

Phibsoo Wildlife Sanctuary

Conservation Management Plan, 2012- 2017

“A natural area that showcases Bhutan’s outstanding sub-tropical Himalayan biodiversity and positive interactions between people and their surrounding natural environment, bringing in enhanced and continued conservation benefits at the local, national, regional and global levels”

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Phibsoo Wildlife Sanctuary Conservation Management Plan 2012-2017

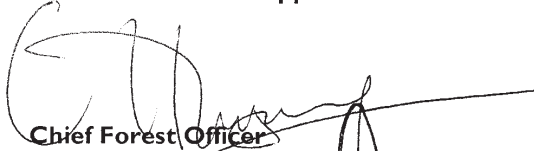
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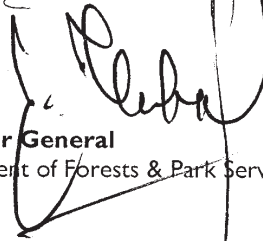


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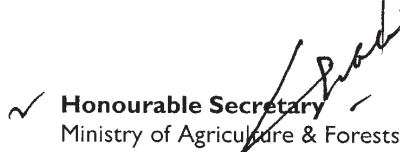
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Executive Summary

Introduction

Phibsoo Wildlife Sanctuary, with an area of 269 km², is the smallest among the existing ten protected areas in the country. It was first declared as Phibsoo Reserved Forest in 1974 and, later in 1993, upgraded to a wildlife sanctuary.

Not only does Phibsoo Wildlife Sanctuary protect the southernmost variant of the country's sub-tropical Himalayan forest ecosystem but is also a critical source of several seasonal and perennial water bodies which contribute to the fertility of the Assam Duars. The sanctuary happens to be the easternmost limit of spotted deer (*Axis axis*), common pea fowl (*Pavo cristatus*) and sal (*Shorea robusta*) bearing forests. At the same time, it is the westernmost limit of the globally threatened golden langur (*Trachypithecus geei*) and the rare and valuable agar tree (*Aquillaria malaccensis*). It also provides refuge to a number of charismatic and globally threatened species such as the Asian elephant (*Elephas maximus*), Bengal tiger (*Panthera tigris tigris*), and rufous-necked hornbill (*Aceros nipalensis*).

Three broad categories of vegetation can be identified in the sanctuary, namely: Sub-tropical Semi-evergreen Forest; Sub-tropical Moist Deciduous Forest; and Sub-tropical Moist Evergreen Forests. Preliminary surveys have recorded 637 species of flowering plants, 20 species of mammals, and 131 species in the sanctuary. Comprehensive surveys are expected to reveal much higher number of species.

The sanctuary is home to 1,254 people. Another 1,357 people live in its peripheries. These people primarily subsist on crop agriculture and livestock rearing. The major local crops include paddy, maize, millet, potato, mandarin, areca nut, chilli, and mustard. Cattle, goat and poultry are the main livestock reared by the local communities. Forest products also play a key role in the local livelihood system. A total of 144 forest plants were listed for their various ethno-botanical values during preliminary surveys in Senge and Katarey villages.

Key Conservation Issues and Challenges

The major conservation issues in the sanctuary are human-wildlife conflicts, poaching and free-range grazing in forest habitats. In 2008, the farmers of Senge and Nichula gewogs lost 37.74 metric-tons and 24.75 metric-tons of cereal crops respectively to wildlife. In monetary terms, this loss translates to roughly Nu. 1.7million. Wildlife incursions have

compelled many farmers to leave their agricultural lands, especially those close to wildlife habitats, fallow. In addition to direct loss of crops, farmers have to bear many indirect costs in the form of loss of time, added cost of production, expenditure on items such as torches, batteries and kerosene, and construction of elevated guard shelters locally known as machans. Livestock depredation by wildlife also occurs albeit on a comparatively limited scale than crop depredation. Reportedly, attacks on cattle by predator species are more frequent during the time when cattle are let out in the forests for free-range grazing.

Phibsoo Wildlife Sanctuary harbours a number of species that are highly valued for their parts and products. A porous international border, insurgency in the neighbouring Indian state of Assam, proximity to regional wildlife trafficking routes, and the presence of a lucrative market for wildlife parts and products in the region make the sanctuary hugely vulnerable to poaching.

A common practice in the local livestock management system is free-range grazing. Cattle herds – usually in large numbers – are left out in the forests for free-range grazing. Such practice may lead to overgrazing, causing loss of vegetation, reduction of land’s biological productivity, and soil erosion. Furthermore, it may also bring about increased competition for forage between domestic cattle and wild ungulates. Very important, but seldom discussed, is also the issue of potential risks of spread of animal disease as a result of the interface between domestic and wild animals provided by overlapping grazing grounds.

Other issues that confront Phibsoo Wildlife Sanctuary include the dearth of research and information to support conservation interventions, limited conservation management infrastructure, and high security risks due to insurgency in the bordering Indian territory. Furthermore, many local households resettled recently from various parts of the country. They have yet to get accustomed to the new environment in which they are to make their livelihood. In such circumstances, there is a lack of community preparedness for participation in conservation and related development activities.

Management Framework and Interventions

This management plan is the first for Phibsoo Wildlife Sanctuary. It has been developed with the vision of the sanctuary as:

“a natural area that showcases Bhutan’s outstanding sub-tropical Himalayan biodiversity and positive interactions between people and their surrounding natural environment, bringing in enhanced and continued conservation benefits at the local, national, regional and global levels.”

