Toorsa Strict Nature Reserve
Management Plan
July 2012-June 2017

"Balancing Conservation of pristine temperate and alpine eco-systems with Development needs of communities"

September 2011
Toorsa Strict Nature Reserve
Department of Forests & Park Services

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Royal Government Endorsement and Approval

Toorsa Strict Nature Reserve
Conservation Management Plan
2012-2017

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

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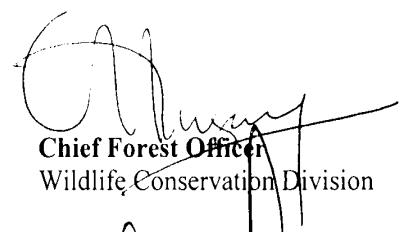

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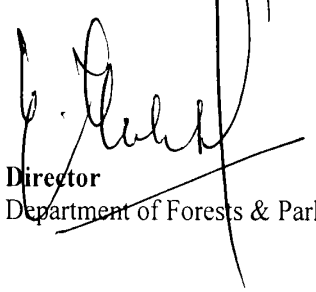
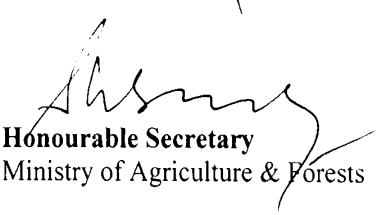


Director
Department of Forests & Park Services



Honourable Secretary
Ministry of Agriculture & Forests

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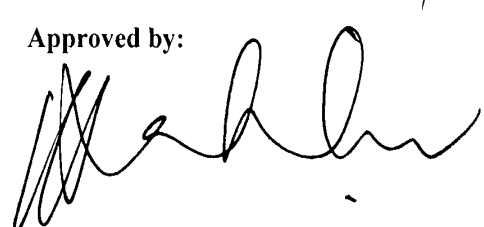

Honourable Minister
Ministry of Agriculture & Forests

Executive Summary

The conservation management plan of Toorsa Strict Nature Reserve (TSNR) is based on the findings of the biodiversity surveys and socio-economic status of the resident communities. In addition, several participatory appraisals contributed to shaping this document, which consists of eight parts.

The first part describes the conservation significance of the park, its location and, history, as well as the policy, legal and salient features of the conservation management plan.

As forest resources have been widely used by resident communities in the buffer zone, including year-round cattle grazing inside the Reserve, the plan aims to mitigate issues related to human- wildlife conflicts, grazing, land tenure, alternative sustainable livelihoods, indigenous knowledge and systems, and eco-tourism prospects to conserve the biodiversity of TSNR. The Reserve is considered unique in that it has the most pristine temperate and alpine ecosystems in the country along with a combination of different vegetation zones, from sub-tropical in the south, to alpine in the north. During the four rapid biodiversity surveys conducted in 2009-2010, the team recorded 161 species of birds, 29 species of mammals, 64 species of butterflies, 7 species of fish and 427 species of plants belonging to 115 families.

Administratively, TSNR spreads across two *Dzongkhags*: Haa (five out of its six *geogs*) and Samtse (two geogs). Conservation is a mammoth task because most of the agricultural land and warm broadleaved forests occur in the same elevation range consisting of alpine meadows, which are also the dominant landscape grazed by yaks. Conversely, livestock and agriculture productivity is significantly affected by crop damage, cattle depredation and time invested to ward-off edge dwelling wildlife. To determine a direction where the development aspirations of communities are met and threats to biodiversity are reduced,; surveys, meetings and field analysis looked into community development priorities. The priorities identified included: access to schools, health facilities and scholarships;, development of eco-trails and irrigation;, introduction of improved cattle breeds;, support for agriculture and horticulture;, community forestry; as well as a range of issues connected with conservation of biodiversity, such as crop damage by wild pigs, livestock depredation, by Snow leopard/Leopard, conversion of *Tseri*, and availability of timber, bamboo, cane and Non Wood Forest Products (NWFPs).

The second part of the plan deals with the present biodiversity and socio-economic status of migratory herders within the Reserve and resident communities within the buffer zone of the Reserve. The third part deals with conservation issues, threats and challenges, while the fourth part outlines the strategic premise of the plan. The fifth part describes how to implement the management plan, which includes four chapters: Landscape & Species Conservation, Buffer Zone Management, Human-Wildlife Conflict Management and Institutional Strengthening (Infrastructure Development & Human Resource Development) & Service Delivery.

For the purpose of safeguarding existing biodiversity and maintaining the integrity of TSNR's pristine eco-systems, zoning will be initiated within the pilot *geog*, Bji. Furthermore, Integrated Conservation & Development Program activities will be extended throughout the two *Dzongkhags* address conflicts between the basic development needs of Reserve residents and the Reserve's conservation goals. Efforts will also be made to improve species conservation through studies on Snow leopard, Wild dog and Red panda.

Parts six and seven of the plan deals with institutional linkages, monitoring and evaluation, and institutional and administrative arrangements. Lastly, the eighth part outlines the financial aspects of the plan.

To implement the conservation management plan, the Reserve will have 31 staff members. For effective protection of biodiversity and overall management, the Reserve is administratively divided into two Range/Warden areas. To accomplish and facilitate the conservation management plan, infrastructural development, including a Reserve head office with a display center, two Range office, three guard posts and a Manager residence, will have to be built based on priority.

In the area of capacity building, the plan aims to avail several enhancements under three categories: in-country training, short- and long-term regional/overseas training, and conservation study tours. These are designed not only for Reserve staff but also for community leaders and, *Dzongkhag* and territorial staff to build a stronger support team. The financial cost to implement the conservation management plan is estimated at Nu. 123.7 million for the period of July, 2012 to June, 2017. Administration, infrastructure, human resource development, research and monitoring, and buffer zone management

(ICDPs & eco-tourism) hold a major share of the estimated budget. To fine-tune all aspects of the conservation management plan, two evaluations are recommended. A mid-term evaluation should be carried out by the end of third year, and a final evaluation on completion of the plan period. Such evaluations will help streamline any or all deficiencies in management activities to ensure full implementation of the conservation management plan.

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Wildlife Conservation Division
Thimphu

Foreword

Toorsa Strict Nature Reserve is a gem within the protected area system of Bhutan. With the most pristine temperate and alpine ecosystems in the country, and arguably the entire Himalayas, it is home to endangered species such as the Snow leopard, Red panda, Tibetan snowcock and Rufous necked hornbills. As well, the Reserve harbours the only endemic poppy, the White Poppy, and has some of the most spectacular landscapes in the country. It is the only protected area in Bhutan that is part of the trans-boundary conservation landscape, i.e. the Kangchenjunga Landscape.

Based on extensive biodiversity surveys and field analysis, the current conservation management plan (July, 2012-June 2017) aims to balance conservation landscapes and build resilient communities. The plan focuses on five key areas: 1) ensure species persistence; 2) build resilient communities in and around the Reserve; 3) ensure sustainable use of resources; 4) enhance sustainable nature tourism; and 5) institutional strengthening. A key salient feature of the plan is the requirement to develop an *Annual Operational Work Plan* which will ensure that existing and emerging challenges and threats are prioritized and addressed adequately. In a sense, it is a dynamic document which should follow and adopt a framework approach, and is not fully based on rigid prescriptions. The activities and budget specifications are provided to serve as a guide.

While the plan has been developed, funding is not certain for activities which will not be paid by the Royal Government of Bhutan (RGoB), except for the Administration Costs which form a major portion of the budget as per the budget details of the conservation management plan. The Reserve is urged to source funds in collaboration with the Wildlife Conservation Division and Nature Recreation & Eco-tourism Division to finance programs from the conservation donors not funded by the RGoB.

It is hoped that the Conservation Management Plan will contribute significantly towards balancing conservation landscapes and development needs within and around Toorsa Strict Nature Reserve.

Tashi Delek

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Abbreviations

AEC	Agriculture Extension Centre
BHU	Basic Health Unit
CBNRMP	Community Based Natural Resources Management Plan
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DoFPS	Department of Forests and Park Services
FNCA , 1995	Forests and Nature Conservation Act of Bhutan, 1995
FNCR, 2006	Forests and Nature Conservation Rules of Bhutan, 2006
GNH	Gross National Happiness
HKH	Hindu-Kush Himalayas
ICDP	Integrated Conservation and Development Program
IUCN	World Conservation Union (formerly known as International Union for Conservation of Nature and Natural Resources)
LEC	Livestock Extension Centre
MoAF	Ministry of Agriculture and Forests
MT	Metric-ton
NRED	Nature Recreation and Eco-tourism Division
NWFP	Non Wood Forest Produce
ORC	OutReach Clinic
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
RNR, RDC	Renewal Natural Resources, Research & Development Center
RGoB	Royal Government of Bhutan
TSNR	Toorsa Strict Nature Reserve
UWICE	Ugyen Wangchuck Institute for Conservation & Environment
WCD	Wildlife Conservation Division
WWF	WWF Bhutan

Glossary of Bhutanese terms

Chushing	Wet land
Dratshang	Monastic body
Dzongkhag	District
Geog	Lowest administrative unit formed by group of villages
Gup	An elected head of *geog*
Kamshing	Dry land
Lanor	High altitude cattle
Pangshing	Shifting cultivation system in higher altitude
Sokshing	Registered government land for leaf litter collection
Thanor	Low altitude cattle
Tsamdrog	A tract of forest land with or without trees belonging to the state where people have grazing rights
Yuelnor	Local breed cattle

1. Introduction and Background

1.1 Area and Location

Sprawling an area of 609.5 km^2, Toorsa Strict Nature Reserve (TSNR) is the only Strict Nature Reserve among the ten protected areas in Bhutan and lies mostly in Haa *dzongkhag*, with a very small area spreading south into Samtse *dzongkhag* in western and south-western Bhutan. At the same time, this is the only protected area in Bhutan without permanent human settlements, except for a few migratory yak herding communities. The Reserve protects the western most variant of central temperate forests in the country ranging from broadleaf forests to alpine meadows in the north. Being virtually uninhabited, the Reserve has one of the most pristine temperate and alpine ecosystems in the entire Eastern Himalayas.

TSNR shares borders with the Indian state of Sikkim to its west; and on the north side, it forms a contiguous natural habitat of pristine alpine meadows with the Tibet region in China. It is connected to Jigme Dorji National Park to its northeast by the Toorsa Strict Nature Reserve - Jigme Dorji National Park Biological Corridor. The Strict Nature Reserve is almost entirely inside Haa *dzongkhag* and slightly within Samtse *dzongkhag*. Presently it falls within the forest administrative jurisdiction of Paro and Samtse Territorial Forest Division.

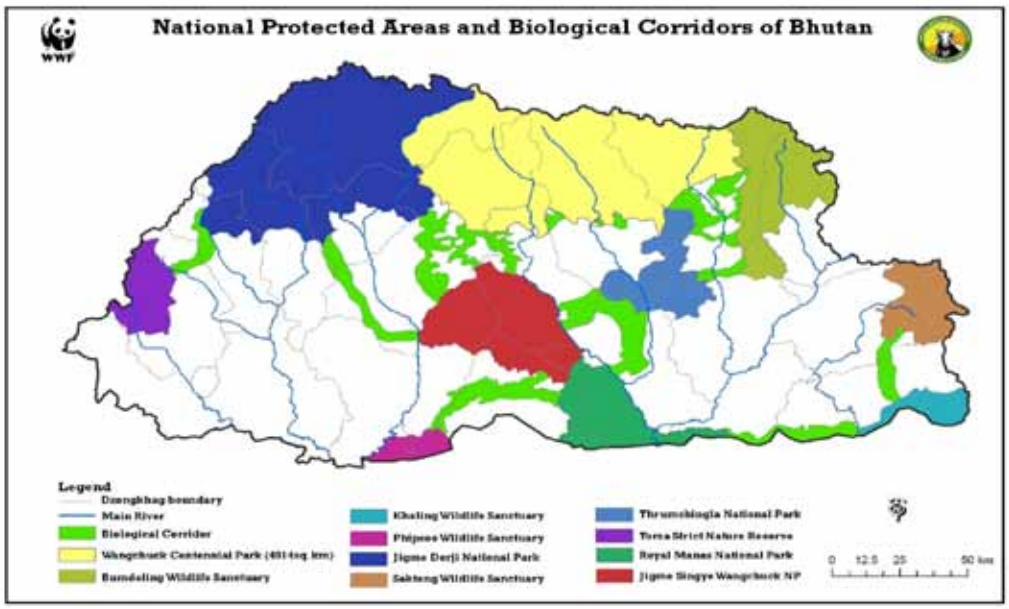


Figure 1: Map of the Protected Areas & Biological Corridors of Bhutan

1.2 Management History

The history of protected areas in Bhutan dates back to the 1960s, when the country's first protected area – Manas Wildlife Sanctuary (now known as Royal Manas National Park) – was designated. After Manas Wildlife Sanctuary in 1974, six other protected areas[1] were created and further revisions to the national protected areas system resulted in the current network of protected areas[2]. Wildlife Conservation Division, the erstwhile Nature Conservation Division, has functioned as the management authority for Toorsa Strict Nature Reserve since its gazettement.

1.3 Policy & Legal Context

The legislation governing the establishment and management of protected areas in Bhutan is the *Forests and Nature Conservation Act of Bhutan, 1995* (FNCA). Chapter VI of the Act has provisions for the establishment of protected areas in the country. Section 21(a) of the Act states that:

"The Royal Government may declare any land in the country to be a National Park, Wildlife Sanctuary, Wildlife Reserve, Nature Reserve, Strict Nature Reserve, Protected Forest, Research Forest, Conservation Area, Cultural or Natural Heritage Site, Biosphere Reserve, Critical Watershed or other category of Protected Area for the preservation of areas of natural beauty of national importance, protection of biological diversity, management of wildlife, conservation of soil and water and related purposes".
The above provision is reaffirmed by Article 5 of the Constitution of the Kingdom of Bhutan, formally adopted in July 2008.

Furthermore, Section 21(b) of the FNCA, 1995, stipulates the requirement of a management plan for each protected area designated by the Royal Government of Bhutan. According to the same Section, the authority for preparing the management plan of a protected area is the Department of Forests and Park Services and the Ministry of Agriculture and Forests for approval.

Provisions for the establishment of protected areas in the FNCA, 1995 are further supported by procedures and regulations described in Sections 58-62 of the Forests and Nature Conservation Rules of Bhutan, 2006 (FNCR).

This management plan, therefore, derives its legitimacy from the mother law or the supreme law of the country, i.e. the Constitution of the Kingdom of Bhutan and from the FNCA, 1995, and the supporting FNCR of Bhutan, 2006

1 These were Doga National Park, Jigme Dorji Wildlife Sanctuary, Namgyal Wangchuck Game Reserve, Phochu Reserved Forest, and Khaling Reserved Forest. Information on old protected areas is cited from the Master Plan for Forestry Development, 1992.

2 Wangchuck Centennial Park was added to this network in 2008, coinciding with the centenary of the Bhutanese monarchy.

1.4 Salient Features of the Plan

The plan is built upon four rapid assessments of biodiversity (plants, mammals and birds) and the socio-economic status of migratory herders within, and farming households bordering, the administrative jurisdiction of the Reserve. Both these assessments have enabled the compilation of relevant and measurable indicators to judge the success of this plan at the end of five years.

The plan leaves room for and stipulates the requirement of an annual assessment of the programmes and activities. This should enable replication and up-scaling of successful models. It also calls upon management to proactively pursue fund mobilization with interested and committed partners/donors.

