4. Ecological thinning & sanitation of dead, dying and fallen trees carried out periodically	
			8. Habitat Improvement	1. Bamboo, fruit bearing trees and banana plantation carried out	
			9. Forest Fire Prevention	1. Periodic awareness program conducted	
				2. Fire line around fire prone area created	
			7. Revision of SWS Management Zones	1. Functionality of designated zones assessed and revision of management zone conducted 2. Critically eroded/landslide/degraded areas identified and designated as special protection zone 3. Important ecological assessed	
			8. Quantification of ecosystem services	1. Ecosystem services provided by conservation landscape and impact of climate change on such services quantified	
Soil and water conservation	Program 8: Management of Soil and Water Erosion	Deteriorating of soil & water resources	9. Prevent in-country and cross-border illegal activity	1. Regular patrolling. 2. Coordination meeting with Indian counterpart started 3. Zero poaching programs initiated 4. Regular environmental education programmes carried out. 5. Environmental education programs supported	
			1. Designation of critically degraded area as special protection zone	1. Assessment of critically degraded area completed 2. Public endorsement acquired to designate the area as special protection zone 3. Strategic plan of the area developed 4. Land management campaign conducted 5. Water source protection & plantation completed 6. Critically eroded and landslide areas assessed 7. Studies on the land management regimes conducted	

	"	"	Regeneration of desire species and remaining tree attending volume	5&6	
	"	"	Wildlife population increased	"	
	"	"	Incidences of forest fire reduced	"	
	"	"	"	"	
	"	"	Revised management zones	6,7&10	
	"	"	Endorsement report	6&7	To obtain endorsement
	"	"	No. of important ecological zone	6	
	"	"	Report	1,4,6,7&8	
	SWS	"	Reports	5,6,7&10	
	SWS & DoFPS	"	MoU	6,7&10	RGoB approval
	SWS	"	Capacity & strategy developed for implementation	6,7,9&10	Fund
	SWS	Schools, Religious institutions & communities in SWS	No. of programs conducted	5&6	Fund
	SWS	Nature clubs & community	Amount	5&8	
	SWS	SWS	Report	1,5&8	
	SWS & community	"	Endorsement report	8	
	"	"	Plan	8&10	
	"	"	Area	1,6,7,8&10	
	"	"	Protection & plantation area	1,5,7&8	
	"	"	Factors contributing to such degradation understood	1,5,6,7&8	
	SWS	"	Best land management technology practiced	1,5,7&8	

CONSERVATION MANAGEMENT PLAN

				8. Payment for ecosystem services (PES) from the settlements in the downstream initiated	
Climate change vulnerability	Program 9: Ensuring Climate Resilient Community	Available climate data	1. Monitor impact of climate change	1. Climate change vulnerability assessment in the settlements in & around SWS conducted	
				2. Perception study on climate change, its causes & impact conducted	
				3. Awareness education on the climate change, its impact & factors contributing to global warming conducted	
				4. Permanent monitoring plot established	
				5. Monitoring protocol developed	
				6. Periodic assessment of monitoring plot conducted	
				7. Monitoring data repository developed	
			2. Secure drinking water resources	1. Water user group formed	
				2. Protection & enrichment of drinking water source completed	
				3. Climate change adaptation workshop conducted	
				4. Climate change adaptation programs initiated	
			3. Health and Hygiene	1. Quantity of solid waste & type of waste produced within the SWS assessed	
				2. Awareness education on the negative effects of solid waste on surrounding environment & wild animal conducted	
				3. Regular cleaning campaigns involving communities & school conducted	
				4. Garbage bins & waste dumping sites in all the villages under the SWS installed	
				5. Agreements and by-laws with local communities for proper management of waste drawn	
				6. Better hygiene in the villages	

	"	"	Amount	1,6,7&8	
	"	"	Report	5,7,8&10	
	"	"	Reports	5,8&10	
	"	"	No. of programs conducted	5,8&10	Fund
	"	"	No. of plots	5,6,7,8&10	
	"	"	Protocol	5,8&10	
	"	"	Assessment report	5,8&10	
	"	"	Database	5,8&10	
	SWS & community	"	No. of active group	4,7,8&10	Community cooperation
	"	"	Support provided	4,5,7&8	
	"	"	No. of workshop	5,7&8	Fund
	"	"	Programs	5,7&8	Fund
	"	"	Assessment report	4,5,8&10	
	"	"	No. of workshop	5,6,8&10	Fund
	"	"	No. of campaign	8	
	"	"	No. of bins & dumping sites	8	Fund
	"	"	Agreements & by-laws	8&10	
	SWS & health sector	"	Cleanliness of SWS area	4&8	

CONSERVATION MANAGEMENT PLAN

Self-reliance Sanctuary Officials	Program 10: Institutional Strengthening and Services Delivery	APA, IWP & Five Year Plan	1. Enhanced service delivery	1. Strict compliance of G2C guidelines	
				2. Optimum staff strength	
				3. HRD plan developed	
				4. GIS base spatial information system to monitor forest cover loss developed	
			2. Improve mobility and accommodation for sanctuary officials	1. Field bikes and additional utility vehicle procured	
				2. Staff quarter construction at Merak, Sakteng & Joenkhar Range completed	
				Field equipment & gears updated	
			3. Capacity development of sanctuary officials	1. Short term training programs on various aspect of protected area management conducted/availed	
				2. Staff upgradation program – Diploma, B.Sc, M.Sc and Ph.D study conducted	
				3. Study visit of sanctuary officials completed	
				4. Local stakeholder study tour conducted	
				5. Environmental Stewardship Award for extraordinary performers of SWS awarded annually	
				6. Quarterly staff coordination meeting conducted	
4. Develop sanctuary information facility	1. Construction of information centre completed				
	2. Operationalization of information centre				

	SWS	"	Service delivery in time	9&10	
	SWS & DoFPS	"	Service delivery in time	9&10	
	"	"	Self-reliance staff	9&10	
	SWS	"	GIS database	9&10	
	"	"	Good mobility	9&10	Fund
	"	"	No. of buildings	9	Fund
	"	"	Procurement records	9	Fund
	"	In & Ex-country	Self-reliance staff	5,9&10	Fund
	"	"	"	5,9&10	Fund
	"	"	Motivated staff	5&9	Fund
	"	"	Public support	5	Fund
	"	SWS	Annual award	9	
	"	"	Better coordination	9&10	
	"	"	Structure	5&9	Fund
	"	"	Visitor flow	5&9	