The main objectives of the PWS management plan are to:

- Reduce conservation threats posed by human-wildlife conflicts, poaching, and free-range grazing;
- Strengthen the infrastructure for effective management of PWS and implementation of planned management interventions; and
- Enhance professional and public knowledge for local biodiversity conservation and related community development.

The implementation of the management plan will be guided by the principles of: (i) Participation and Partnership; (ii) Adaptive Management and Learning; (iii) Integrating Conservation and Development; and (iv) Recognizing and Reconciling Conflicting Interests.

The activities are clustered into seven components, corresponding to the three main objectives of the management plan as shown below:

Objective	Component
1. Reduce conservation threats posed by human-wildlife conflicts, poaching, and free-range grazing	1.1 Human-Wildlife Conflicts Management
	1.2 Anti-Poaching
	1.3 Sustainable Grazing and Livestock Management
2. Strengthen the infrastructure for effective management of PWS and implementation of planned management interventions	1.4 Conservation Infrastructure Development
	1.5 Equipments
3. Enhance professional and public knowledge for local biodiversity conservation and related community development	1.6 Research and Information Development
	1.7 Conservation Education and Awareness-Building

Activities for human-wildlife conflicts management include: construction of solar electric fences; installation of sound-based repellent and alarm devices; provision of powerful searchlights and other mechanical devices to the local communities on a group basis; enrichment of salt licks and vegetation corridors used by elephants; introduction of community-based crop and livestock insurance schemes; introduction of alternate

cropping system; and promotion of alternate livelihoods.

Anti-poaching activities include: increase in the frequency of coverage of field patrolling; staff training in advanced anti-poaching techniques, first-aid, arms handling and field safety; training workshop on communication and intelligence sharing between various law enforcement agencies; inter-agency coordination meetings; field-level exchange/ coordination events between sanctuary staff and their Indian counterparts; advocacy for infusion of cross-border poaching as a key issue of deliberation in the High Level Border Coordination Meetings; and development of procedural guidelines for dealing with poaching offences by non-nationals.

Activities pertaining to sustainable grazing and livestock management include: support/ incentives for swapping of local cattle breed with improved cattle breed; improvement of local veterinary services required by farmers for maintaining productive cattle; support/ incentives to local communities for procurement of power tillers; improved grazing practices; homestead fodder tree plantations; and designation of community grazing areas based on sustainable grazing management plans.

Conservation infrastructure development will comprise: construction of field outposts at Longashir, Nichula, Pingkhua, and Dhaneshri; construction of a field conservation research station at Phibsoo; renovation of office buildings and staff quarters at Phibsoo; and improvement of the access road to Phibsoo. Also equipments will be procured for camping, surveillance, navigation, protection, radio communication, mobility, and conservation education.

Research and information development activities include: surveys of mammals, birds, vegetation, herpeto-fauna, fish, and butterflies; field studies on the socio-economic and ecological dynamics of human-wildlife conflicts; ecological studies on flagship/ keystone species such as Asian elephant and spotted deer; habitat management trials such as in alluvial grasslands and sal-bearing forests; study on the potential for community-based nature tourism; and establishment of an information research facility.

Conservation education and awareness-building will be pursued through: development and dissemination of communication materials such as brochures, posters and documentary; establishment of eco-clubs in schools; farmers' study tour to other protected areas; conservation awareness campaigns each year focusing on a special local conservation theme; and staff training for social mobilization and community action on conservation-related issues.

Implementation and Financial Outlay

An independent PWS management authority will be established for the implementation of the management plan. Based on the standard organizational structure for a protected area in Bhutan, the PWS management authority will be headed by a Chief Forest Officer and made up of the following sections: (i) Protection of Wildlife and Resource Utilization Section; (ii) Research and Monitoring Section; (iii) Integrated Conservation and Development Section; and (iv) Environmental Education Section

A Finance and Administration Section will also be created for financial and administrative management of the PWS. Four field outposts will be created at Longashir, Nichula, Pingkhua and Dhaneshri to extend the coverage of conservation activities and delivery of associated public services.

A wide range of potential agencies exist for partnership and collaboration in the implementation of the management plan. These include: Sarpang Forest Division; Sarpang Dzongkhag Administration; Gewog Administrations of Senge and Nichula; Gewog RNR Centres of Senge and Nichula; Royal Bhutan Police; Department of Revenue and Customs; Ugyen Wangchuck Institute for Conservation and Environment; and Royal Society for Protection of Nature.

The Department of Forests and Park Services will be the parent organization of the PWS management authority and therefore the overall monitoring and supervising agency. Specifically within the Department, the Wildlife Conservation Division will monitor the implementation of the management plan through periodic field visits and the regular system of progress reports.

The implementation of the PWS management plan will cost an estimated Nu. 39.556 million, not including general administrative costs in the form of staff salaries, service benefits and operational overheads. The component-wise estimated budget is: Nu. 4.175 million for human-wildlife conflicts management; Nu. 6.819 million for anti-poaching; Nu. 1.077 million for sustainable grazing and livestock management; Nu. 16.655 million for conservation infrastructure development; Nu. 3.43 million for equipments; Nu. 3.1 million for research and information development; and Nu. 4.3 million for conservation education and awareness-building.



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



Foreword

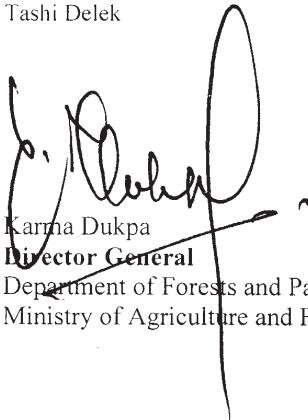
Phibsoo Wildlife Sanctuary, though one of the smallest protected area within the protected area system of Bhutan. However, not only does the sanctuary protect the southernmost variant of sub-tropical Himalayan forest ecosystem but is also a critical source of several seasonal and perennial water bodies which contribute to the fertility of the Assam Duars.