It envisages meeting the following key outcomes:

1. Population estimates for selected target/key species of the pristine temperate and alpine eco-systems obtained and monitored, and critical habitats identified;

2. Buffer, Multiple-use and Core zones identified, mapped and understood by Reserve staff and relevant stakeholders;

3. Innovative strategies piloted and replicated to mitigate or minimize human-wildlife conflicts including crop loss and livestock depredation;

4. Access to natural resources enhanced and ensured to local communities, and novel technologies to minimize or promote sustainable use of natural resources and NWFPs, in order to provide alternative income generating avenues transferred and replicated;

5. Smart Green Infrastructure piloted and up-scaled if successful. Innovative eco-tourism packages developed and implemented for enhancing and sustaining eco-tourism thereby contributing to improving rural livelihoods through alternative income generating avenues;

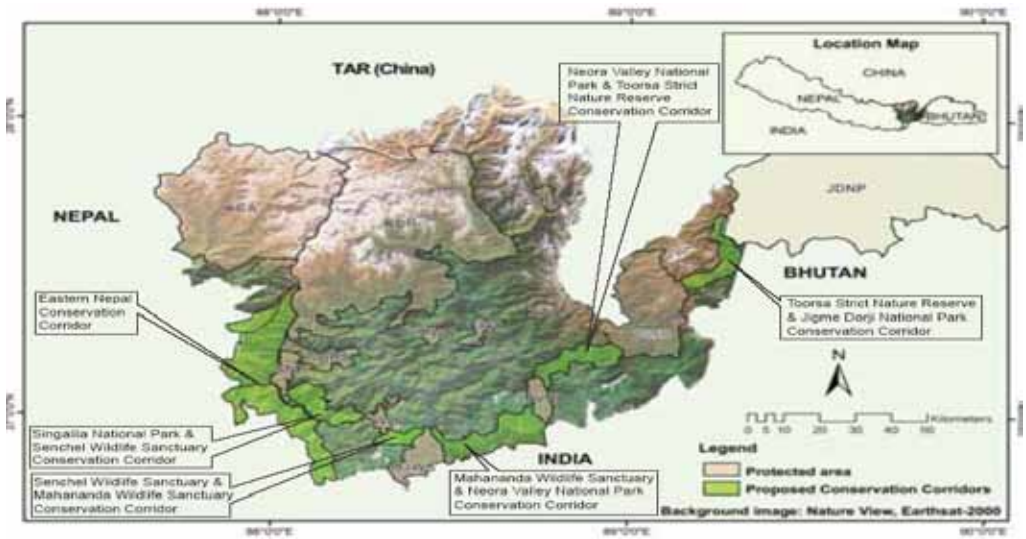
6. Migratory herders within and farming settlements at the buffer zone of Reserve boundaries adequately managed to buffer negative impacts on Reserve landscapes, ecosystems and species.

1.5 Conservation Significance of the Area

The significance of TSNR is not only for Bhutan but also for the entire Hindu-Kush Himalayan region (HKH), which is a significant reservoir of biodiversity, composed of extraordinarily varied eco-systems, assemblages of species of global importance, and rich genetic diversity. It is home to many endemic, endangered and threatened flora and fauna. TSNR forms an integral part of the Kangchenjunga Landscape, which is part of the proposed Sacred Himalayan Landscape (SHL) of the Eastern Himalayas. SHL is,

also known popularly as the Snow Leopard Landscape forming part of the Indo-Burman Biodiversity Hotspot,; one of the 10 hotspots of the world. SHL is a trans-boundary conservation area covering 39,021 square kilometers, of which about 73.5% falls in Nepal, 24.4% in Sikkim and Darjeeling of India, and the remaining 2.1% in Bhutan.

Figure 2: Kangchenjunga Landscape Conservation Area



The SHL builds links with the three major trans-boundary conservation areas in China, India and Bhutan. The landscape is contiguous with one of the largest protected areas in Asia, the vast Quomolongma Nature Preserve in Tibet (China) to the north. In the east, the SHL-Nepal maintains continuity with Kangchenjunga Landscape in India, linking further to the Bhutan Biological Conservation Complex that has natural connectivity to Toorsa Strict Nature Reserve in western Bhutan. SHL Nepal includes four protected areas – Langtang National Park, Sagarmatha National Park, Makalu Barun National Park, and Kangchenjunga Conservation Area - covering about 22% of the land area (HMGN/MFSC, 2006).

Recent review and research in Kangchenjunga Landscape revealed that the landscape is rich in biodiversity and a high proportion of these species are threatened or endemic to the region. Species such as Snow leopard, Asiatic black bear, Red panda, Himalayan musk deer, Tiger and Takin are the flagship species of the landscape.

The main habitat type in the Strict Nature Reserve consists of pristine mixed-conifer forests interspersed with grasslands and alpine meadows and has the strongest representation of the pristine temperate and alpine ecosystems in the country. It is also suspected to have the highest endemism in the country. Although there is no permanent settlement of local people inside the Reserve, a socio-economic survey was conducted to confirm the interrelationship between a few local communities, namely the migratory herders that have long since been present, and TSNR.

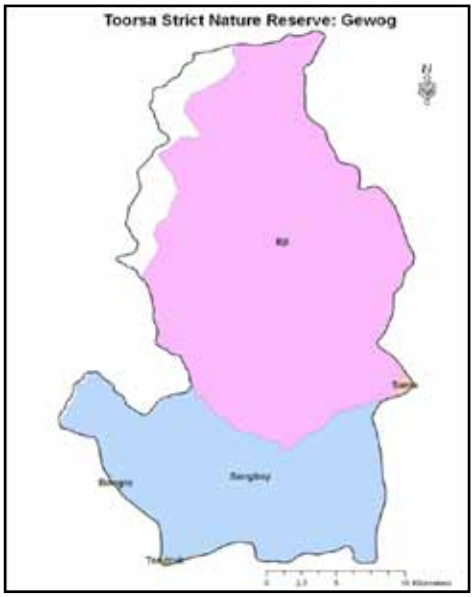


Figure 3: Settlement Map of TSNR

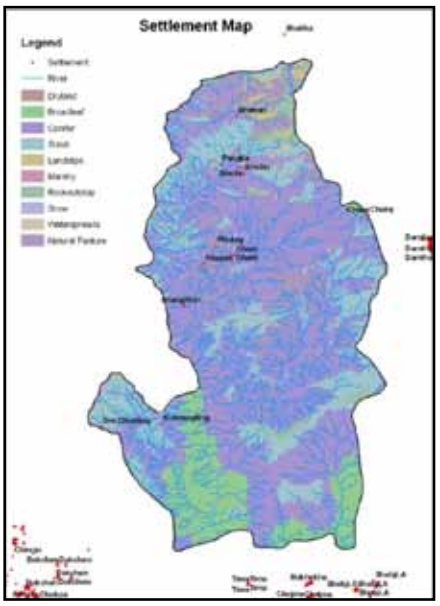


Figure 4: *Geogs* Falling within TSNR

DZONGKHAG	***GEOG* NAME**	**Sq_km**	**% area in TSNR**
Haa	Bji	400.82	65.76
Haa	Sama	1.36	0.22
Haa	Sangbay	206.02	33.80
Samtse	Baira	0.43	0.07
Samtse	Tendu	0.43	0.07

Table 1: Geog area which falls within TSNR (Source: GIS, WWF Bhutan Program)

2. Biodiversity and Socio-economic Conditions

2.1 Biodiversity

2.1.1 Floral Biodiversity & Habitat Types

From the four rapid biodiversity surveys conducted in 2009 and 2010, a total of 427 species were identified and recorded,; including: 137 species of trees, 68 shrub species, 182 herb species, 5 weed species, 10 orchid species, 8 grass species, 6 bamboo species and 10 fern species, belonging to 115 families (Refer Vegetation Report for details).

Among these, numerous Schedule I plants protected under FNCA, 1995, such as Cordyceps, Snow down Lily, Blue Poppy, Ginseng, and the recently included *Rhuem nobile,* were recorded during the surveys. In addition, three Appendix II species of the CITES, and four endemic species namely *Viola bhutanica, Bhutanthera himalayana, Meconopsis superba* (White Poppy) and *Bryocarpum himalaicum* were recorded.

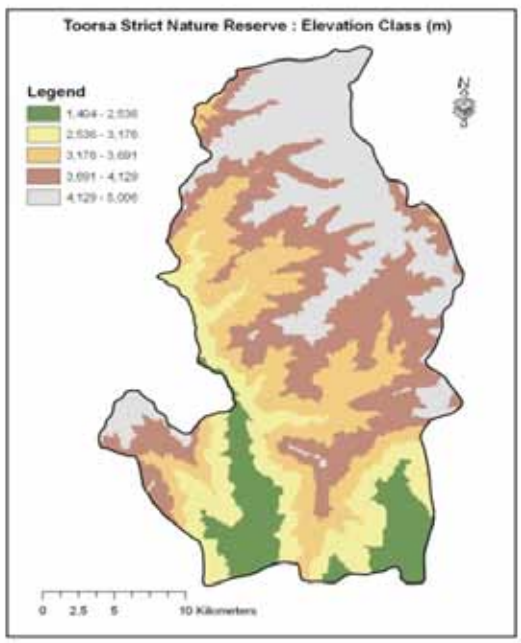


Figure 5: Habitat Types in TSNR

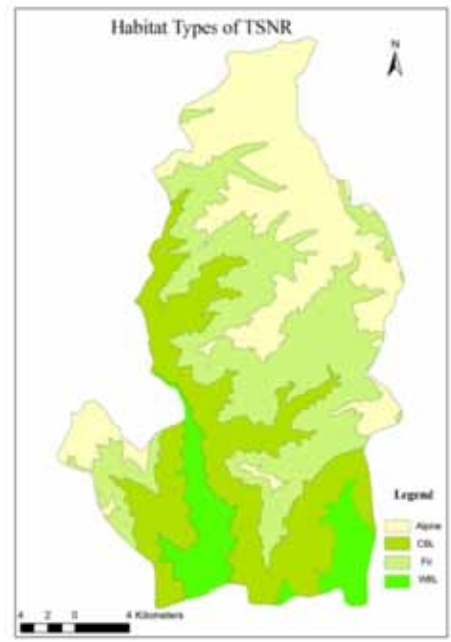


Figure 6: Elevation Class of TSNR

Other species of high timber value for construction and firewood, along with many medicinal, ornamental and horticulture value were also recorded. However, the total number of species recorded during the survey is not exhaustive, as revealed by the species richness curve that shows an increase in the number of species as the area surveyed increased. It is therefore, possible that with more sample plots, species richness could be even higher for all plant, mammal and bird species since the curve has not plateaued yet. (Refer to Figure 7 below).

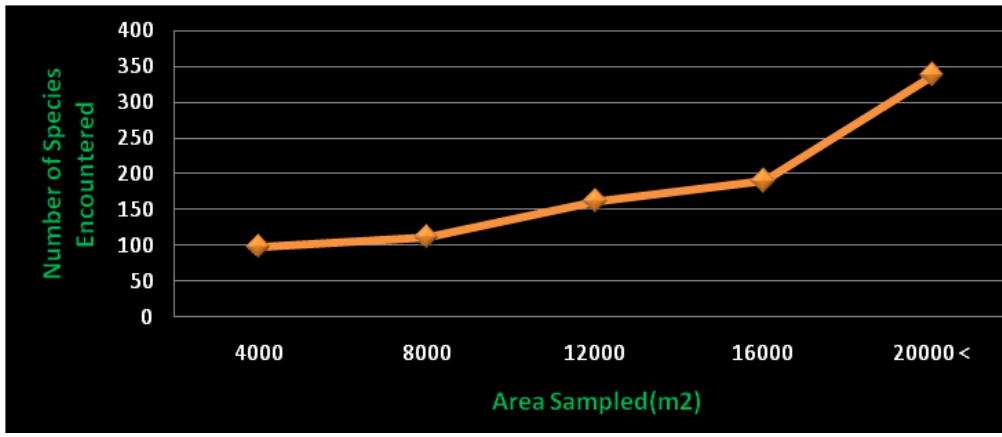


Figure 7: Species Richness Curve for Vegetation in TSNR

The survey revealed the greatest diversity of tree species in the CBFE, shrub species in the TMCE and herb species in the TMCE & AMGE forests (Refer to plant survey report for details). Further evidence suggested species diversity is highest in mid altitudes ranging between 1500–3500 metres above sea level (masl), i.e. in the CBFE & TMCE (Refer to Figure 8 below). The survey covered most of the areas ascending from 1400 to 4600 masl. Given that most of the Reserve lies within these elevation ranges, it is believed that species diversity is significantly high in the Reserve. A complete list of the plant species recorded in TSNR is provided in the plant survey report.

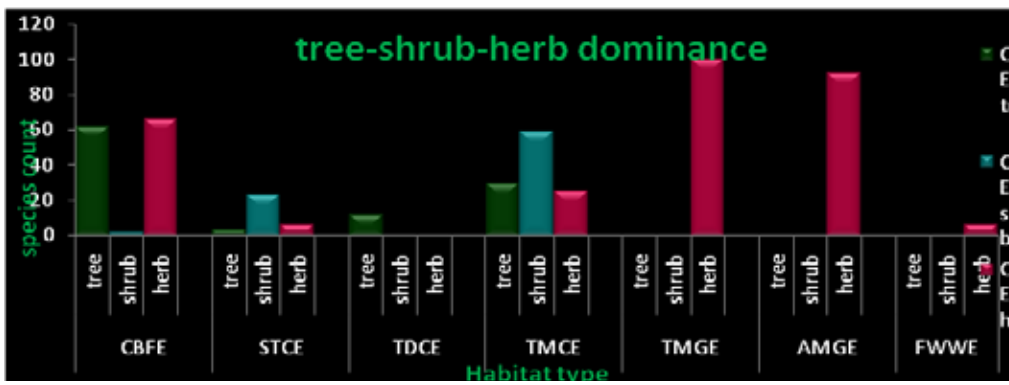


Figure 8: Tree-Shrub-Herb Dominance Graph in the 4 Habitats in TSNR

However for our purpose, four major habitat types were defined and the area coverage of each habitat type for TSNR was based on the elevation range (Refer to Table 2 below)

.

Habitat Type	Area (Sq km)	Altitude
Alpine area	179.90	4000-4900
Fir area	164.81	3500-4000
Cool Broad-Leaved	208.77	2500-3500
Warm Broad-Leaved	57.31	1700-2500
Total Area	**609.51**	

Table 2: Habitat Type Coverage within TSNR

Bhutan lies within the two bio-geographic realms, the Paleartic and the Indo-Malayan realms. These bio-geographic realms are divided into eight eco-regions, which are further sub-divided into 14 ecosystem types (Cleveland et al, 1997). Of the 14 ecosystem types classified for Bhutan, 11 eco-system zones are found within the Reserve area.
All ecosystems are characterised by their own specific vegetation habitats. The different ecosystems also vary in their area coverage within the Reserve which shows that the Cool Broad-Leaved Eco-system has the largest area coverage followed by others, Alpine Meadows Grassland Ecosystem and the Temperate Moist Conifer Ecosystem with the smallest area covered by Warm Broad-Leaved Ecosystem.

2.1.2 Faunal Biodiversity

A total of 29 species of mammals, 161 species of birds, 64 species of butterfly and 7 species of fish were recorded through the four rapid surveys.

i. Mammal Diversity:

Among the 29 species of mammals recorded, eight species are listed in Schedule I of FNCA, 1995 (Refer to mammal survey report for details), ten species are listed in Appendix I, three in Appendix I/II , two in Appendix II , and three in Appendix III of CITES. In addition, two are globally endangered and seven categorized as vulnerable according to the Red List of Threatened Species 2010 of the IUCN. These include the most charismatic and elusive Snow leopard, Clouded leopard, and Red panda, as well as others like the Asiatic Black Bear, Golden cat, Leopard, Leopard cat, Musk deer, Serow, Takin, Wild dog and Assamese Macaque. Several of these species can be considered 'flagship' species for TSNR, such as Snow leopard in the pristine alpine ecosystem, Common Leopard in the pristine temperate ecosystem, and Red panda in the bamboo forest. Though the southern part of the Reserve is found to be excellent habitat for tiger, evidence of the tiger was never encountered during the entire survey nor reported by the local communities. Many local people and herders of Sangbay *geog* in, Haa reported that tigers have not been seen wandering the forest of the Reserve since 2005. Some

people believed that the tigers were either poisoned with a substance intended for wild dogs or killed via retaliation since conflict with livestock was common in the past. The conservation status of mammals in TSNR was evaluated based on the results of the field survey and secondary information provided in the mammal survey report.

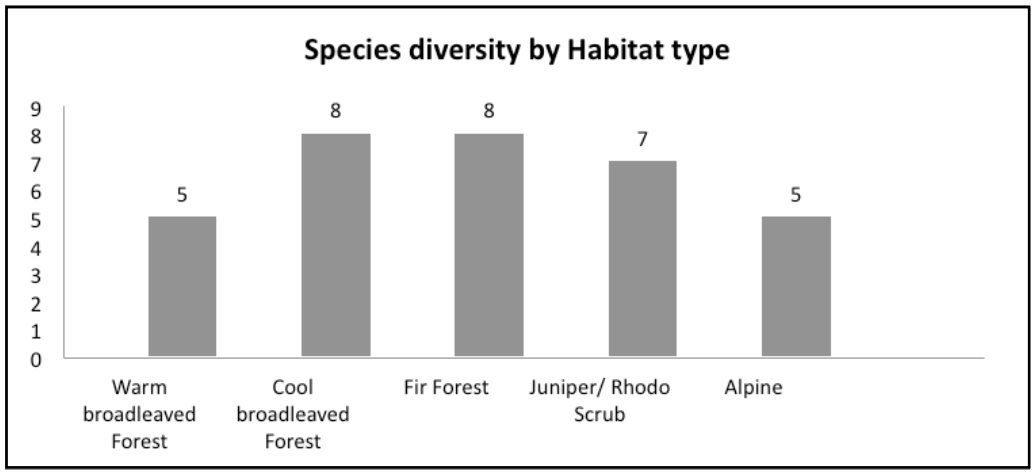


Figure 9: Mammal Species Diversity by Habitat Type

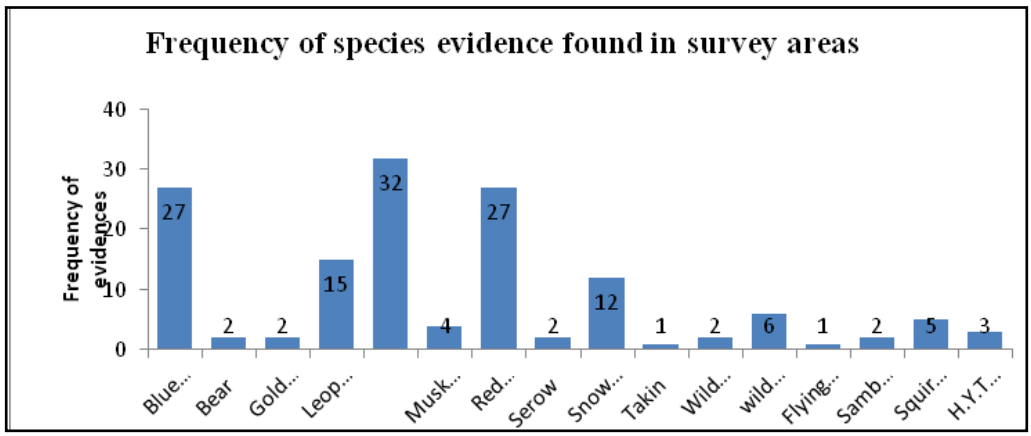


Figure 10: Evidence Frequency of mammal species

ii. Bird Diversity:

Among the 161 species of birds recorded, two species are listed in Schedule 1 of the FNCA, 1995 (Refer to bird survey report for details); the Himalayan monal and Rufous-necked hornbill. In addition, one restricted range species (Hoary-throated barwing) and the Tibetan snowcock are listed in Appendix I of CITES and one species in Appendix I/ II of CITES, and categorized as vulnerable in the Red List of Threatened Species 2010 of the IUCN.

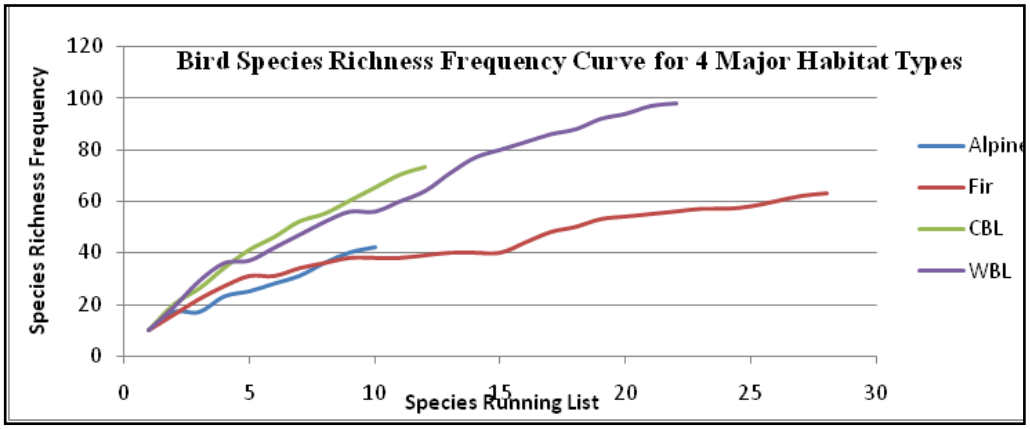


Figure 11: Bird Species Frequency Curve for Four Major Habitats

iii. Butterfly Diversity:

Among the 64 species of butterflies recorded belonging to 15 families,; several rare species were found, including *Lethe scandal, Prosotas nora airdates, Pontia daplidice moorei, Tirumala septentrionis, Euploea midamus rogenhoferi, Melitaea arcesia sikkimensis, Kuekenthaliella gemmata, Parnassius hardwickei, Albulina lehana, Choaspes benjaminii, Lethe sinorix, and Appias lalage.*

2.2 Local People and Livelihoods

2.2.1 Demography & Social Structure

Inside TSNR, there are two distinct groups of communities: yak herding and non-yak herding/farming (Refer to Table 3 below). Unlike the other yak herders of Bhutan, they do possess some agricultural land and have been cultivating different cereal crops. These yak herders (*geogs* of Katsho, Bji and Eusu numbering 71 households with 314 residents) have traditional customary grazing rights over the area and depend upon income earned from yak husbandry supplemented by agriculture farms. In contrast, the farming communities of Sangbay *geog (*183 households with 970 residents) depend upon subsistence production from agricultural land supplemented by livestock (traditional and improved breeds).

Sl.No	Geog	Dzongkhag	Yak herders		Buffer		Average hh
			No. hh	Human popln.	No.hh	Human popln	
1	Katsho	Haa	25	113	0	0	4.5
2	Bji	Haa	35	151	0	0	4.3
3	Eusu	Haa	11	51	0	0	4.6
4	Sangbay	Haa	0	0	183	970	5.3
			71	314	183	970	

Table 3: *Geogs* Falling Within TSNR

Sl.No	*Geog*	*Dzongkhag*	Total hh	Population	Average hh
1	Katsho	Haa	251	1130	4.5
2	Bji	Haa	244	1049	4.3
3	Eusu	Haa	202	929	4.6
4	Sangbay (buffer)	Haa			5.3
			697	3108	

Table 4: *Geogs* Falling Outside TSNR

Table 4 shows the remaining households out of the total number of households who are interacting directly with TSNR. These remaining households were not surveyed since they do not have any implications upon TSNR and are situated at more than 3-4 days walk from TSNR.

2.2.2 Stakeholder Groups

Based on the use and importance of the area to the inhabitants, three categories of inhabitants have been identified. Such division is important as the area poses different opportunities to different groups.

a) Primary Users/Inside TSNR (28%): The yak herding communities of Katsho, Bji and Eusu having traditional grazing rights in the area and use the area exclusively for grazing falls within this category. This group is considered to include the primary users of the Reserve. There has been an overall decrease in actual households depending upon yak herding.

b) Secondary Users/Buffer Area (72%). The agricultural community of Sangbay *geog* falls within this category and depends upon sustenance farming mainly agriculture supplemented by livestock farming. Their area falls within the buffer of the Reserve and has minimal interaction with the Reserve.

c) Other Users: Besides the above users, there are other user groups outside the Reserve known to use the Reserve's resources such as army outposts, tourists, government agencies, etc., particularly while travelling.

2.2.3 Livelihood Activities

The majority of the communities in TSNR depend upon agricultural farming (82%) supplemented by livestock rearing, followed by the yak herding communities of Katsho *geog,* Bjee *geog* and Eusu *geog* under Haa *dzongkhag.*

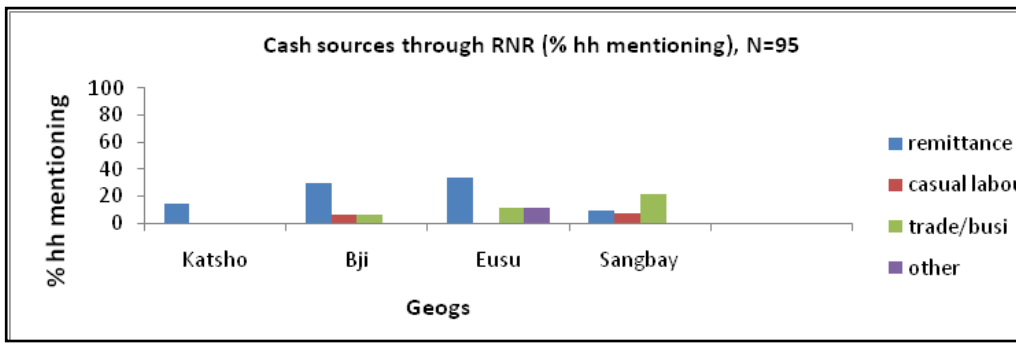


Figure 12: Cash income from RNR Sources

The cash sources from Renewable Natural Resources (RNR) activities namely agriculture, livestock and forestry vary from place to place as shown in Figure 12. The cash income from agriculture is noted highest in Katsho *geog* under Haa *dzongkhag* followed by Sangbay and other *geog*s. The cash source from agriculture is mainly in the form of selling potatoes in Katsho, Bji and Eusu *geogs* and other vegetables such as chillies as shown in Figure 13. Potato farming is almost exclusive in these *geogs*, since its harvest is taken down to Phuntsholing and in return essential food items are brought back. Potato cultivation started 30 years ago and picked up rapidly during the last 10 years. On average, the community harvest is around 10 to100 bags (1 bag=50kgs). On the other hand wheat, barley and buckwheat cultivation have gone down due to imported cereals from India through potato, due to which children do not understand the terminologies used for measuring such as *nyishochig* (twenty one), which is used for 400 and 800 *dreys* (a container used as a measure for cereals) respectively. Apples are also sold by these *geog*s.

Cardamom is the main source of cash income for Sangbay *geog*. Cardamom is taken down to Sibsoo and in return essential food items are brought back. From cardamom, the community fetches around Nu.20,000-30,000 averaging 3 to 20 *boras* for each

household (1*bora*=50kgs). Cardamom cultivation has decreased due to diseases and as such is being converted into vegetable farms.

The cash sources from livestock mainly through the sale of butter and cheese are reported highest from yak herders. In addition, the yaks are also sold to Laya and Lunana, with each yak fetching about Nu.30,000-40, 000.

The forest products namely mushrooms such as *Sangay Shamu* and *Sisi Shamu* and other wild vegetables are sold to the international market and at Haa market by the yak herders. Dried *Sisi Shamu* fetches around Nu.20,000 and the fresh ones fetch around Nu.800–1200/ pound. There is also one wild vegetable resembling wild potato which is sought out by an international market which fetches around Nu.150/ kg. Towards Sangbay *geog*, cane shoots are sold at Nu.20-30 per piece and each household on average collects around three head load with one head load measuring 30-40 pieces.

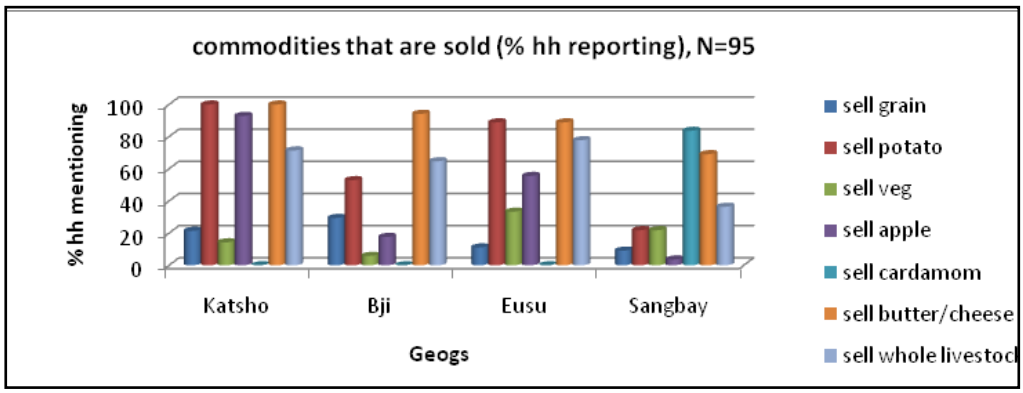


Figure 13: Commodities that are sold by each household

There is an opportunity for TSNR to work with the local communities and local governments to enhance the economic benefits from these activities.

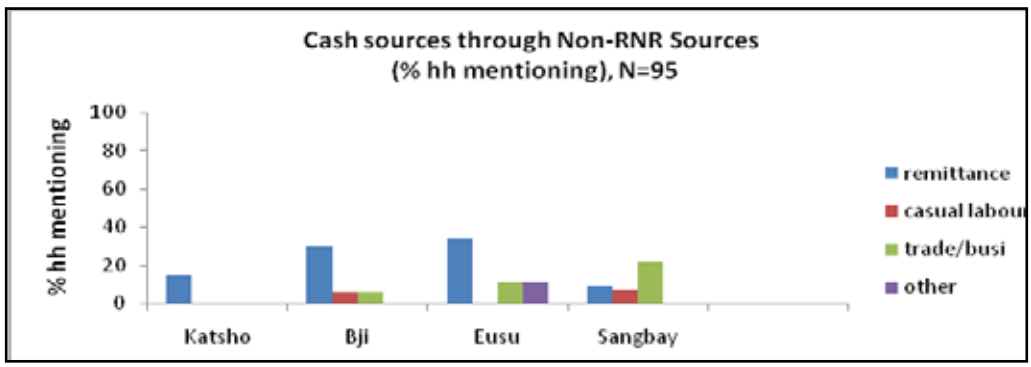


Figure 14: Cash income from Non-RNR sources

While analyzing cash sources through non-RNR activities (Figure 14), remittances play a critical role in supplementing the income of the communities. Towards Sangbay *geog*, a cash source through trade is highest, as each and every household is involved with trading of cardamom. Others include cash sources through rituals.

2.2.3.1 Livestock Activities

Livestock grazing in forest areas represents a serious threat to biodiversity, through reduction of habitat for species depending on forest under-growth, changes in structure and tree species composition, and competition with wildlife for grazing. Traditionally cattle, yaks and sheep are reared in an extensive system, in large herds with a relatively low productivity per head. As forests are often regarded as an open access resource, grazing areas are often stocked with livestock up to the carrying capacity, in terms of the number of animals that can be sustained. Extensive forms of cattle grazing are found to be unhealthy from a livestock production point of view as well as from the carrying capacity of forest ecosystems, followed by clearing of forests for pasture, particularly in the alpine/fir zone. Fortunately the Royal Government of Bhutan has banned the burning of pastureland. There are several disadvantages with the presence of herds in forest areas, including: increased risks of livestock depredation, retaliatory actions on predators by herders, and disturbing the activities of the wild animals.

Sl.No.	*Geog*	*Dzongkhag*	Total yaks in TSNR	Total horses	Cattle out-side TSNR
1	Katsho	Haa	1092	159	948
2	Bji	Haa	1168	305	1187
3	Eusu	Haa	495	28	1088
4	Sangbay	Haa	0	90	**1477**
			2755	582	**4700**

Table 5: Number of Livestock inside TSNR (Source: RNR Report)

The livestock pertaining to the resident communities using resources from TSNR are dealt instead of looking at the whole *geog*. The yaks are kept inside TSNR (as shown in Table 5) unlike horses and cattle. The cattle from Sangbay *geog* are kept at the periphery of TSNR. The horses only move seasonally and are not kept inside the Reserve. However, the armed forces' horses have been posing a threat to already scarce grazing land.

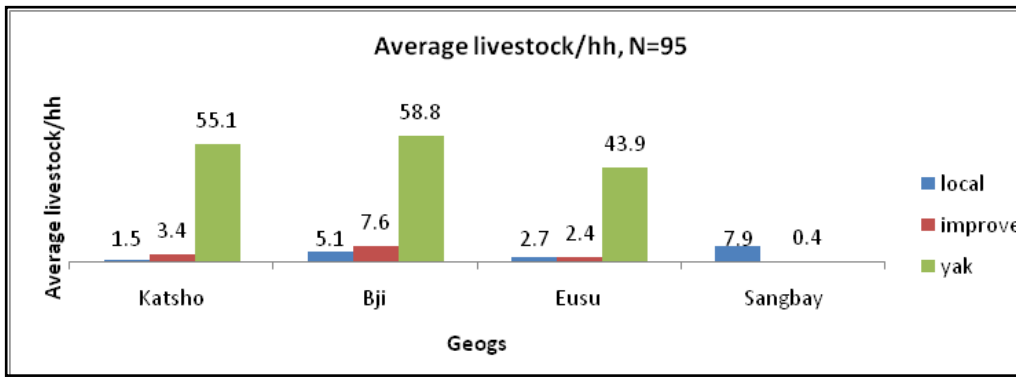


Figure 15: Average livestock/hh

On average, Bji has the highest number of yaks per household followed by Katsho and Eusu *geogs* (Figure 15 above). These communities also raise traditional and improved breeds of cattle which are kept beyond the Reserve. However the local breeds of Sangbay *geog* are the ones which infringe upon TSNR, but are at present kept at the Reserve's periphery.

Overall the local communities of Katsho, Bji and Eusu *geogs* raise three types of cattle categorically termed as *Lanor:*-meaning cattle kept at the mountains, *Thanor:* -meaning cattle kept at the lower valleys and *Yuelnor:*- meaning cattle kept in and around the houses, including Brown Swiss and Jersey, basically the improved breeds of cattle. Sangbay *geog* raise only the latter two types of cattle, particularly the *Nublang*.