At the same time, it also happens to be the easternmost limit of spotted deer (*Axis axis*) which is found only in this sanctuary and the westernmost limit of the globally threatened Golden langur (*Trachypithecus geei*). It harbours the only natural sal (*Shorea robusta*) forests in the country and has the highest sighting of wildlife per distance travelled in the entire country. Many key endangered species such as the Asian elephant (*Elaphas maximus*), Bengal tiger (*Panthera tigris tigris*), Agar tree (*Aquillaria malaccensis*), Rufous-necked hornbill (*Aceros nipalensis*) and Golden langur are found in the sanctuary. 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 four key areas: 1) ensure species persistence; 2) build resilient communities around the sanctuary 3) ensure sustainable use of resources; 4) and 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.

It is hoped that the Conservation Management Plan will contribute significantly towards balancing conservation landscapes and development needs around Phibsoo Wildlife Sanctuary.

Tashi Delek



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Director General
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Acronyms

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DoFPS	Department of Forests and Park Services
FNCA	Forests and Nature Conservation Act of Bhutan, 1995
GNH	Gross National Happiness
IUCN	World Conservation Union (formerly known as International Union for Conservation of Nature and Natural Resources)
MoAF	Ministry of Agriculture and Forests
MT	Metric-ton
NTFP	Non-timber Forest Products
PWS	Phibsoo Wildlife Sanctuary
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources

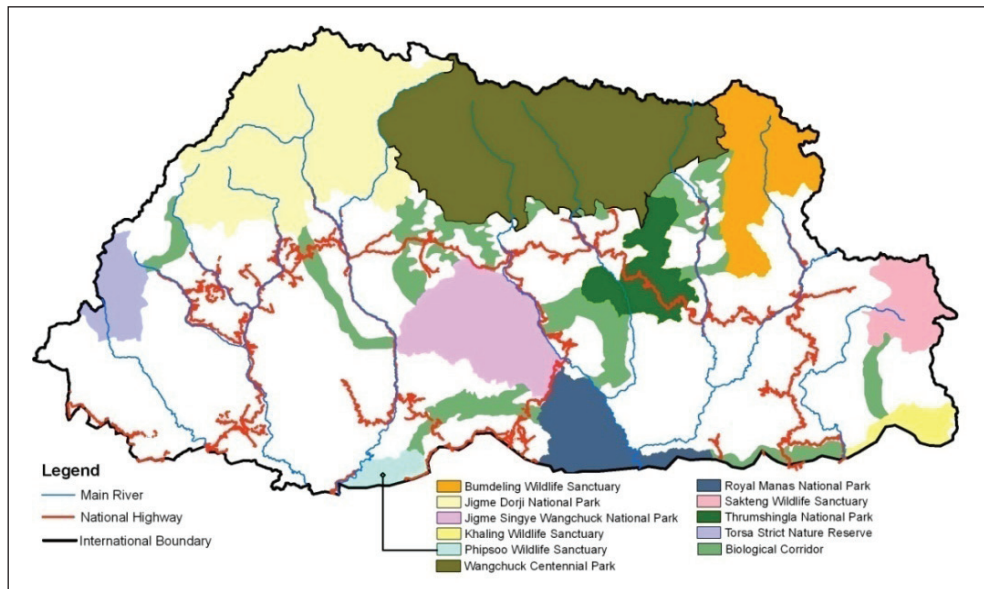
1. Introduction and General Context

1.1 Bhutan's Overall Development Context

Bhutan has embarked on a development path that places environmental conservation at the core of its national policies and programmes. The overarching Bhutanese development philosophy of 'Gross National Happiness' (GNH) underscores that true development cannot take place on the premise of economic growth alone but has to occur in combination with the emotional and spiritual wellbeing of the people. Environmental sustainability, which is vital for the economic, emotional and spiritual wellbeing of the people, aptly forms one of the cornerstones of the GNH development philosophy.

In pursuit of the GNH objective of environmental sustainability, Bhutan, among other things, has established a system of protected areas encompassing all representational samples of the country's wide-ranging natural ecosystems and habitats. There are currently ten protected areas, covering a total area of 16,398 km² i.e. 42.7 percent of the country's territory (see Figure 1). These protected areas are further connected by biological corridors, which total 2,686 km², to form a contiguous protected network of natural ecosystems and habitats.

Figure 1: Map of Bhutan's Protected Areas System

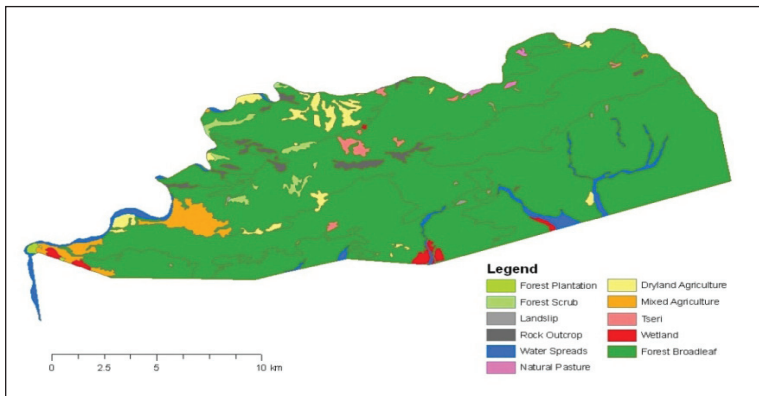


¹The source for the figures on protected areas and biological corridors is the Department of Forests (now the Department of Forests and Park services) as cited in Biodiversity Action Plan 2009

1.2 Phibsoo Wildlife Sanctuary: Area and Location

Encompassing an area of 269 km², Phibsoo Wildlife Sanctuary (PWS) is the smallest among the ten protected areas in the country. It is located in the Himalayan foothills of south-central Bhutan, between 26^o42' to 26^o51' N latitude and 89^o56' to 90^o12' E longitude. The sanctuary's southern boundary follows the Indo-Bhutan international border with Ripu-Chirang Reserved Forest on the Indian side. To the west, it is flanked by Sunkosh river, to the east by Senge river, and to the north by Dhaneshri ridge.