However, yak herds have been decreasing for the last 20 years as shown in Table 6 below.

Table 6: Trends in yak rearing

Sl.No	Name village	*Geog*	Pres-ent	20 years back	Started decrease
1	Bali	Katsho	1	5	3-5 yrs started selling
2	Ingo	-do-	8	28	3-5 yrs started selling
3	Kajena	-do-	7	20	Since 10 yrs started selling
4	Yatam	-do-	2	5	-do-
5	Naktsho	-do-	5	11	-do-
6	Lhayulkha	-do-	1	5	-do-
7	Wangtsha	-do-	1	3	3 yrs back started selling
			25	**77**	
1	Chumpa	Bji	3	5	3 years back

2	Chempa	-do-	13	18	3-5 years
3	Gyentsa	-do-	1	1	
4	Yangthang	-do-	15	30	7-8 yrs , 60 hh sold, followed in 3-5 years
5	Yangthang Gompa	-do-	3	3	
			35	**57**	
1	Gedona	Eusu			Due to *thanor* and area located in warm area
2	Sangkari	-do-	3	3	
3	Kana	-do-	2	4	5 years sold to Haa
4	Tshaphey	-do-	2	6	4-7 years to Soe
5	Tshiolimbeytop	-do-	2	4	10 years ago
6	Dumcho	-do-	2	10	5-15 years
7	Bagney/Tagchu	-do-			
			11	**27**	

The reasons for the decline include: developmental activities;, insufficient labour since it is labour intensive;, younger generations opting out due to more children attending schools (no one wants to look after yaks);, and less support for the herding communities (their Tibetan counterparts are provided with three man days' payment per yak herd).

The rearing of sheep and goat also stopped 15–30 years ago and has not been reported by any *geog*. The stoppage is mainly due to readymade garments which are available in the market and predation by bear and leopard. Previously it was regularly practiced by the community of Sangbay *geog* to exchange for ration items.

The yak herders follow seasonal migration from higher elevations to lower elevations and vice-versa to utilize the grazing land that is available during different times of the year and also to avoid extreme winter conditions in higher altitudes as shown in Appendix 2 (Refer to Socio-Economic Report for details)**.** Grazing land management varies from area to area. In Eusu *geog* the herders from the villages of Kana, Tshaphey, Tshilimbeytsop and Dumcho utilize their grazing land on a rotation basis after every five years, usually done by throwing dice.
There have been a lot of conflicts in winter and summer grazing grounds for yaks. In summer grazing, it is more severe in places where Bhutanese herders share grazing land (Shakhatey -3hh, Jamana- 2hh, Sinchuloom- 3hh) with Tibetan herders. In Loomkhamikha and Jateykha, Bhutanese herders have reduced to two herds each from five herds. The shift between the different grazing grounds has also been reduced to two shifts in a year. During winter, 40-50 horses are kept throughout the year, and by the time their yaks reach the area, the palatable grass is exhausted. The problems are being

exacerbated by seven households of *Ha-tep* (upper community of Haa) which depend upon yaks winter grazing grounds to rear their *Thanor* during the summer from 4-8th Bhutanese months. Around 300 cattle are kept.

The other communities of Katsho, Bji and Eusu *geogs* also raise *Thanor (*meaning cattle kept at the lower valleys), and the trend is strong in Eusu *geog*. This type of livestock also has separate winter pasture towards Dorokha (9-4) and summer pasture (4-8) at higher places. Summer pastures are located towards Bji, Katsho and Paro and at times overlap with the yaks winter grazing land. *Thanor* - includes traditional breeds of cattle such as; *Jatsha, Jatsham, Thrabam.* They also raise another form of cattle locally called *Yuelnor (*meaning cattle kept in and around the houses) which includes the improved breeds of cattle like Brown Swiss and Jersey.

Towards Sangbay *geog*, more and more communities are resorting to raising cattle near the village rather than in far flung pastures. Far away pastures are now being used for keeping only the non-milking cattle and ox, unlike before. If any, the cattle migration is at three hours to one day walk to Yaba. In the earlier years, Yaba grazing ground was being used during 10th -3rd Bhutanese months and there were around 18 different grazing sites where more than ten households used to take their cattle, but this stopped in 1990. Similarly most of their previous grazing grounds are located in TSNR's jurisdiction but they have not been used due to labour shortages. Horse rearing is mainly for transporting different items where there is no road head.

Picture 1: *Nublang* from Sangbay *geog*

Sangbay *geog* has been well known for *Nublang's* origination - a native breed of cattle from the area. Oral history has it that some 280 years ago, there lived a nomad high in the mountains. One day an old couple came seeking shelter for a night in the nomad's herd, to which they were greeted with the best hospitality. Before retiring to bed, they were refrained from looking at their resting place at night. However, the curious nomad couple peeped through a hole, and to his surprise found two huge snakes coiled together. While the day dawned they again regained the human form and before going to their destined place that is *Nub-Tshonapata,* noted that after about a week's time, a bull will be sent as a gratitude for hosting them. On the appointed date a bull from the north descended down for which it was greeted with a grand celebration. The nomad family later became prosperous as a result of obtaining the breeding bull. Today, those seen in the village are said to be the descendants of the bull from the north. As such, even the Government is encouraging the farmers of Sangbay *geog* to raise their native breed of cattle. TSNR can take a pride in preserving such unique agro-biodiversity.

2.2.3.2 Agriculture

TSNR is the only protected area in Bhutan where there is no agricultural cultivation inside the Reserve. The presence of agricultural land in a protected area reduces the space available for natural forest habitat, affecting the integrity of the habitat. The presence of agricultural land leads to human wildlife conflict, as wildlife can damage crops and people tend to encroach upon forest land as well as collect a lot of products from the forest. In TSNR, all agricultural land falls way beyond its boundary. Since the livelihood of the community is interdependent upon a different farming system, agriculture is also being dealt in brief with relation to the residents of TSNR as agriculture activities are mainly concentrated in the buffer of the Reserve and as such do not have much effects on the Reserve. Farmers cultivate various crops such as maize, wheat, buckwheat, barley, millet, paddy, potato and other vegetables. Towards the three *geogs* of Katsho, Bji and Eusu potato cultivation dominates supplemented by other cereal crops. Potato is taken to Phuntsholing to get rations. In Sangbay *geog* they cultivate almost all of the land with paddy. Maize and wheat are also dominant.

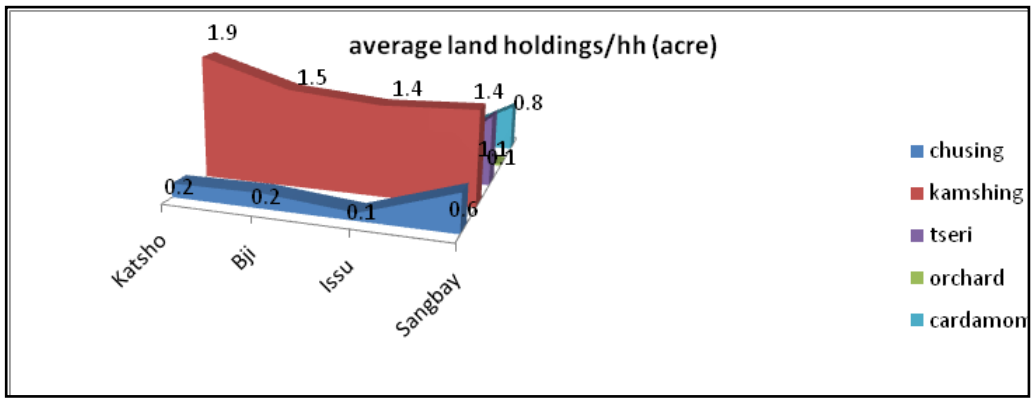


Figure 16: Average land-holdings per household

As shown in Figure 16, average land per household varies from *geog* to *geog*. Unlike other yak herding communities in Bhutan, the yak herders of Haa have a fairly good amount of land. It is quite alarming to note that Katsho *geog* possesses the highest dry land compared to Sangbay *geog*, although the latter are agriculturalist. With regards to *Chushing*, they are located at warmer places and distributed as share cropping except for Sangbay *geog*. Apple orchards are predominantly available in Katsho, and Eusu *geogs*. Cardamom is extensively cultivated in Sangbay *geog*.

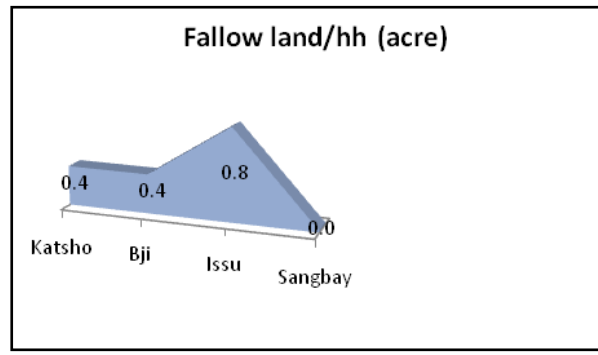
Twenty years ago, buckwheat and wheat were extensively cultivated, however due to crop raiding by wild animals and labour shortages, they have given up the practice to cultivate. The Royal Government has also imposed a ban on *Tsheri* cultivation as most of the cereal crops were abundantly grown. With the change in policy, the farming system has also changed, firstly from *Tsheri* to *Kamshing* and now *Kamshing* is being used as potato fields. As such the *geog*s of Katsho, Bji and Eusu prefer potato over

cereal crops (for more details, please refer to Chapter 3: Livelihood Activities in the Socio-Economic Report) which started 30 years ago and gained momentum over the last 10 years. Simultaneously wheat, barley and buckwheat cultivation have decreased due to imported cereals from India through cash from the sale of potato.

Some remnants of *Tsheri* are still followed in Sangbay *geog*. Overall *Tsheri* is being converted to *Kamshing* (dry land) starting eight years ago. Earlier they used to follow a rotation period of 12-13 years, had 5-6 different *Tsheri* areas, and cultivated almost all cereals including wheat, barley, buckwheat, mustard, etc. The land holding ranges from one acre to ten acres. *Tsheri* used to be cultivated at a stretch of a one day walk from the village. Some communities still practice *Tsheri* but it is slowly being phased out.

Chushing (wetland) varies from 50 decimals to 2 acres. In Sangbay *geog* most of the wetland cultivation started four years ago, except in Lhojona village where *Chushing* has been practised for a long time. Some communities do not own any wetlands. In Tima village, under Sangbay *geog*, most people hold small plots of land (under one acre) or work in fields owned by others. Thus many residents of the Tima community live below the poverty line.

The fallow land, as shown in Figure 17 is cause for concern from a food production point of view. The extent of fallow land kept for different reasons is important especially to mitigate rural urban migration, although it is beneficial for wildlife. The main reason attributed to keeping the land fallow is intense crop raiding. The other notable reason is due to the ban on *Tsheri* (shifting cultivation). In Sangbay *geog*, the communities basically cultivate on whatever land they have due to smaller land holdings.



(Figure 17: Fallow land/hh (acre))

Towards Katsho, Bji and Eusu geogs, the communities can afford to keep their land vacant since they have other diverse means to meet their ends.

2.2.4 Public Service Delivery Infrastructure

Development facilities in the form of service centers such as; schools, health care, RNR-centre, markets, road points and monasteries have been a driving force for economic growth in any community since these determine where economic activities and population will be concentrated. TSNR's mandate is not development but it has to streamline developmental activities in order to win the goodwill of the community.

While developmental facilities cannot be provided to each and every community, it is important to see the availability and travel time of such facilities, and try to work with local government to provide services.

Where ever possible, facilities need to be planned taking into consideration the conservation interests of the protected area, to minimise negative impacts on biodiversity. In TSNR, all the service centers are located outside biologically sensitive areas. Access to development facilities (education, health, RNR) is very important, as it forms the basis for people's involvement in alternative economic opportunities and puts less pressure on the protected area. TSNR management and *dzongkhag* administration can try to develop mule tracks, build small bridges and upgrade existing facilities to promote different services. Regarding access to education, particularly expansion of boarding facilities and a scheme of scholarships for children from poorer households to attend primary and secondary education, can be instrumental in boosting the enrolment rate. Also non-formal education can contribute to this.

Important aspects related to the location and access of service centers include:

- School enrolment rates
- Distance to nearest service facilities such as schools, RNR-centre, health care, road head, etc.

2.2.4.1 Access to developmental services

In TSNR, all the developmental facilities are located in the village itself for Katsho *geog*, Bji *geog* and Eusu *geog*s which is around 3-4 days walk from the yak herds. As such developmental facilities outlined in this chapter are with reference to their actual village and not from the yak herds. For Sangbay *geog* it is from their village only because they do not migrate like the other three *geog*s since the residents are permanently settled in the buffer and are not migratory. Figure 18 shows that for Katsho, Bji and Eusu *geogs*, all the facilities can be reached within 30minutes to one hour. Moreover all these *geog*s are covered by road networks. The *dzongkhag* administration and main town of Haa are located in Katsho *geog*. Since the health and RNR facilities are located at Sangbay *geog* headquarters, the other villages have to traverse around one day to avail the services. For marketing purposes Sangbay *geog* communities travel around four days either to Haa or to Sipsoo in Samtse *dzongkhag*.

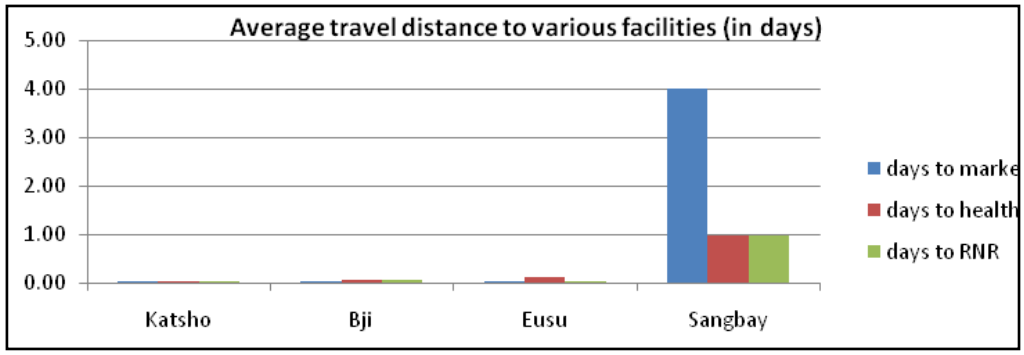


Figure 18: Average travel distance to various facilities in days (Note: 1 day=10hrs)

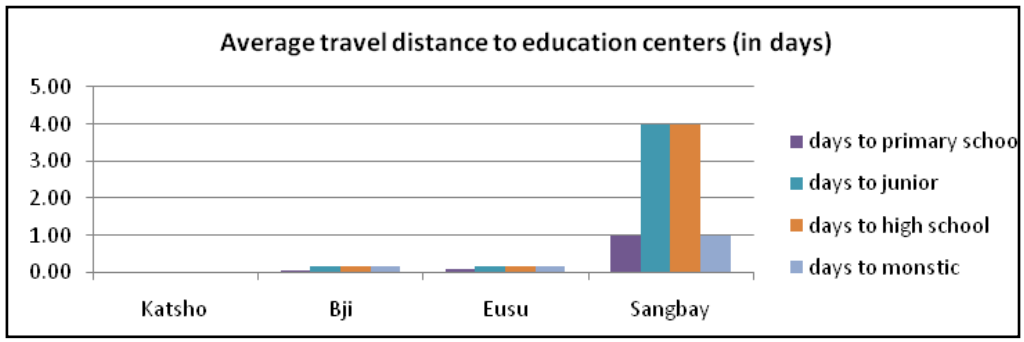


Figure 19: Average travel distance to education centers in days (Note: 1day=10hrs)

From Figure 19**,** it is evident that all the primary education facilities are mostly located within the *geog* itself. As such it is less than one hour walk from individual villages for Katsho, Bji and Eusu *geogs*. Although higher education facilities such as junior school and high school are located at the *dzongkhag* head quarters (i.e. in Katsho *geog)*, for Bji and Eusu *geogs* it is less than two hours since these *geog*s lie in close proximity to each other. However for Sangbay *geog*, even to avail primary education the children have to traverse one day although it is located within the *geog* itself. Moreover the villages are situated at a distance of one day from each other; as such the *geog* centre is located in the middle of all these villages. For availing higher studies, children have to traverse for four days either way to Sipsoo in Samtse or to Haa. There is also one monastic educational institute located above the *geog* centre in Sangbay *geog*, meant for this particular *geog*.

2.2.4.2 School enrolment

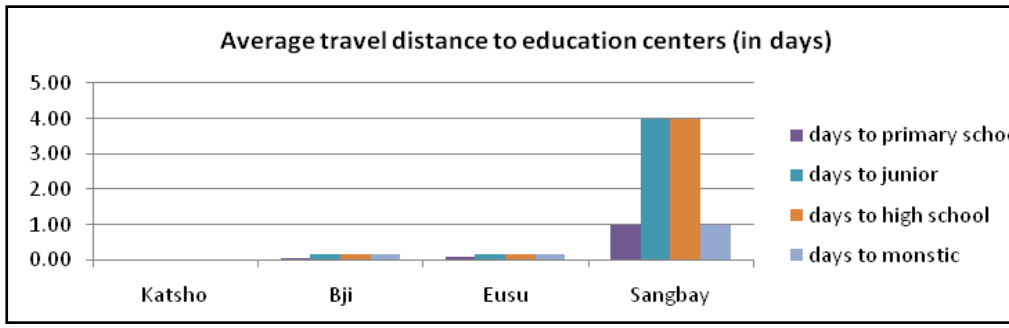


Figure 20: % School enrolment for males

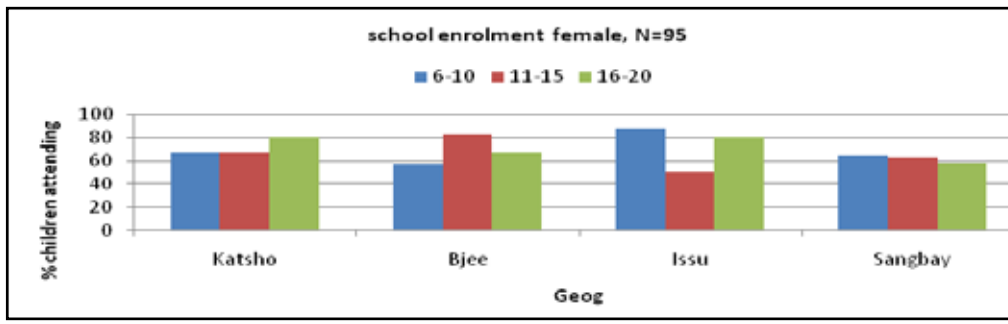


Figure 21: % School enrolment for females

Figures 20 and 21 shows the percentage of school going children for males and females in various age categories until the completion of higher secondary education. The graphs are interesting as they show more female children completing education than male children. The reason for more female children attending schools may be the nature of household work wherein it demands more strenuous physical work, thereby keeping male members at home to do the work. The other possible reason for male members of the family opting not to study is the trading business by these communities in the north (Katsho, Bji and Eusu *geogs* with Tibetans) as well as in the south by Sangbay *geog* with Samtse. The tradition for sending a male member to receive monastic education from these communities is quite strong, resulting in less male members attending schools. In Sangbay *geog,* it has been seen that from each household, at least one male member has been sent to the monastic institution resulting in more female children attending schools than male children. The other reason especially for less male children attending school concerns parents' ability to pay. TSNR can intervene through scholarship programs or by providing alternative sources of income.

3. Conservation Issues, Threats and Challenges

3.1 Free Range & Over Grazing

Yaks form an integral part of the pastoral system and domestic biodiversity in TSNR. Yak husbandry is therefore a major part of the livelihoods and economy of pastoral groups in TSNR. A significant portion of the Reserve is under severe grazing pressure during the summer months when the herds return from the lowlands to the highland pastures. The requirement here is for mitigation measures that integrate communal grazing rights with conservation issues.

There are continuing debates with regards to the effect of grazing. However, with the current level of information available, it is not possible to ascertain the extent of grazing and its impacts on a certain forest type. However, habitat destruction to enlarge grazing areas or facilitate grazing by burning the scrub forest and girdling of the trees was encountered during the survey. Communicable diseases like Foot & Mouth Disease can be transmitted to wild ungulates from livestock that annually migrate outside the Reserve and often pass through the urban areas. A common practice in livestock management in the country is free range grazing where large numbers of cattle or yak heads are left out in the forests to graze which can lead to overgrazing causing vegetation loss, reduction of the bio-logical productivity of land and soil erosion. At the same time it may increase competition between domestic cattle and wild ungulates which may weaken the prey base and force predators to kill livestock or wild ungulates may raid farm crops out of scarcity of forage in the forests. In the alpine scrub, the population of blue sheep seems to compete with snow leopards and any reduction in the blue sheep population poses a threat to the snow leopard population.

3.2 Poaching - Characteristics and Extent

One major concern for the Reserve is remoteness. Distance between the nearest village settlements which increases the probability of poaching activities. Poaching of species continues inside the Reserve as evident from the traps and snares encountered during the surveys, though the extent has yet to be confirmed. The Reserve harbours a number of species highly valued for their parts or products. A porous international border and proximity to regional wildlife trafficking routes, and a lucrative market for wildlife parts and products in the region coupled by remoteness, make TSNR highly vulnerable to poaching. Poaching of wildlife species especially Musk deer is evident around the Nub Tshonapata areas. Since TSNR shares an international boundary with China, the trans-boundary populations of both predators and prey are vulnerable to poaching. Targeted species mostly Musk deer, Cordyceps, Fritillaria, Saussurea, Picrororhiza and other high altitude medicinal plants. The majority of illegal cases in the Reserve are associated with poaching and illegal harvesting of medicinal plants from within and across the border. Tigers, like many other predators, can be exterminated locally due to retaliatory killing because of conflict with livestock or poaching. Although there was no evidence of bird poaching, the large number of Musk deer traps collected from areas around

Nub Tshonapata clearly indicates that birds especially the bigger sized pheasants like Himalayan monal and Tibetan snowcock, could be under threat due to these unintended traps.

At the same time, dearth of manpower for patrolling and trained field staff and equipment for surveillance, communication, camping and mobility as well as the inaccessibility of areas, make it difficult to combat poaching.

3.3 Lack of Data on Species, Ecosystems & Landscapes

Knowledge of species dispersal and persistence is the primary goal for any protected area. One major concern which needs to be immediately addressed concerns a lack of knowledge of target key species populations and their habitats. This lack of information has hampered management's ability to zone the Reserve. For this, detailed information on species presence, distribution and population estimates is required. Furthermore, this lack of insight into species and associated parameters will seriously hamper the Reserve in implementing successful species conservation programmes in the future.

3.4 Human-Wildlife Conflicts

Close to 428 people (71 households in three geogs) depend on natural resources found inside the Reserve, and 970 people in one geog with 183 households depend on natural resources from the fringes of the Reserve. One major impediment to livelihoods is the plight which herders suffer due to persistent and widespread wildlife damage to both crops and livestock.

3.4.1. Problems with livestock rearing

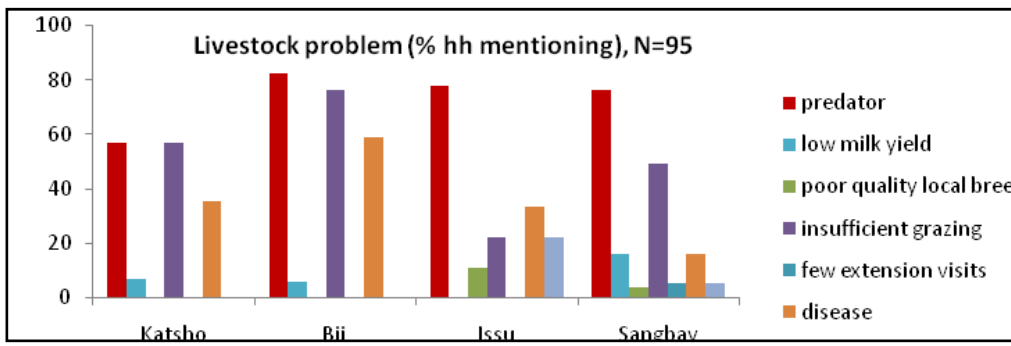


Figure 22: Livestock problems

In analyzing the problems faced while raising livestock, livestock depredation seems to be most reported from every geog followed by insufficient grazing, as shown in Figure 22. The next section specifically deals with livestock depredation. The grazing problem in highland areas is being exacerbated by the overlapping of Thanor (lowland cattle), and horses among others as reported in the preceding section.

3.4.2 Livestock Depredation

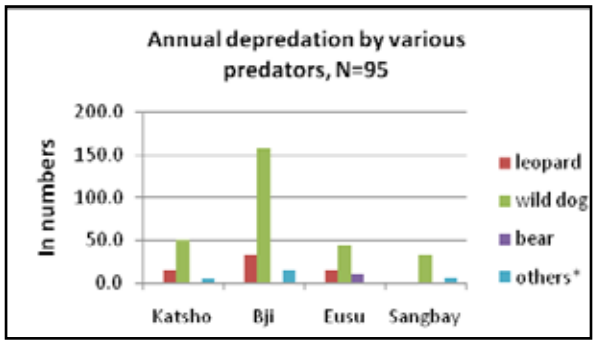


Figure 23: Annual livestock depredation by various predators

Based on the survey it can be ascertained that there is livestock depredation by different predators depending upon different habitats.

As shown in Figure 23, the predation by wild dog seems to be taking place in almost all the geogs, followed by leopard. Attacks by tigers have not been reported from any of the surveyed areas. Others include small cats, such as marten, and eagles predating upon poultry and young cattle and yaks.

From the livestock depredation trend shown in Figure 24 for the past three years, the predation by bear, wild dog and others has been steadily increasing, while attacks by leopards have been the same. Attacks by wild dogs have particularly increased during the winter season on young yaks, adult yaks as well as horses. The attacks by wild dogs account for more than 50% of attacks in almost all the areas. It is reported that wild dogs in packs of 3-15 frequent yak herds as well as villages. The wild dog population has been increasing for the last 10-15 years. Tigers have not been seen for five years, although wolves have been reported from the highlands. Occasionally bears and other small cats also lift young ones, while the others attack more poultry in Sangbay geog. Leopards have been known to attack more horses than other animals.

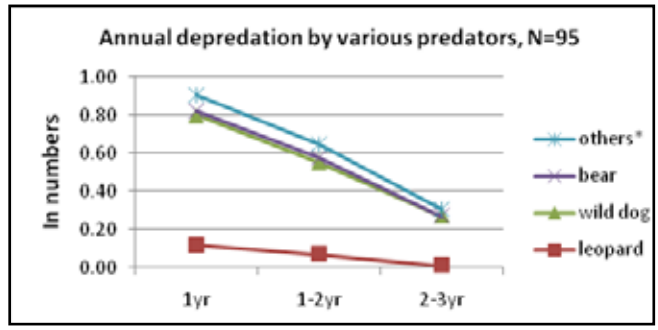


Figure 24: Livestock depredation trends for past 3 years

3.4.3 Agricultural Problems

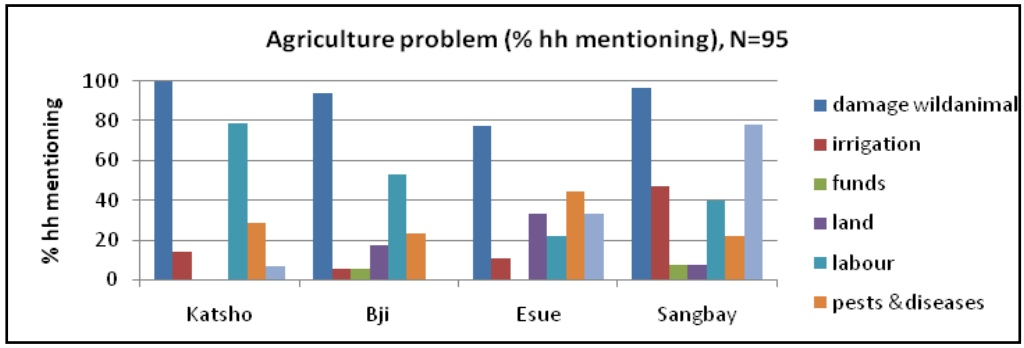


Figure 25: Agriculture Problems (%hh)

As illustrated in Figure 25 above, the major problem among communities in all the geogs is crop depredation. This is followed by labour shortages in Katsho and Bji geogs, pests and diseases in Eusu geog and transportation problems in Sangbay geog. It is certain that during the time of Tsheri cultivation, crop raiding was not felt, although it was likely present since farmers were cultivating more cereals as compared to now. Since the ban on Tsheri, crop raiding has been felt more as production has decreased. It is also reported that abandoned Tsheri land provides a safe haven for wildlife hide outs. Another significant problem with agricultural production is irrigation, among others.

3.4.4 Crop Depredation

Crop raiding animals, especially in Sangbay geog are likely to be in TSNR (Figure 26), as the villages are situated within the buffer area, and for other geogs it cannot be ruled out, since wild animals have no boundaries. Wild pig remains the number one wild animal reported by all the geogs, followed by rats and birds. Guarding, scarecrows and fencing have been used to solve the problem, although with minimal success.

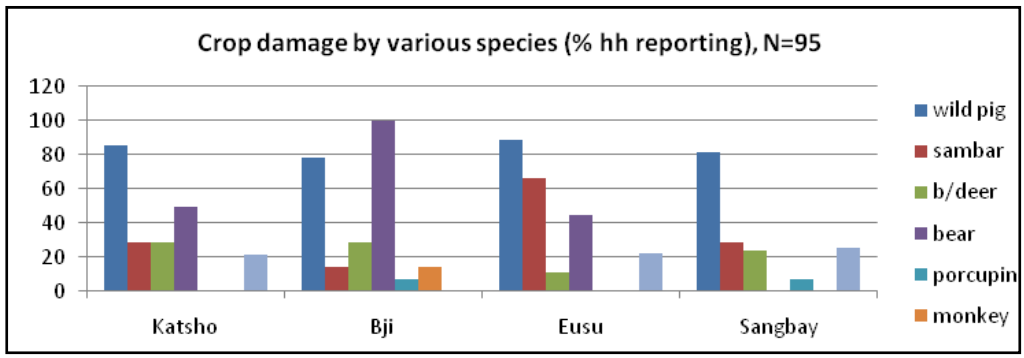


Figure 26: Crop damage by various wild animal

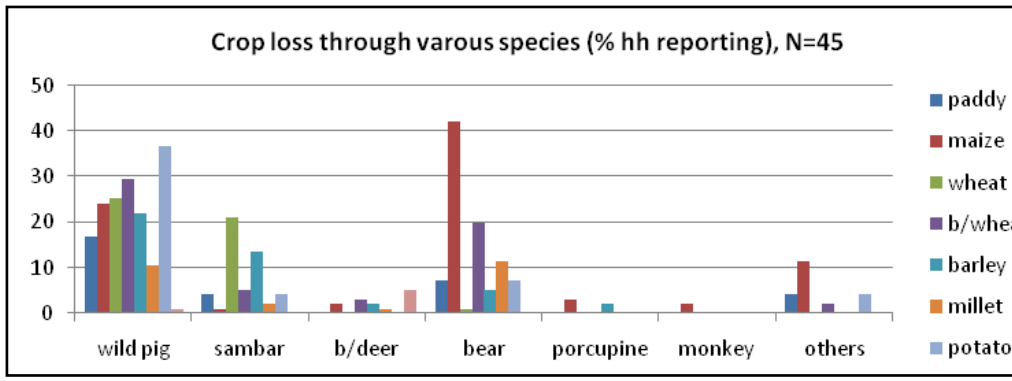


Figure 27: Type of crop loss by various wild animals

As illustrated in Figure 27 above, maize, wheat, barley and buckwheat are the crops most vulnerable to wildlife attacks. It also shows the preference of different crops by different animals. Wild pig depredates almost all the crops, although it shows a higher preference for potato. Overall maize is preferred by every wild animal and depredated in abundance. Barking deer nibbles on chillies more than other crops. Crop loss varies from place to place even in the same village, although it is more rampant at the periphery and near the forests. Despite strenuous efforts in guarding over crops, the loss varies from 1/3 to1/2 of total crops.

3.5 Institution Building and Service Delivery

Lack of housing facilities, field gear and capacity building opportunities remain as significant challenges. Without proper arrangement of such facilities, ensuring effective service delivery will not be possible.

Current lack of information and personnel, combined with workload and insufficient capacity to deliver services, has also hampered effective planning and rationalizing of field activities.

3.6 Under-Grazing

Most of the local herders have sold their yaks and quit the pastoralist lifestyle. This has led to under-grazing for most of the habitats which were grazed by yaks in the past and lived in harmony with wild ungulates. The immediate absence of large grazers like yaks can change the ecosystem as well. Establishment of forest management units and logging processes in the buffer zone of TSNR also have the potential to cause further disturbance to the wildlife and its habitat.

3.7 International Boundary Demarcation

The international boundary demarcation in some parts of Haa has not been finalized

with the neighbouring Chinese Government. Since the boundary has not been finalized between the two governments in the border areas, it is disadvantageous to the wildlife and its habitat. The movement of staff is also restricted in border areas, thus limiting monitoring and anti-poaching programs since approval has to be sought from the Royal Bhutan Army for visiting the majority of the Reserve area.