Figure 2: Land Cover Map of Phibsoo Wildlife Sanctuary



1.3 Management History

The history of protected areas in Bhutan dates back to 1966, when the country's first protected area – Manas Wildlife Sanctuary (now known as Royal Manas National Park) – was designated. After Manas Wildlife Sanctuary, PWS was created in 1974 along with five other protected areas. It was at that time named Phibsoo Reserved Forest. Later in 1993, it was upgraded to a wildlife sanctuary following a comprehensive review and revision of the national protected areas system which resulted in the current network of protected areas. In absence of a management plan, Sarpang Forest Division has hitherto functioned as the management authority for PWS.

² These were Doga National Park, Jigme Dorji Wildlife Sanctuary, Namgyal Wangchuck Game Reserve, Phochu Reserved Forest, and Khaling Reserved Forest. The information on old protected areas are cited from the Master Plan for Forestry Development, 1992.

³ Wangchuck Centennial Park was added to this network in 2009, coinciding with the centenary of the Bhutanese monarchy.

1.4 Conservation Significance

PWS is of immense conservation significance for Bhutan, the region and the world at large. Not only does the sanctuary protect the country's southernmost variant of sub-tropical Himalayan forest ecosystem but is also a critical source of several seasonal and perennial water bodies which contribute to the fertility of the Assam Duars. The sanctuary happens to be the easternmost limit of spotted deer (*Axis axis*), common pea fowl (*Pavo cristatus*) and sal (*Shorea robusta*) bearing forests. In fact nowhere else in Bhutan, spotted deer and natural sal forest are found but in this sanctuary. At the same time, PWS is the westernmost limit of the globally threatened golden langur (*Trachypithecus geei*) and the rare and valuable agar tree (*Aquillaria malaccensis*). It also provides refuge to a number of charismatic and globally threatened species including the Asian elephant (*Elephas maximus*), Bengal tiger (*Panthera tigris tigris*), and rufous-necked hornbill (*Aceros nipalensis*).

Not only does the sanctuary protect the southernmost variant of the country's sub-tropical Himalayan forest ecosystem but is also a critical source of several seasonal and perennial water bodies which contribute to the fertility of the Assam Duars.

1.5 Legal Context

The main law governing the establishment and management of protected areas in Bhutan is the Forests and Nature Conservation Act of Bhutan (FNCA), 1995. Chapter VI of the Act provides for the establishment of protected areas in the country. Under this Chapter, 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.”

⁴ Spotted deer is also known as chital or axis deer.

The foregoing 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 (RGoB). According to the aforesaid section, the Department of Forests and Park Services (DoFPS) is the responsible authority for preparing the management plan

This management plan derives its legitimacy from the highest law of the country, i.e. the Constitution of the Kingdom of Bhutan...

of a protected area and the Ministry of Agriculture and Forests (MoAF) is the responsible authority for approving the management plan.

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 Forest and Nature Conservation Rules of Bhutan, 2006.

This management plan, therefore, derives its legitimacy from the highest law of the country, i.e. the Constitution of the Kingdom of Bhutan, and from the FNCA, 1995, and the supporting Forest and Nature Conservation Rules of Bhutan, 2006.

2. Local Biodiversity and Human Communities

2.1 Biodiversity

2.1.1 Vegetation and Flora

Vegetation and Habitat Types

The PWS straddles the Indo-Malayan bio-geographic realm. On the basis of topography and altitude, three broad categories of vegetation can be identified namely: Sub-tropical Semi-evergreen Forest; Sub-tropical Moist Deciduous Forest; and Sub-tropical Moist Evergreen Forests.

From the wildlife management point of view, PWS can be divided further into a finer classification of following habitat types (adapted from Rawat and Wangchuk, 1996):

Semi-evergreen Forests of Plains: A narrow band of forest, between 100-300 masl, along the edge of Assam Duars, showing a transition between the tropical and sub-tropical vegetation.

Moist Deciduous Forests of Lower Hills: These forests occupy the lower hill slopes and slightly elevated (300-700 masl) plateaus.

Riverine Forests: A number of streams and rivulets, locally known as kholas, flowing from north to south in PWS form deep inner valleys and outer alluvial fans. While the alluvial fans support the grasslands and Khair–Sissoo woodlands, the narrow stable valleys support characteristic riverine forests.

Evergreen Forests of Middle Hills: Along the upper reaches of PWS and ridge tops, generally occurring between 700-1,200 masl, this habitat type is dominated by evergreen species with frequent occurrence of cane and bamboo in the openings.

Secondary Scrub Vegetation: Abandoned villages and fields both in the foot hills and middle hill slopes represent this vegetation type.