3.8 Unsustainable Collection of NWFPs and medicinal plants

There seems to be unsustainable collection of NWFPs and medicinal plants. However, no precise data or information is available from the local authorities, which warrants effective patrolling activities within the Reserve.

4. Strategic Premise of the Plan

4.1 Vision

An area dedicated to maintain ecological integrity and species of the pristine temperate and alpine ecosystems.

4.2 Guiding Principles

4.2.1. Adaptive Learning & Management:

As this is the first management plan for TSNR,; the approach and activities should be dynamic to adapt to unforeseen circumstances and new insights. An adaptive approach is particularly important to manage complex ecosystems and human-nature interactions, as well as the unpredictable security situation that currently exists in TSNR. Adaptive management will ensure that conservation interventions are dynamic and sufficiently resilient to respond to fast-changing and immediate needs, and also take advantage of new opportunities.

Consistent monitoring and organizational learning are important components of an adaptive management approach. Emphasis will be placed on learning from past successes as well as failures to continuously modify activities to address conservation and associated development needs in evolving circumstances. This will involve regular monitoring and proper documentation of methodologies, approaches and techniques to make this knowledge available to various interest groups. As an adaptive and dynamic document, it is stipulated that prescribed activities be reviewed and revised on an annual basis. Key lessons learnt during the course of implementation should be used to guide formulation of strategies and subsequent activities.

4.2.2. Participation and Partnership:

No agency can successfully pursue and achieve conservation objectives on its own. For instance, anti-poaching efforts will be more effective if there is stronger coordination and collaboration with local civil administrative bodies and other relevant law enforcement agencies such as the Royal Bhutan Army, Department of Revenue and Customs and the Royal Bhutan Police.

Similarly, conservation education activities are likely to yield better results with engagement of schools, *geog* RNR extension agents, and local community leaders. Therefore, conservation interventions need to be pursued through participatory approaches and built on partnerships with the local communities and other development agencies whereby stewardship is nurtured over the long-term. Emphasis will need to be given to eliciting knowledge, perceptions and interests of various stakeholders and using them in a synergistic way to effectively deal with conservation issues.

4.2.3. Balancing Conservation with Community Development Needs:

Traditional relationships, which include traditional user rights and resource use rights, need to be respected and integrated in conservation interventions to the maximum extent possible. In today's world of rapid socio-economic development and environmental degradation, conservation is of utmost importance, however; exclusionary conservation policies and approaches do not work as evident from experiences of other protected areas around the world. Instead they alienate local communities who have the most direct stake in the positive state of their natural biodiversity and, in doing so, the country loses knowledge, insights and support for conservation.

Conservation threats can be best addressed by dealing with underlying development pressures and constraints, and offering development alternatives that are more compatible and synergistic with conservation objectives. Therefore, integrating conservation and development in ways that are mutually-reinforcing is fundamental for successful implementation of conservation interventions.

4.2.4. Recognizing and Reconciling Conflicting Interests:

The challenges and issues identified in this plan and its supporting documents should be referred to so as to ensure identified threats are adequately addressed. There will obviously be diverse interests in TSNR, some of which may be conflicting. It is imperative to recognize these diverse interests and reconcile conflicting issues to the maximum extent possible. Major conflicting issues in TSNR are likely to arise from the migratory herders grazing rights and conservation in TSNR, as well as the Amo-chhu hydropower project along Toorsa-river downstream. While major development hydro projects may be unavoidable because of their importance to overall national development, conflicting issues need to be recognized proactively. In addition, reconciliation measures will need to be considered early on in the design and planning stage, followed by implementation of appropriate safeguards and mitigation measures to minimize potential adverse environmental impacts. A detailed Strategic Environmental Assessment and a full Environmental Impact Assessment will therefore be mandatory for downstream development projects that are inimical to conservation objectives upstream.

4.2.5 Dynamism:

Based on the *implementation actions and guidelines* outlined in subsequent chapters, an annual work plan should be prepared. This will help ensure the relevance of the plan to emerging challenges and shifting priorities over the course of plan implementation. Guidance can be drawn from the forecasted five year work plan and budget projections presented in Table 7 and 8 of this plan.

4.2.6 Ensuring Continuity:

All the lessons learnt during the course of implementing the plan, whether failures or successes, should be documented and optimistically accepted as lessons learnt to guide future courses of action, thereby ensuring continuity in implementation of the planned activities over time.

In Annexure 1 at the end of the management plan, we provide a set of indicators against which success can be measured.

4.3 Objectives

4.3.1 Short-term Objectives

To provide guidelines for developing investment plans for the next five years of the Reserve based on the bio-diversity and socio-economic surveys conducted.

4.3.2 Mid-term Objectives

1. To halt further degradation of the eco-systems and the species therein as a result of existing land-use patterns and threats therein.
2. To establish adequate institutional structure and infrastructure of the Reserve for effective implementation of planned management interventions in the Reserve.
3. To ensure effective coordination between different sectors for management of the Reserve.
4. To balance conservation and developmental needs through ICDPs, Eco-tourism and alternative income generation activities like NWFPs in the Reserve.
5. To solicit technical, financial, social, legal and other support required for the activities of the Reserve.
6. To mobilize financial resources including recycling of entry and such other fees received in the Reserve, to foster stake-holder development and eco-tourism.
7. To support research, environmental education and training in the above related fields.

4.3.3 Long-term Objectives

1. To ensure conservation of the pristine temperate and alpine ecosystems.

2. To maintain the ecological, cultural and historical integrity of the pristine temperate and alpine eco-systems within the Reserve.
3. To build a scientific database, containing both social and ecological aspects to facilitate informed policy decision making.
4. To make TSNR a special attraction for its pristine eco-systems, scenic beauty and endemism.

5. Biodiversity Conservation Management Interventions

Chapter 1: Landscape & Species Conservation

A. Landscape & Species Research & Monitoring

Rationale

Any successful conservation programmes should be built on a proper understanding of landscapes, ecosystems, and species therein, and the interactions between them since they are interdependent.

However, with the government prioritising socio-economic development, conservation has to be justified. Research targeted at understanding landscapes, ecosystems and species interactions, and quantifying natural capital which landscapes and species provide to humanity, should therefore be accorded equal priority.

Goal: To ensure research work:

1. Enables an improved understanding of the biology and ecology of the pristine temperate and alpine ecosystems, the key species therein and their interactions.
2. Enables an improved understanding of the threats to the pristine temperate and alpine ecosystems and the key species therein.
3. Supports implementation of robust management measures to mitigate or minimise the threats.

Policy Objectives

1. To accord priority to pristine temperate and alpine landscapes, eco-systems and species based research.

2. To initiate the quantification of natural capital provided by pristine temperate and alpine landscapes, ecosystems and species therein.

3. To use the results obtained to guide zonation of the Reserve.

4. To enhance professional and public understanding of the inherent bio-diversity and culture of TSNR and the associated conservation/development needs and to use the results to influence conservation policy decision making and actions.

5. To establish a database of the biodiversity (floral, faunal and herpeto-faunal) within the Reserve.

Implementation: Actions and Guidelines

1. Strong conservation measures need to be adopted within TSNR to mitigate the degradation of bio-diversity caused by grazing. Robust research programmes

with an aim to understand pristine temperate and alpine landscapes, eco-systems, habitats, species and associated threats to conservation should be accorded top priority for management with the aim to ultimately enable proper zonation of the Reserve and thereby define appropriate management interventions.

2. Comprehensive surveys of biodiversity should be carried out within TSNR, building upon past preliminary rapid biodiversity surveys, to cover all seasons and include migratory species particularly the fauna species like bird diversity, and to document and systematically analyze the survey results. For those species like fish, herpeto-fauna, etc., where there is no baseline to date, preliminary/ baseline surveys need to be conducted, followed by comprehensive surveys.

3. During the next stage of planning, robust research programmes (short, medium and long term) should be a top priority on:

    a. Issues related to grazing
    b. Distribution, population estimates and habitat status for the following key/ flagship mammal and bird species:
        i. Snow leopard
        ii. Red panda
        iii. Wild dog
        iv. Woolly hare
        v. Rufous-necked hornbill
        vi. Galliformes (Himalayan monal and Tibetan snowcock)
        vii. Tibetan wolf
        viii. Musk deer
        ix. Blue sheep

    c. Ecology of key species such as White Poppy and other endemic floral species to demarcate areas for zoning and allocation of rural timber and other forest resources.
    d. Ecology of pristine temperate and alpine ecosystems and the endemic plants within the Reserve.
    e. Socio-economic and ecological dynamics of human-wildlife conflicts in TSNR and strategies to mitigate them.
    f. Interaction of blue sheep and livestock in the pristine alpine ecosystem, document changes in ecosystems, and monitor usage of habitat by wild ungulates in the absence of yaks and their symbiosis.
    g. Potential/feasibility for community based eco-tourism in the buffer and multiple-use zone of TSNR.

h. Establish an information resource facility within the proposed field research station at Loleythang.
i. Quantify ecosystem services provided by conservation landscapes, pristine temperate and alpine eco-systems, and the impact of climate change on such eco-systems and services.
j. Use regular data collection and official reports to assess the status of species presence, resource use and extent of illegal activities in the Reserve.

4. Conduct photographic monitoring to help identify land cover changes over time.

5. Establish research plots for ecological and grazing studies.

6. Research on Snow leopard, Red panda, Tibetan wolf and Wild dog with the dual objective to estimate population figures, and define remedial measures for mitigating human-wildlife conflicts.

7. Additionally, efforts will be made to define and demarcate areas for species of significance in all taxonomic groups. For instance, definition of areas occupied by the White Poppy – (which has a high tourism value), and other endemic flora will help design adequate management measures to be implemented.

8. Results from all such research and studies should lead to safeguarding the habitats of such species and thereby securing species conservation. For instance, rural timber allocation shall not be allowed from habitats occupied by the rufous-necked hornbills.

9. Research potential threats and opportunities in TSNR.

10. Improve local veterinary services required by farmers to maintain improved breeds.

11. Introduce improved grazing and herding practices such as rotational grazing and development of pastures through training and extension support from Department of Livestock.

12. For immediate purposes, multiple-use zones should be identified and demarcated on Reserve management maps. These multiple-use zones should be areas within 2 or 3 km of all settlements, timber and firewood collection sites. Within the Reserve boundary, the remaining areas could be defined as core zones by default.

13. Subsequently, core zone areas could be refined to include areas where key species are known to breed or are vital for their survival in terms of high availability of resources such as food and shelter sites.

14. With increasing availability of research results and enhanced understanding of landscapes, pristine temperate and alpine eco-systems and species present therein, boundaries of the core and multiple-use zones should be revised and delineated.

B. Anti-Poaching

Rationale

The main objective of setting aside any area as a protected area is to ensure that the species within persist in perpetuity. An understanding of landscapes, eco-systems and species along with associated threats from poachers and other biotic and a-biotic factors, is imperative to ensure species survival.

Goal: To ensure comprehensive protection provisions are in place and enforced.

Policy Objectives

1. To minimise and if possible mitigate poaching through regular, frequent and informant based patrolling or *ad hoc* anti-poaching activities.
2. To deter potential poachers by making communities aware that regular patrolling trips are undertaken by Reserve staff and heavy penalties will be levied as per existing regulations.
3. To initiate mass environmental education programmes to build community partnerships that increase appreciation of wildlife and biodiversity and cooperation with staff in conservation activities.

Implementation: Actions and Guidelines

1. Increase frequency and coverage of patrolling and make office reports mandatory and to be documented. At the same time, use the patrols to collect data on species evidence and habitat associations.

2. Carry out regular and *ad hoc* patrolling to curb poaching.

3. Map hot spot poaching areas. The information collected should be analyzed on an annual basis to determine trends and to define future anti-poaching strategies.

4. Carry out awareness and education programmes focussed on anti-poaching, FNCA, 1995 and FNCR, 2006 directed to the herders within the Reserve and communities close to the Reserve, and at the same time carry out law enforcement to stop poaching.

5. Regulate the opening of primary hemlock, fir and juniper forests for pasture expansion through regular patrols, and restrict practices such as fire letting and slash and girdling.

6. Establish intelligence networking with the other law enforcement agencies like RBP, RBA, BAFRA, DRC etc., and organise inter-agency coordination meetings.

7. Conduct training workshops on communication and intelligence sharing for all law enforcement agencies on an annual basis. For such workshops, WCD can provide support by bringing in resource persons from India, TRAFFIC, CITES etc.

8. Train a core group of 7-10 TSNR staff in advanced anti-poaching techniques including MIST/M-STRIPE. Institutions in India, Thailand, Malaysia or Indonesia may be explored to provide such training.

9. Conduct training on first aid, arms handling and field safety for TSNR staff once every two years. Military and health personnel services should be requested to impart such training.

Chapter 2: Zone Management

1. Balancing Conservation and Development Needs:

Rationale

One of the main objectives of conducting socio-economic surveys is to develop interventions necessary for economic development through alternative income generating opportunities like ICDPs, collection of NWFPs, firewood and eco-tourism without undermining conservation of biodiversity.

As such the following potential ICDP, collection of NWFPs, firewood and eco-tourism activities have been identified for various areas in TSNR based on the socio-economic survey report. Further discussion is required with the concerned *dzongkhag* and responsibilities need to be clear from the very onset. Once the program gets implemented, there should be continuous monitoring.

A. Integrated Conservation & Development Programs:

The expected outcomes/results from the activities and programs are not included and are therefore expected to be developed during ICDP planning using the approaches provided in "Guidelines for ICDPs in Protected Areas of Bhutan" at a later stage.

Goal: To promote sustainable utilization of natural resources.

In order to achieve the above goal it is important to ensure widespread stakeholder understanding, support and involvement.

There are potential areas for conflict within these objectives whereby development interventions that change the way natural resources are used, may lead to negative and/ or unplanned impacts on biodiversity. A conservation-based enterprise for instance could result in over-exploitation of an economic species (e.g. cane) for short-term gain. ICDPs should be designed to manage or avoid conflict situations before they arise. The long-term goal of ICDPs is to establish the Reserve's position/identity within local government and within the local community, to influence and facilitate the management of natural resources in relation to biodiversity objectives. The Reserve should negotiate agreements with local communities that will increase the park's ability to regulate the use of a resource without undermining people's livelihoods.

As Sangbay *geog* is situated at the buffer zone of the Reserve, ICDP activities can play a role in establishing a sustainable forest management system by which external demand from outside the Reserve can be more easily fulfilled. For example through community and private forestry activities, promoting the rational use of forest resources through promotion of firewood saving technology, where pressure on the wood stock is high. Local management of forest resources can be an important element of such strategies for rational use. These should follow a co-management approach, where the Reserve provides legal and institutional support and monitoring, while the communities take responsibility for day-to-day management. This requires the development of responsive and transparent community institutions such as Community-Based Natural Resource Management bodies.

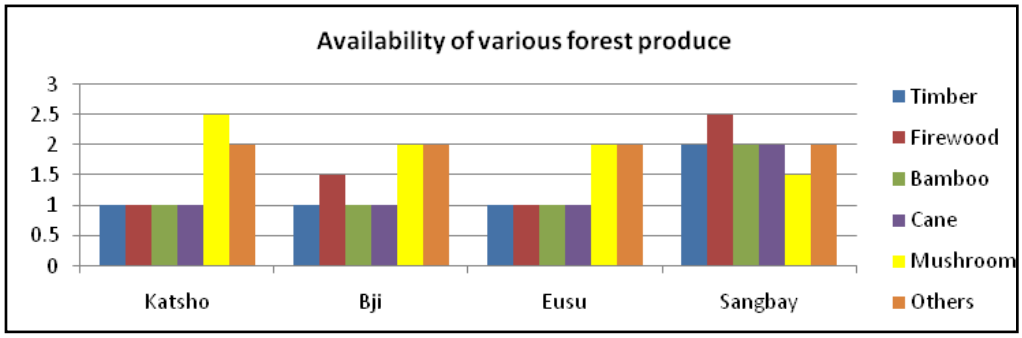


Figure 28: Availability of various forest products (1=scarce, 2=adequate, 3=abundant)

Presently the most common natural resource needs of the community are the collection of NWFPs and firewood which are described below:

B. Non Wood Forest Products (NWFPs):

In TSNR, the collection of forest produce includes both timber and non-timber forest products. Among the various forest products as shown in Figure 28, mushrooms and other products seem to be adequately available in almost all the *geog*s. In the grazing ground, mushrooms such as *sangay shamu* and *sisi shamu* are found in abundance, with the communities of Katsho, Bji and Eusu rated the highest. Individual herders collect

around 3-4 kgs which are sold at the Haa market at Nu.800-1000 per kg. *Sisi shamu* fetches more money than *sangay shamu.* Individually they collect around 2-3 kgs per household which are dried and sold to their Tibetan counterparts with 1 kg fetching around Nu.22, 000. If sold fresh, 100 grams fetch about Nu.800-1200. They are also found in abundance in the highlands. There is also one wild vegetable similar to wild potato categorized under "Others" which the Tibetans seek. It is sold at Nu.150 per kg and is plentiful. Other than mushrooms and wild vegetables, the rest of the resources are scarce in within their grazing land and in their villages.