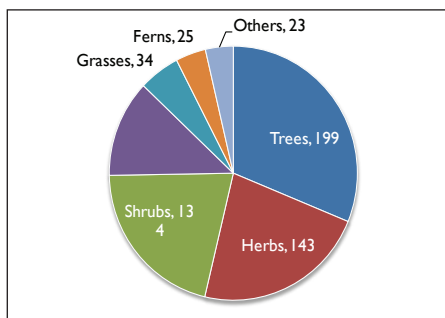
Plantations: Tracts of degraded forestland have been brought under plantation of valuable timber trees such as sal (*Shorea robusta*), teak (*Tectona grandis*), champ (*Michelia champaca*), jarul (*Lagerstroemia speciosa*), gamari (*Gmelina arborea*), etc.

Alluvial Grasslands: Large flanks of Sunkosh in the west, sizeable alluvial fans of Phibsoo, Longa, Pingkhua and Ranga kholas adjacent to Assam border have given rise to such grasslands.

Plant Species

There are 637 recorded species of flowering plants – 528 dicotyledons and 109 monocotyledons – in the wildlife sanctuary.

Figure 3: Distribution of Recorded Plant Species by their Type

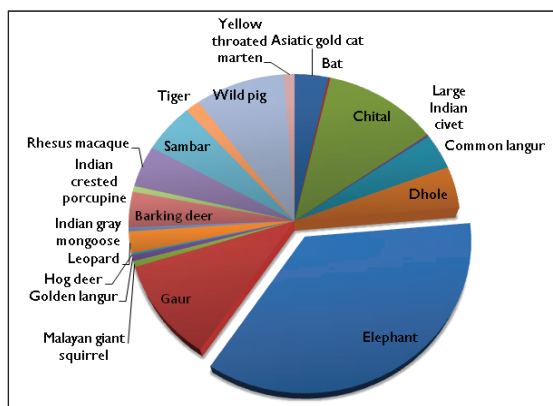


These include some 199 trees, 143 herbs, 134 shrubs, 79 climbers, 34 grasses, 25 ferns, and 15 orchids. A number of these species, such as *Caryota urens*, *Arundina graminifolia*, *Typha elephantina*, *Acer oblongum*, *Ilex godjam*, *Aristolochia tagala*, *Mesua ferrea*, *Syzygium jambos*, *Aegle marmelos*, and *Aquillaria malaccensis* are known to be rare or globally threatened. A complete list of the plant species recorded in PWS is provided in Annex 1.

2.1.2 Fauna

Around 35-40 mammalian species are expected to occur in the area; of these 20 have been confirmed so far through rapid surveys in March 2009 and January 2010. These include five globally endangered species as recognized in the Red List of Threatened Species 2010 of the World Conservation Union (IUCN), eight Appendix I species of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and six totally protected species listed under Schedule I of the FNCA, 1995 (see Annex 2 for details).

Figure 4: Relative Abundance of Recorded Mammalian Species



Of key note is the occurrence of Asian elephant (*Elephas maximus*) in significant numbers (see Figure 4). Also evidences collected during the rapid mammalian surveys suggest that there is a healthy prey base with species such as gaur (*Bos gaurus*), spotted

⁵ Rawat GS and Wangchuck S (1996)

⁶ Thinley P and Jigme K (2010)

deer, barking deer/ muntjac (*Muntiacus mutjak*), sambar (*Cervus unicolor*), and wild pig (*Sus scrofa*) occurring in good numbers. Besides Bengal tiger, major predator species found in PWS include dhole/ wild dog (*Cuon alpinus*) and leopard (*Panthera pardus*).

Rapid bird surveys conducted in March 2009 and January 2010 have recorded a total of 131 bird species in PWS, including the globally threatened rufous-necked hornbill (*Aceros nipalensis*). Comprehensive bird surveys are expected to take the number of bird species in PWS close to 200.

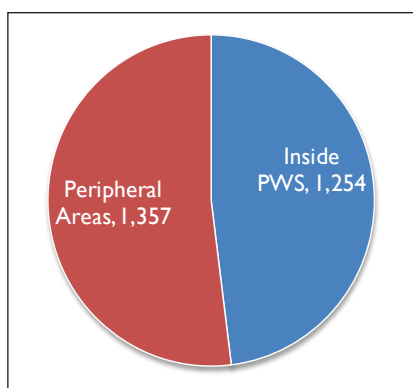
Although their surveys have not been conducted and numbers are consequently not known at the present, PWS is expected to be rich in herpeto-fauna, fish and butterfly given the relatively healthy state of its ecosystem and habitats, and the large number of these fauna recorded in the neighbouring Buxa Tiger Reserve and Ripu-Chirang Reserved Forest.

2.2 Local Communities and their Livelihoods

2.2.1 Human Settlements

The PWS socio-economic survey, carried out in March 2009, lists 21 villages and hamlets in and around PWS. These villages and hamlets shelter a total population of 2,611¹; of which 1,254 people, i.e. 48 percent, live inside the sanctuary (see Figure 5). Accordingly, human population density inside PWS works out to 4.7 people per km².

Figure 5: Population Distribution by Location Relative to PWS



The major human settlements inside PWS are located at Bichgaon (28 households, 235 people), Allay (22 households, 196 people),

Katarey (17 households, 175 people), Daragaon (16 households, 159 people), Solmoley (17 households, 156 people), and Thremba (20 households, 111 people). However, the relatively larger local human settlements – Sisty (68 households, 372 people), Senge (66 households, 360 people), and Balatrung (45 households, 265 people) – are situated in the

peripheral areas (see Table 1).

¹Dendup N (2010), Socio-economic Survey Report of Phibsoo Wildlife Sanctuary.

Table 1: Human Settlements in and around PWS

Village/ Hamlet	Gewog	Number of Households	Population
<i>Inside the Sanctuary</i>			
Allay	Nichula	22	196
Apgachi	Nichula	10	84
Basiney	Nichula	4	39
Bichgaon	Nichula	28	235
Daragaon	Nichula	16	159
Phibsoo	Senge	9	49
Pingkhua	Senge	2	14
Katarey	Nichula	17	175
Mangalabari	Nichula	2	12
Nichula	Nichula	3	13
Solmoley	Nichula	17	156
Suntaley	Nichula	1	11
Thremba	Senge	20	111
Total (inside the sanctuary)		151	1,254
<i>Peripheral Areas</i>			
Balatrung	Senge	45	265
Chota Tsirang	Senge	5	38
Deorali	Senge	47	173
Kopchey	Senge	5	27
Labarbotey	Senge	6	72
Sisty	Senge	68	372
Sisty Khopan	Senge	4	50
Senge	Senge	66	360
Total (peripheral areas)		246	1,357

Source: Adapted from PWS Socio-economic Survey Report, 2010

Several households are recent migrants from other parts of the country, particularly the east, who have inhabited the area under the government's resettlement programme. As a result, heterogeneous groups of local communities exist in a number of villages.

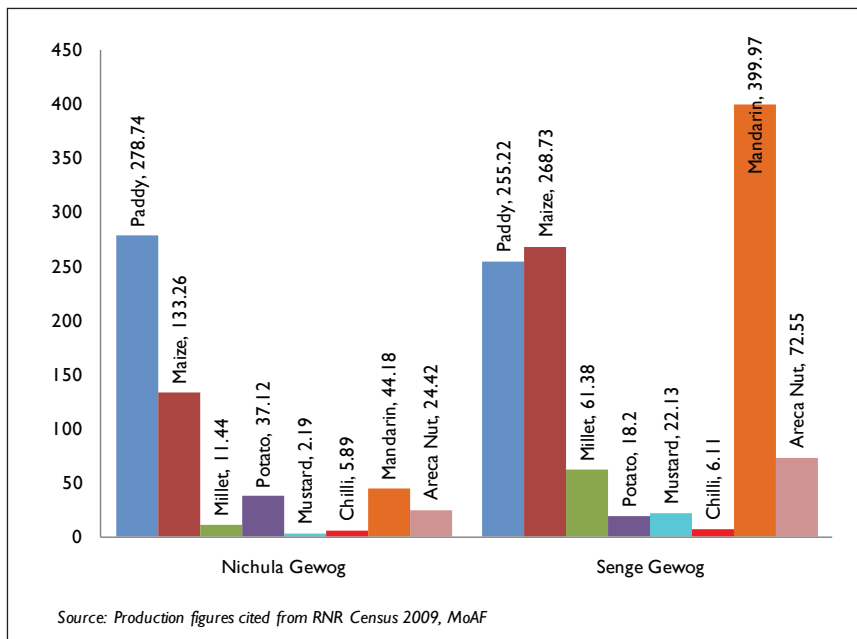
2.2.2 Local Livelihoods

Crop Agriculture

The primary source of local livelihood is crop agriculture. By far, the most extensively grown crops are paddy and maize. These two crops account for more than 45 percent of the total agricultural production in Nichula and Senge gewogs. Other major crops

include: millet among cereals; potato, spinach, radish, and pumpkin among vegetables; chilli and ginger among spices; mandarin and areca nut among fruits; and mustard among oilseeds.

Figure 6: Production Volume (MT) of Major Crops, 2008



Average landholding per household is 2.25 hectares (ha) in Nichula gewog and 1.71 ha in Senge gewog. The most dominant agricultural land use type is dryland (kamzhing), accounting for 57 percent of the total agricultural land in Nichula gewog and 58 percent in Senge gewog. Wetland (chhuzhing) comprises 41 percent of the total agricultural land in Nichula gewog and 30 percent in Senge gewog while cash crop land comprises 2 percent of the total agricultural land in Nichula gewog and 12 percent in Senge gewog.

Crop products make up a key source of cash income for the local communities. In 2008, the farmers in Nichula gewog earned Nu. 1.9 million and those in Senge gewog earned Nu. 13.19 million from the sale of crop products, mainly fruits and cereals.

⁸ The primary source of information on crop agriculture is the RNR Census 2009. The agriculture-related figures provided in this management plan have either been directly cited from the RNR Census 2009 or computed using the data available in it.

Livestock Rearing

Cattle, goat and poultry are the main livestock reared by the local communities. In Nichula gewog there were 1,512 cattle, 276 goats, and 245 poultry while in Senge gewog there are 1,294 cattle, 1,187 goats, and 2,315 poultry (2008 figures). The local people also raise other livestock, such as sheep, pigs, and horses but only in limited numbers. Livestock products are a major source of cash income with much of it coming from sale of dairy products. In fact, majority of the interviewees during the Socio-economic Survey of PWS in March 2009 regarded livestock production as important as crop agriculture in terms of generation of cash income.

In addition to dairy and meat production, cattle are maintained for draught power (ploughing of cultivation land). This corresponds with the fact that 98.6 percent of the households in Nichula gewog and 93.6 percent in Senge gewog depend on bullock for tilling of agricultural land as reflected in the RNR Census 2009.

Use of Forest Products

Forests provide the local people with a wide range of forest products for their subsistence. These include timber, poles and thatch for construction of homes, firewood for energy, a wide range of edible and medicinal plants, and forage for livestock. During the preliminary surveys in Senge and Katarey villages in the mid 1990s, a total of 144 species were listed for their various ethno-botanical values.