Almost all of these resources are adequately found in Sangbay *geog* since there is no major road network and less developmental activities. Most of the resources are used for local consumption except for cane shoots which are sold although this is getting more difficult year by year wherein locals have to travel around two hours to one day. Each cane shoot is sold at Nu.20-30/piece and individually they collect around three head loads (1head load=30-40 pieces). The other concern is use of the bamboo for making crop guard houses which is also getting more difficult yearly. In making a guard house, each household collects about 2-3 loads of bamboo (1 load = 120-130 pieces).

Tima village has been a concern for *dzongkhag* administration, moreover since the move to resettle its residents within the Sangay *geog* failed on several occasions. It is the farthest and least developed village of Sangbay *geog,* with around 10 households depending upon bamboo for their entire house construction.This village is cut off from the main villages, and the surrounding area is very rich in biodiversity. On several occasions, the *dzongkhag* administration has tried to persuade the villagers to resettle to other areas in Sangbay *geog,* however the residents have resented this effort. TSNR along with the *dzongkhag* and *geog* administrations should work out the formalities to resettle these communities to other areas. From a biodiversity point of view, this village is defragmenting the habitat contiguity and using large amounts of natural resources from the Reserve.

In the case where resettlement is impossible, Community-Based Natural Resource Management Plans (CBNRMPs) for bamboo may be initiated for conservation-based enterprises since they provide an additional or alternative source of income from sustainable management of economic species and natural forest management.

CBNRMPs may also be initiated for mushroom and allied species which have huge international markets. Conservation-based enterprises can provide an economic incentive to adopt sustainable practices and also offset any perceived loss of income

from restrictions put on unsustainable practices (such as over grazing). There is also a potential to collaborate with local institutions that can take up resource management responsibilities. It is envisaged that these plans would consist of negotiated agreements between the local community, the Reserve authority and the *dzongkhag*. Local user groups would implement the plans with technical support from the Reserve staff and *dzongkhag* administration.

C. Firewood Use:

The daily firewood consumption as shown in Figure 29 indicates more firewood consumption in Sangbay *geog* and less in other *geogs* since they are located above the tree line. Moreover, firewood availability is scarce among the herds. The calculation is based on the formula of one head load of firewood = 35 kg = 0.048 m^3. According to forestry departmental allocation of firewood, each rural individual household is entitled to receive two truck loads which is equivalent to 16 m^3 in a year. As shown in Figure 30, the annual consumption of firewood per household is alarmingly high in Sangbay geog as compared to the departmental allocation. This is due to readily available firewood near their homes (about 15 minutes to one hour distance) and fewer forestry staff visiting the area. In the high land area, the average time spent getting a back load of firewood ranges from three hours to one day and the firewood availability is becoming scarcer each year. On average 17.5m^3 is being consumed by the whole *geog*.

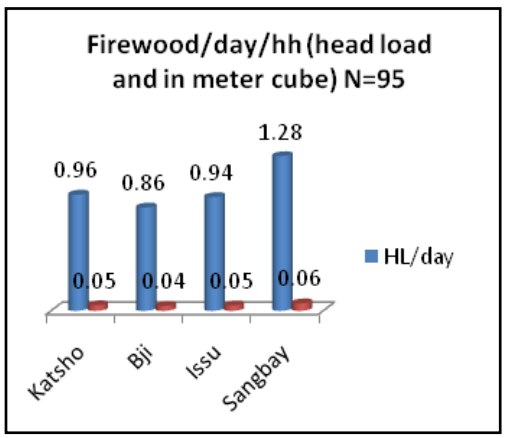


Figure 29: Firewood consumed/hh/day

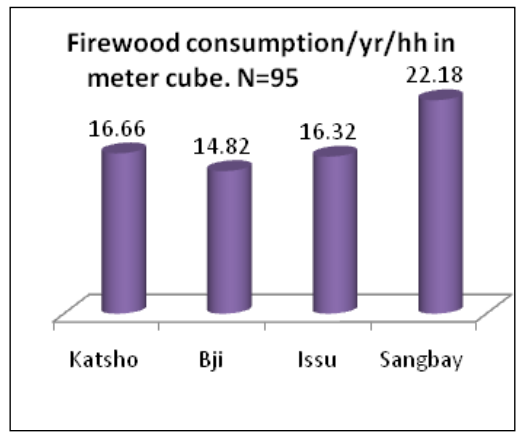


Figure 30: Firewood consumed/hh/yr

Implementation: Actions and Guidelines

2.1 Improved Natural Resource Management

The results of the Socio-Economic Survey analysis in TSNR suggest that traditional land-use practices have responded over time to national policy decisions. (for example, the ban imposed on *tsheri* cultivation; and the attempt to intensify livestock rearing to produce smaller productive herds). The consequences of these changes from a social,

economic and ecological point of view are unclear. Since the park and the *dzongkhag* have limited capacity to undertake such a process alone, there is great potential to working closely with local resource users and facilitate the intensification of natural resource use without compromising with conservation goals.

- **Improve backyard farming and animal husbandry in collaboration with *dzongkhag* officials.**
- The supply of inputs should be followed by providing training on feed management, prevention of diseases, and general management of livestock and horticulture. Markets for surplus products should be found and transportation facilitated through the provision of community owned power tillers where appropriate.
- **Intensify livestock management by supplying improved cattle breeds and pasture/rangeland management.** This should serve the dual goal of reducing free forest grazing as well as increasing availability of manure for vegetable gardens and biogas plants.
- In collaboration with the *dzongkhags*, supply fodder trees to intensify on-farm cattle management and offset fodder shortages.

Activity	Location
Agriculture intensification	
i. Reduce crop depredation	Throughout the Reserve
ii. Introduce crop compensation scheme	Throughout the Reserve
iii. Renovate irrigation channel	In paddy growing areas of Sangbay *geog*
iv. Promote horticultural crops	Throughout the Reserve
v. Promote farm yard manure	Throughout the Reserve
Livestock intensification	
i. Supply breeding yak bulls	In yak herding community (Grouping herders where possible. If not, supply to individual yak herds)
ii. Supply improved breeds of cattle	Yak herders (to intensify their production while in village) as well as Sangay *geog*
iii. Preserve *Nublang*-a native breed of Sangbay *geog*	Sangbay *geog*
iv. Develop improved pasture and fencing	Throughout the Reserve
v. Develop livestock compensation scheme	Throughout the Reserve
vi. Churning machine, proper packaging and marketing of yak produce	Yak herders
vii. Back yard farm (poultry)	Sangbay *geog*

Community-based Natural Resource Management Planning	
i. Conduct a feasibility study on harvest of NTFPs (mushrooms- *sangay and sisi shamu* and other edible wild vegetables) Understand the abundance and collection trend and protocols framed in order to sustainably harvest and minimize damage to pastureland, and also ensure that damage is not done to herder's livelihood	Yak herders area involving relevant stakeholders
ii. Sustainable harvest of NTFPs	Same as above
iii. Cane and Bamboo management	Sangbay *geog*
iv. Plant trees in degraded areas	Sangbay *geog*
v. Cane & Bamboo handicrafts	Sangbay *geog*

2.2 Strategic Planning of Development Services in the Geogs

The growth of local government infrastructure and service provision is placing greater demands on the park's natural resources particularly for supplying construction timber and firewood, especially in Sangbay *geog*. Education content targeted towards sustainable agriculture and sustainable natural resource use could support the park's efforts to achieve conservation objectives. Improved veterinary services could stimulate an increase in livestock pressure on resources unless these services are well integrated into ICDPs.

Activity	Location
i. Develop scholarship programs to enable greater attendance in schools	Throughout the Reserve (for the lowest income residents especially in Sangbay *geog*)
ii. Supply taurpaulin/CGI sheets	Tarpaulin can be supplied to herders camp and CGI to Sangbay *geog* (for those households with low sources of income and high impact on natural resources)
iii. Supply solar sets	Yak herders, *Lhakhangs* (namely Tebji *lhakhang* and others), and government establishments where grid electrification is impossible
iv. Provide clean drinking water supply	i.Scattered households in a village ii. Tebji *lhakhang,* Sanbay *geog*

v. Renovate and maintain sacred sites	Tebji *lhakhang* under Sangbay geog and other areas of religious/cultural and historical significance in TSNR
vi. Document the significance of religious sites	Religious/cultural/historical areas in TSNR
vii. Resettlement to avoid habitat integrity	Tima village in Sangbay *geog* can be suitably resettled through TSNR intervention – provision of building and CGI materials and other farming equipment

Monitoring ICDP Activities

Monitoring and evaluation are required to cross check whether the ICDP plans are reaching their desired goals. Generally ICDPs are planned within a strategic framework that includes clear, measurable objectives, and explains how the proposed development interventions for strengthening people's livelihoods will result in conservation of biodiversity. Monitoring can take place yearly and is best thought of as a continuous process; whereas evaluation can take place throughout and/or at the termination of the plan. The information collected from monitoring efforts should feed into the ICDP plan/ *geog* level database so it can be used to measure trends, assess the social and ecological impact of different interventions, and assist in recommending any necessary adaptations to the ICDP plans.

D. Eco-Tourism:

Bhutan's protected area system has significant potential for eco-tourism development. At the same time there is increasing consensus on the need to make protected areas in Bhutan self sustaining over the long run. Likewise TSNR, with its extensive natural areas has the potential to provide natural experiences. Development of services and products in the Reserve will help enhance the economic opportunities of the local communities living around the Reserve.

TSNR has many places of historical and cultural significance and is believed to be the home of one of Bhutan's guardian deities – *Ap Chundru,* with its citadel, the *Chundru Gong* located inside TSNR.

There are many beautiful lakes associated with various legends. One legend goes that *Terton* Sherab Mebar discovered a treasure - cymbal (*relmong)* from Nubtshonapata (lake inside TSNR) and can be still seen during Paro *tshechu.* There are also many places of scenic and breathtaking beauty. From *Tegola* (a pass between Sangbay and other Haa *geogs*) one can have a spectacular view of other magnificent mountain ranges like *Jhomolhari, Jwichudrakey, Tsherimgang and Gangkar Puensum.*

Sangbay *geog* is so called because there are many hidden treasures to be revealed at fortunate times by enlightened beings in the future. *Tegola* is known as '*the door of*

hidden treasure land' which is the door towards Sangbay and Sangbay *geog* is known to be the *hidden treasure land'*. At *Tegola* there is evidence of *Yeti* appearances. There are many lhakhangs associated with the history of the Druk-yul. One such *lhakhang* can be found above the Sangbay *geog* head quarters in memory of HH Zhabdrung Rinpoche – the founding father of Bhutan. There are also remnants of a *dzong* which can be seen in Sangbay.

In addition, ancient trading routes with Tibet and India trespass through TSNR. It is also home to the native breed of cattle- *Nublang.* Such places of historical and cultural significance have great potential to draw tourists in the future and attract enthusiastic pilgrims from within and outside the country.

Policy Objectives

1. Provide high quality and innovative nature and community based tourism packages within the Reserve's buffer and multiple use zones to diversify the services offered by Bhutan's tourism industry.

2. Contribute to the preservation and maintenance of sites of special significance both natural as well cultural.

3. Contribute to enhancement of economic opportunities.

Implementation: Actions and Guidelines

1. Conduct feasibility studies on the establishment of treks, eco-trails and campsites in the buffer and multiple use zones.

2. Develop all the above treks, eco-trails and camping sites in collaboration with relevant stakeholders or partners.

3. All eco-tourism activities will be guided by the Eco-tourism Framework developed by the Department of Forests & Park Services.

4. Any infrastructure to be built within the Reserve should be Smart Green Infrastructure (SGI) and kept as low impact as possible and built with locally available materials as much as possible. Furthermore, upcoming infrastructure should consider existing local design and landscape characteristics to preserve local uniqueness.

5. Tourist Information Centres will be established at appropriate locations.

6. The Reserve Visitor Center or headquarers at Bji in addition to providing information on the Reserve will also issue permits for various recreation/tourist facilities within the buffer zone and multiple-use zones of the Reserve.

7. The management of the Reserve will be fully involved in facilitating and monitoring of the ecotourism activities and fees will be prescribed as necessary.

Strategic Planning of Alternative Income Generating Activities

Given the diverse culture and traditions of the communities within TSNR, coupled with the area's potential to support additional income generating activities, TSNR Management with the help of other developmental partners should carry out feasibility studies of alternative income generation from the sale of cane and bamboo crafts, handicrafts, and other conservation – based enterprises (which could be related to CBNRMPs).

Activity	Location
i. Conduct feasibility study on eco-tourism activities	Throughout the Reserve
ii. Identify trekking routes linking to different sites, avoiding those areas along the border	Throughout the Reserve
iii. Promote tradition and culture	Throughout the Reserve
iv. Promote cane and bamboo handi-crafts	Sangbay *geog*
v. Develop new trails and improve old mule trails	Highly used tracks and to encourage Yak herding communities to stay inside TSNR
vi. Construct new bridges and renovate old bridges	Highly used tracks and to encourage Yak herding communities to stay inside TSNR

There is already some demand from tour operators to open up the area to eco-tourism. Also TSNR residents foresee benefitting from some eco-tourism relate income if developed and managed properly. TSNR management, with the help of other relevant agencies, could carry out feasibility studies on eco-tourism activities, handicrafts, etc. and promote the same after obtaining approval from the RGoB.

E. Environmental Awareness and Education

It is expected that any changes in the attitudes and behaviours necessary to establish sustainable land-use management practices within the TSNR, will come about largely during the participatory process while carrying out the above strategies.
Environmental awareness is one of the important components for making people aware about conservation activities, nature conservation rules, appreciating nature, etc. In support of this process, it is felt that environmental education activities directed at communities and schools in the Reserve would also be valuable. Nature clubs are being established and these will provide a link between the schools, communities and the Reserve.

Implementation: Actions and Guidelines

Activity	Location
i. Raise awareness in local communities	Throughout the Reserve
ii. Establish nature clubs within schools	Schools within the Reserve
iii. Organise study tours within the country and in the region for Reserve staff, partners and some community leaders to learn best practices and models from different places	Within the country and in the region

1. Organise two study tours for farmers, community leaders, Reserve staff and herders to other protected areas in and around Bhutan. Protected Areas in Sikkim and Darjeeling, India adjoining TSNR in the west are suitable venues outside Bhutan, given similar ecosystems and conservation issues.

2. Conduct conservation awareness campaigns for herders, and local communities each year focusing on different themes.

3. Train a group of 15 TSNR and *geog* RNR extension staff under TSNR's jurisdiction in techniques for social mobilisation and community action on conservation and related development issues. The Center for People and Forests may be an appropriate service provider for this training.

4. Organise a minimum of one meeting per year to discuss common concerns, and to refine and tabulate common strategies for the development of Sangbay *geog* with the Haa *dzongkhag* authorities and Tendu, Baira *geog* with Samtse *dzongkhag* authorities.

5. Once the national cadastral survey (recording property boundaries, buildings, etc.) carried out by the Land Commission is complete, obtain relevant spatial data sets for the Reserve area to further facilitate the zonation process.

Chapter 3: Human-Wildlife Conflict Management

Rationale

An estimated 1284 people live in 254 households in four *geogs* within and on the fringes of the Reserve. These communities are treated as part of the conservation landscape. They are predominantly agrarian and depend on the forest and its resources for energy and food. Non-wood forest products such as cane, bamboo and ferns help to supplement incomes. Poverty levels are high, and even basic needs of food and water are not met adequately in a few villages in Sangbay *geog*.

Furthermore, given that herders live within the Reserve together alongside wildlife, and some of these settlements are in close proximity to forests, two related problems have arisen:

- Continuing loss of crops and livestock to wild animals; and
- Loss of wild animals to poachers, who kill and trap wild animals either in retaliation to the above mentioned losses, or to supplement incomes through the sale of poached animal products.

Goal: To avoid or minimise adverse effects of human interactions on populations and individual species.

Policy Objectives

1. To avoid, mitigate or minimize conservation threats posed by human-wildlife conflicts to save species from retaliatory killings, provide immediate economic relief and also improve food security through appropriate measures and strategies.
2. To consolidate conservation of pristine landscapes, temperate and alpine eco-systems within the core and multiple use zones of the Reserve through active involvement of local people in conservation and provision of alternative livelihood enhancement activities.
3. To engage, participate and gain a stake in buffer zone land-use decisions and management through collaboration with relevant stakeholders and provide technical and financial support for relevant development programmes.
4. To alleviate poverty and raise income levels by providing alternative income generating avenues.