During the preliminary surveys in Senge and Katarey villages in the mid 1990s, a total of 144 species were listed for their various ethnobotanical value

At the present, the use of forest products for generation of cash income is virtually non-existent. Nonetheless, there is good potential for forest-based community enterprises to generate cash income for the local communities. A few community forestry initiatives are underway in Senge gewog and these may, in the future, present opportunities for income generation.

Other Sources of Livelihood

Members of some households work as casual labourers on other's farms and in public works (generally during off-farm season) to earn additional income. Remittances from relatives employed in government service or private companies also supplement household income. A few households are also involved in small trade and business.

3. Key Conservation Issues and Challenges

3.1 Human-Wildlife Conflicts

Interactions with local communities during the PWS socio-economic survey, March 2009, suggest that crop depredation by wildlife has been on the rise over the past 10-20 years, and more particularly in the last five years with the resettlement of new communities. In 2008, the farmers of Senge gewog lost 37.74 metric-tons (MT) of cereal crops to wildlife whilst those in Nichula gewog lost 24.75 MT (RNR Census, 2009). In monetary terms, this loss translates to roughly Nu. 1.7 million.

Wild pigs, monkeys and elephants accounted for 33.43 percent, 33.22 percent and 30.91 percent of the crop depredation in Senge gewog whereas all crop depredation in Nichula gewog were due to wild pigs. Whilst in terms of scale wild pigs were the most damaging, the intensity of damage was most severe by elephants, which not only pillaged maize and paddy but also uprooted larger crops like areca nut trees, damaged village homes, and threatened human lives. Proximity of agricultural lands to wildlife habitats, shrinkage of natural habitats in the bordering Indian territory, and presence of salt licks in and around village precincts have led to increased wildlife incursions on crops. Reportedly, prior to 1988, local people could own licensed locally-made arms (which were apparently used for preventing wildlife from crop and livestock depredation). The licensing of such arms was done away with in 1988 due to security risks.

Crop depredation by wildlife is a major constraint to agricultural development and food self-sufficiency. Due to fears of wildlife incursions, several households have left agricultural lands fallow – 21.47 percent of the agricultural lands in Nichula gewog and 35.71 percent in Senge gewog were left fallow in 2008. In both the gewogs, wildlife incursions ranked among the top reasons for keeping agricultural lands fallow¹⁰.

In both the gewogs (Nichula and Senge), wildlife incursions ranked among the top reasons for keeping agricultural lands fallow.

In addition to direct loss of crops, farmers have to bear many indirect costs. These include loss of time, added cost of production, expenditure on items such as torches and batteries, kerosene,

⁸The primary source of information on crop agriculture is the RNR Census 2009. The agriculture-related figures provided in this management plan have either been directly cited from the RNR Census 2009 or computed using the data available in it.

and construction of machans (elevated guard shelters), and disruption in family life. Persistence or exacerbation of crop depredation by wildlife may have serious ramifications for conservation. It may create anti-conservation sentiments among frustrated farmers and drive them to resort to retribution killing and abet poaching.

Livestock depredation by wildlife also occurs albeit on a comparatively limited scale than crop depredation. Data provided in the RNR Census 2009 suggest that livestock depredation is especially more frequent in Nichula gewog, where 28 cattle were killed by tigers and leopards during 2008. During the socio-economic survey of PWS in March 2009, local people reported that attacks on cattle by predator species are more frequent during the time when cattle are let out in the forests for free-range grazing.

3.2 Poaching

Poaching is the illegal capture or destruction of wild animals and plants in contravention of local and international laws for conservation and wildlife management. It is a serious concern in PWS. The sanctuary harbours a number of species that are highly valued for their parts and products. A porous international border, insurgency in the neighbouring Indian state of Assam, proximity to regional wildlife trafficking routes, and the presence of a lucrative market for wildlife parts and products in the region make PWS hugely vulnerable to poaching. In addition, the adjacent Indian tribal communities, who have traditionally depended on game hunting and collection of non-timber forest products (NTFPs), are highly inclined to subsistence poaching in PWS. This is largely due to increase in human population and consequent depletion of wildlife population in the neighbouring Indian tribal areas.

Dearth of trained field staff and equipments for surveillance, communication, safety and defence, camping, and mobility make it difficult to combat poaching. In addition, the absence of field-level anti-poaching coordination mechanism between Bhutanese and Indian authorities and the lack of regulatory procedures for dealing with poaching offences by non-nationals impede efforts to prevent and control cross-border poaching.

3.3 Free-range Grazing in Forest Habitats

As mentioned in 2.2.2, livestock rearing plays a major role in the local economy. A common practice in the local livestock management system is free-range grazing. Cattle herds – usually in large numbers – are left out in the forests for free-range grazing. Such practice may lead to overgrazing, causing loss of vegetation, reduction of land's

biological productivity, and soil erosion. Furthermore, it may also bring about increased competition for forage between domestic cattle and wild ungulates. This, in turn, is

Very important, but seldom discussed, is also the issue of potential risks of spread of animal disease as a result of the interface between domestic and wild animals provided by overlapping grazing grounds.

likely to have two major unfavourable outcomes. One, scarcity of forage in the forests would drive wild ungulates to raid farm crops. Two, it would weaken the natural prey base and cause predator species to kill domestic livestock. Very important, but seldom discussed, is also the issue of potential risks of spread of animal disease as a result of the interface between domestic and wild animals provided by overlapping grazing grounds.

A major reason for free-range grazing is the ownership of large numbers of local cattle breeds.

More than 87 percent of the cattle owned by the local communities are local breed. Stall feeding, homestead pastures and other improved grazing practices are considered economically unviable for local breeds because of the labour and material costs involved in such practices. Also of concern is the presence of large numbers of goats, especially in Senge gewog. Goats are known to have preference for woody plants and forbs unlike cattle which prefer grasses. This may cause attrition of forest species and loss of protective vegetative cover.