This would not only lead to the reduction or removal of negative attitudes toward conservation, but also ensure resilient farming communities act as stewards of natural resources in a much more sustainable manner.

Implementation: Actions and Guidelines

1. Initiate crop and livestock loss mitigation strategies in pilot villages. Liaise and be guided by Bhutan's National Human-Wildlife Conflicts Management Strategy.
2. Initiate and pilot strategies to mitigate livestock depredation.
3. Pilot community based livestock and crop insurance or compensation schemes in the worst affected areas and make these clear to communities at a grassroots level. Form community groups and define by-laws and governance mechanisms to verify claims.
4. Source funding to provide seed money for such insurance schemes through the HWC Endowment Fund.

5. Document the effectiveness, experiences and lessons learned from all of the above initiatives.
6. Upscale successful initiatives. Engage donors and actively source other funding.
7. Give special focus to migratory yak herders within the Reserve. Efforts will be pursued to reduce fuel-wood consumption and raise food security of these herders through promotion of alternative income generation activities. These may include provision of solar lighting facilities, churners, cheese processing equipment, sustainable harvesting of NWFPs etc.
8. Establish a '*Wildlife Rescue and Rehabilitation Unit*' within the Reserve's head office. Funds for training, manpower and procuring essential wildlife drugs should be budgeted every year. This Unit should cater not only to emergencies within the Reserve but will also serve as a sub-regional rescue centre for Haa and Paro. Coordination meetings with divisional forest offices and local civil authorities should be held to specify areas of intervention and modalities of operation in case of emergencies.
9. Encourage stall feeding to reduce livestock depredation through improved breeds.
10. Improve herding practices to reduce livestock depredation.

Chapter 4: Institutional Strengthening (Infrastructure Development & Human Resource Development) and Service Delivery

Rationale

Institutions need to be vibrant, self-sustaining and responsive to emerging challenges of high importance. Institutions need to be strengthened to ensure:

1. Effective and prompt service delivery;
2. Resilient institutions in terms of institutional memory and adaptability to change; and
3. Continuous human resources development to ensure the above.

One of the key lessons learned from the implementation of protected areas in and outside Bhutan has been that human resources are critical to ensure successful implementation of any programmes. Additionally, the Reserve as an institution should be structured in a way which facilitates the delivery of services and effective utilization of staff capacity.

Policy Objectives

1. To provide basic infrastructure and communication facilities for strengthening effective management of TSNR and for implementation of the planned management interventions and effective service delivery.

2. To ensure sustained institutional development to provide high conservation impacts and deliver effective public services.

3. To ensure effective information management to facilitate adaptive management and enhance institutional memory.

4. To ensure sustained human resources development.

Implementation: Actions and Guidelines

1. Construct Reserve head-quarters at Bji *geog* and Reserve field range office at an appropriate *geog* for the plan period.

2. Construct a field research station in Loleythang or Nub-Tshonapata area.

3. Equip TSNR staff with all necessary office equipment (computers, fax, telephone, photocopier, internet etc.), surveillance equipment (binoculars, arms), survey equipment (GPS, compass, altimeter, maps etc.) and extension kits (tents, sleeping bags, ruck sacks etc.).

4. Equip TSNR with radio-communication equipment (wireless radio sets, repeaters and walkie-talkie) and transportation (four wheel pick-up truck, motor bikes, etc.).

5. Equip TSNR with audio-visual equipment (LCD projector, digital camera) for research, education and awareness building.

6. Give priority to information management in order to contribute towards enhancing institutional memory and thereby promoting adaptive and lesson based management.

7. Develop a comprehensive GIS based spatial information system to monitor land allotment and forest cover loss.

8. Propose a comprehensive human resources development plan depending on the expertise required for TSNR to carry out the research work needed to meet the main objectives of TSNR. This needs to be endorsed in collaboration with the Wildlife Conservation Division, Department of Forests & Park Services, and Human Resource Development Division, Ministry of Agriculture and Forests to ensure availability of highly trained and motivated staff.

9. Undertake proactive consultative donor engagements to ensure planned human resources development programmes are adequately financed. Additionally, relevant and deserving staff must be encouraged to pursue scholarships for both short and longer term studies.

10. Provide field staff with adequate facilities in terms of housing and capacity building opportunities to ensure they remain motivated and perform optimally.

11. Make effort to keep all infrastructure as Smart Green Infrastructure. Provision of

solar water heating facilities should be explored for both staff and communities within or at the fringes of TSNR.

12. While over the next five years, the proposed number of three Guard Posts seems adequate, plan staff mobilization and deployment to effectively cater to public requirements and conduct patrolling activities.

6. Institutional Linkages, Monitoring and Evaluation Plan

Rationale

Institutional Linkages among Partner Agencies:

Since conservation is inherently a multi-sectoral task, there is a wide range of potential stakeholders for partnership and collaboration. The success of conservation initiatives hinges upon ensuring effective linkages and proactive engagement of all concerned stakeholders.

Some of the main stakeholders as envisaged are mentioned below:

1. Herding and farming communities within and at the fringes of the Reserve.
2. Haa Range and Tendu Beat office under Paro and Samtse Territorial Forest Division (for anti-poaching, resource use and general forestry administrative matters);
3. Haa *dzongkhag* Administration (for anti-poaching, cross-border security, human-wildlife conflicts management, and sustainable grazing, agriculture intensification and livestock management);
4. *Geog* Administrations and *Geog* RNR Centers of Bji, Katsho, Issu, Sama, Baira and Sangbay (for human-wildlife conflicts management, sustainable grazing, agriculture intensification and livestock management, and conservation education);
5. Schools in Haa *dzongkhag* and in Baira and Tendu *geogs* (conservation awareness education);
6. Royal Bhutan Police, Haa (for anti-poaching and cross-border security);
7. Royal Bhutan Army, Damthang, Haa (for anti-poaching and cross-border security);
8. Department of Revenue and Customs (for anti-poaching);
9. Bhutan Agriculture & Food Regulatory Authority (for anti-poaching);
10. Department of Energy (for solar panels and heaters);
11. Department of Culture (for cultural and sacred sites);
12. Ugyen Wangchuck Institute for Conservation and Environment (for research and training);
13. Royal Society for Protection of Nature (for research and conservation education);
14. WWF Bhutan office (for funding the conservation activities);

15. BTFEC (for funding the conservation activities);
16. Bhutan Foundation; and
17. Other donors, if any.

Monitoring Agencies

Additionally, timely monitoring and evaluation of programmes is essential to ensure proper delivery of outputs. The Department of Forests and Park Services (DoFPS) in general and WCD in particular will be the parent organizations of the TSNR management authority and therefore the overall monitoring and supervising agency for monitoring the implementation of the management plan activities through periodic field visits and a regular system of technical progress reports. Other relevant divisions of the DoFPS, namely the Nature Recreation and Ecotourism Division and Social Forestry Division, will also provide monitoring and guidance where activities relate to their areas of work such as sustainable nature tourism and NTFPs.

Policy Objectives

1. Ensure coordination and build partnerships amongst stakeholders to ensure effective implementation of Reserve activities and thereby secure and consolidate conservation landscapes.

2. Ensure exchange of information and experiences amongst stakeholders and partner organizations to help make implementation of conservation strategies more effective.

3. Ensure monitoring and evaluation to effectively address emerging challenges and changing issues.

Implementation: Actions and Guidelines

1. Organise and hold bi-annual coordination meetings with *Dzongkhag* and *Geog* officials, Territorial Forest Divisions, RNR officials, RBA, RBP, BAFRA and other stakeholders. Such meetings should table common issues and provide strategies for moving forward.

2. Report regular and timely information to WCD, FIMS and other relevant divisions of DoFPS. An annual report should be produced for the Reserve.

3. Create and launch a Reserve website.

4. Carry out field visits by the Reserve Manager at least once every 2 to 3 months, if possible. Timely monitoring should be carried out by the Reserve Managers and Range Officers at their own level.

7. Institutional & Administrative Arrangements

An independent TSNR management authority needs to be established to implement the management plan. Based on the standard organizational structure for a protected area in Bhutan, the TSNR management authority will be headed by a Chief Forest Officer and made up of the following sections:

1. Species Conservation & Monitoring Section
2. Resource Management Section
3. Eco-tourism & ICDP Section
4. Human-Wildlife Conflict Management Section

The Reserve is to be organized into these four sections under the Reserve Manager/ Chief Forest Officer (Refer Figure 31). The two field range offices at Bji and Sangbay *geogs* will provide administrative services in support of the head office. At the moment, only four technical staff manage the Reserve.

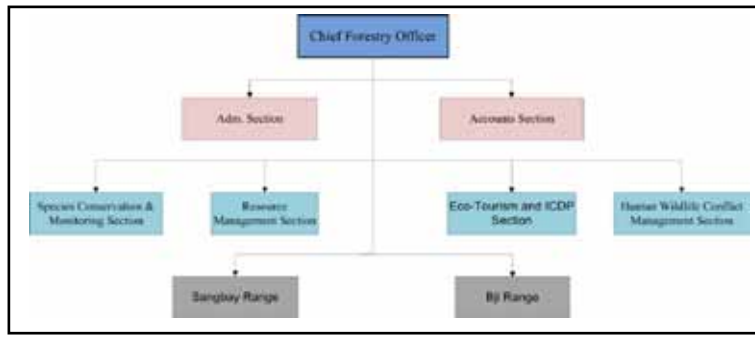


Figure 31: Administrative setup of TSNR.

A Finance and Administration Section will also be created for financial and administrative management of the TSNR. Two field warden posts will be created at Sangbay and Tendu *geogs* to extend the coverage of conservation activities and delivery of associated public services. The Reserve boundary intersects with five *geogs* in Haa and two *geogs* in Samtse and administers jurisdiction in five (Bji, Katsho, Issu, Sama & Sangbay) out of the six *geogs* in Haa and Baira *geog* in Samtse. To ensure effective service delivery, it is proposed to have the head office and a field range office at Bji *geog*, and one field range office at Sangbay *geog* in Haa *dzongkhag*.

All field range offices must be equipped with computers, faxes, printers and photocopiers. Digital cameras need to be supplied to the two Range Offices and the guard posts. To facilitate communication, radio sets need to be issued for use during patrolling and other times of emergencies. The Reserve head office needs a pick-up truck. In addition to this, motor bikes need to be allocated to field offices and sections. At the moment, the Reserve has none as of now.

8. Financial Plan

Fund requirements, including *Administrative Costs* (Table 7), projected under RGoB funding should be included in the yearly budget requisition to the RGoB. Recurrent costs have been calculated at current estimates as provided by the Royal Government of Bhutanwith 10% inflation consideration.

Requirements for all other activities are projected under the assumption that funding will be secured from relevant donor agencies. This entails active engagement of donors.

In the event that full financing for the plan is not secured, proactive and sustained effort should be put into engaging potential donors through proper channels to ensure funding for proposed activities on an annual basis for prioritized packages. Projects should be developed for potential donors based on common thematic areas addressing key issues.

Tables 7, 8 and 9 outline all planned activities and budget estimates for the next five years.

Total budget requirement of Nu. 123.7 million is estimated for five years, including administrative costs like staff salaries, service benefits and operational overhead which will be met entirely from government sources (Refer to Table 7 Below)

Table 7: Total Budget Requirement for 5 years in Nu. Millions (July, 2012 to June, 2017)

Programme Areas	Donor (Nu in Millions)	RGoB (Nu.in Millions)	Total (Nu.in Millions)
1. Research & Monitoring	8.0	3.0	**11.0**
2. Infrastructure	23.0	2.0	**25.0**
3. Species Protection	1.5	1.0	**2.5**
4. Information Management	1.0	0.5	**1.5**
5. Communication, Mobility and Equipment	6.0	1.0	**7.0**
6. Buffer Zone Management	9.0	3.0	**12.0**
7. HRD & Management	22.5	0.0	**22.5**
8. HWCM	1.5	2.0	**3.5**

9. Administrative Costs	0.0	27.6	**27.6**
10. Institutional Linkages, M&E	1.5	1.5	**3.0**
11. Technical Expertise	5.6	2.0	**7.6**
Total Budget (Nu. in Millions)	**79.6**	**43.6**	**123.7**

Table 8: Details of budget expenditure (Nu. In millions)

Costs for Activity	Y1	Y2	Y3	Y4	Y5	TOTAL (Nu. in millions)
1. Administration Costs	4.5	5.0	6.0	6.1	6.1	**27.6**
2. Infrastructure	0	4.0	8.0	12.0	1.0	**25.0**
3. Mobility, Communication & Equipment	2.0	3.0	2.0	0	0	**7.0**
4. Research & Monitoring	1.0	2.0	3.0	3.0	2.0	**11.0**
5. Species Protection	0.5	0.5	0.5	0.5	0.5	**2.5**
6. Human Resource Development & Management	3.0	5.0	7.0	5.0	2.5	**22.5**
7. Information Management	0	1.0	0.2	0.2	0.1	**1.5**
8. Buffer Zone Management	2.0	3.0	3.0	2.0	2.0	**12.0**
9. HWCM	0.5	0.1	1.0	1.0	0	**3.5**
10. Institutional Linkages, M & E	0.6	0.6	0.6	0.6	0.6	**3.0**
11. Technical Expertise	1.9	2.04	2.2	0	1.6	**7.6**
TOTAL						**123.3**

Table 9: Details of Administration Costs (Nu. in Millions)

Particulars	Y1	Y2	Y3	Y4	Y5	Total
1. Pay & Allowances	1.6	1.7	1.9	2.1	2.3	9.6
2. Travel Allowances	1.8	2.2	2.4	3.03	3.13	13.0
3. Utilities	0.1	0.1	0.11	0.12	0.14	0.55
4. Rental of Property	0.1	0.1	0.11	0.11	0.00	0.43
5. Supplies & Materials	0.2	0.4	0.2	0.3	0.3	1.1
6. Maintenance of Property	0.52	0.54	0.6	0.6	0.6	2.8
7. Operational Expenses	0.12	0.13	0.2	0.2	0.2	0.7
Total	**4.1**	**5.2**	**5.5**	**6.4**	**6.7**	**27.6**

9. Implementation Plan

The list of activities should be treated as a guide and not as comprehensive. With the emergence of new issues and threats, activities will have to be realigned to address/ mitigate such threats. An *Annual Operational Work Plan* should be prepared to help achieve this dynamism. Details provided in Tables 7, 8 and 9 should be viewed as a guide to help with prioritization. A general set of success indicators are provided in Annexure 1.

Table 10: (X=Year of Implementation of Activities)

Activity	Y1	Y2	Y3	Y4	Y5	TOTAL (Nu. in millions)
1. Administration Costs	X	X	X	X	X	**27.6**
2. Infrastructure	X	X	X			**25.0**
3. Mobility, Communication & Equipment	X					**7.0**
4. Research & Monitoring	X	X	X	X	X	**11.0**
5. Species Protection	X	X	X	X	X	**2.5**
6. Human Resource Development & Management	X	X	X	X	X	**22.5**
7. Information Management		X	X	X	X	**1.5**
8. Buffer Zone Management	X	X	X	X	X	**12.0**
9. HWCM	X	X	X	X		**3.5**
10. Institutional Linkages, M & E	X	X	X	X	X	**3.0**
11. Technical Expertise	X	X	X		X	**7.6**
TOTAL						**123.3**

Annexure 1: A Set of General Purpose Success Indicators

- TSNR Management Authority in place with all the required infrastructure and equipment.

- The population estimates, ecology and associated threats of the following key species generated, documented, identified and better understood.
  i. Snow leopard
  ii. Red panda
  iii. Rufous-necked hornbill
  iv. Common leopard
  v. Wild dog
  vi. White poppy

- Monitoring protocols developed and implemented for five key species:
  i. Snow leopard
  ii. Red panda
  iii. Rufous-necked hornbill
  iv. White Poppy
  v. Pheasant

- Research undertaken and completed on the impact of climate change on invasive species inside TSNR.

- Research undertaken and completed on the impact of climate change on the pristine temperate eco-system.

- Research undertaken and completed on the impact of climate change on the pristine alpine eco-system.

- Research undertaken and completed on the interaction of snow leopard and blue sheep and their habitat associations.

- Research undertaken and completed on the interaction of blue sheep and yaks.

- Mapping and delineation completed of the habitats of White poppy, Viola spp and other endemic plant species within TSNR.
- Greater understanding of the threats to the key species and their habitats and investigation of possible mitigation measures.

- Hot-spot poaching areas in TSNR identified and mapped for all of TSNR

- Research conducted is used to aid and assist in the implementation of informed and effective management measures.

- Practical zoning for the park completed, adopted and endorsed by all stakeholders.

- Firewood use minimized through the adoption of alternative energy sources.

- Timely monitoring of activities translated to reports which aids in making informed conservation policy decisions

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