3.4 Additional Issues

3.4.1 Dearth of Research and Information to Support Conservation Interventions

There have been effectively no detailed studies on biodiversity in the PWS except for a series of rapid surveys on mammals, birds and plants conducted since 2009 and earlier in the mid 1990s. These surveys provide only preliminary and partial information on species and habitats, and have not been analysed and documented systematically. Well-designed conservation interventions, including those for species conservation and habitat management, would require detailed research and incisive information. The PWS has some unique biodiversity qualities. As mentioned in the introductory part of this management plan, it is home to the country's only population of spotted deer and natural sal forests. Furthermore, it is a human-wildlife conflict hotspot particularly with respect to elephant raids. These and other critical aspects of PWS merit to be studied in detail and documented for enhanced knowledge and informed decisions on conservation management.

3.4.2 Limited Conservation Management Infrastructure

Infrastructures for conservation management of PWS are currently few and rudimentary or in dilapidation. These basically include hard infrastructure such as staff quarters, office buildings, field outposts, and access road to head office, as well as soft infrastructures such as equipment for office and on-field conservation work, and transport. In particular, the improvement of the access road to Phibsoo needs attention. Currently, many stretches of the road are very rough, slowing down vehicle movement and consequently posing huge risks of ambush by poachers and insurgents.

3.4.3 Security

The PWS is located in a volatile area from the security point of view. Insurgency in the neighbouring Indian state of Assam poses a great deal of uncertainty and security risks. For instance, in December 2008, a group of PWS staff, on their way back to Phibsoo from Sarpang, were ambushed by militants resulting in six deaths and two injuries.

3.4.4 Lack of Preparedness for Community Participation

Many families in the local communities are those resettled recently from various parts of the country. They have yet to get accustomed to the new environment in which they are to make their livelihood. In addition, language and custom barriers exist between long-time settlers and migrant communities although these are short-term and expected to diminish. Consequently, the preparedness for community participation as a cohesive group is currently lacking. This hampers efforts to mobilize community action for conservation and related development interventions.

4. Management Framework and Interventions

4.1 Overall Strategic Premise

4.1.1 Vision and Objectives

Vision Statement

This management plan, which is the first for PWS, has been developed with the vision of PWS as:

“a natural area that showcases Bhutan’s outstanding sub-tropical Himalayan biodiversity and positive interactions between people and their surrounding natural environment, bringing in enhanced and continued conservation benefits at the local, national, regional and global levels.”

Objectives

The main objectives of the PWS management plan are to:

- Reduce conservation threats posed by human-wildlife conflicts, poaching, and free-range grazing;
- Strengthen the infrastructure for effective management of PWS and implementation of planned management interventions; and
- Enhance professional and public knowledge for local biodiversity conservation and related community development.

4.1.2 Key Operational Principles

The implementation of this management plan will be guided by the following operational principles:

Participation and Partnership

No single 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 the local civil administrative bodies and other relevant law enforcement agencies such as the Department of Revenue and Customs and the Royal Bhutan Police. Similarly, conservation

education activities are likely to yield better results through engagement of schools, gewog 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. Emphasis will need to be given to eliciting knowledge, perceptions and interests of various stakeholders and using them in synergy to effectively deal with conservation issues.

Adaptive Management and Learning

This management plan is a first for PWS; many of the activities will be a learning process. Therefore, the approach and activities will have to be flexible to adapt to unforeseen circumstances and new insights. This approach is particularly important to manage complex ecosystems and human-nature interactions, and unpredictable security situation that currently exists in PWS. Adaptive management will ensure that conservation interventions are not static but rather dynamic and sufficiently resilient to respond to fast-changing and immediate needs, and take advantage of new opportunities.

Consistent monitoring and organizational learning are important components of an adaptive management approach. So, emphasis will be given on learning from past successes as well as failures to continuously evolve activities to address conservation and associated development needs in evolving circumstances. This will involve regular monitoring and proper documentation of methodologies, approaches and techniques and to make this knowledge available to various interest groups.

Integrating Conservation and Development

While the primary aim of managing a protected area is to conserve the natural biological diversity, the socio-economic development of local communities cannot be ignored. As evident, several conservation issues in PWS are linked to local culture and livelihoods, and consequently have a bearing on local livelihoods such as agriculture and livestock production. The Bhutanese people have lived in harmonious interaction with their surrounding natural environment for many decades. This traditional relationship, which includes resource use rights, need to be respected and integrated in the conservation interventions to the extent possible. In today's world of environmental degradation, conservation is of enormous importance but exclusionary conservation policies and approaches do not work as evident from experiences of 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, we lose out their knowledge, insights

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

Recognizing and Reconciling Conflicting Interests

There will be a diversity of interests in PWS, some of which may be conflicting. It is imperative to recognize these diverse interests and reconcile the conflicting issues to the extent possible. Major conflicting issues in the PWS are likely to arise from the possible construction of a lateral national highway along the southern belt and hydropower projects along Sunkosh river. While these major development projects may be unavoidable because of their importance to overall national development, the conflicting issues need to be recognized proactively and reconciliation measures 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-blown Environmental Impact Assessment will therefore be mandatory for development projects that are inimical to conservation objectives.

4.2 Management Interventions

4.2.1 Related to Objective 1

Objective 1

Reduce conservation threats posed by human-wildlife conflicts, poaching, and free-range grazing.

Activities for Component 1.1: Human-Wildlife Conflicts Management

- Construct solar-powered electric fences in at least two locations, giving priority to those that are the most vulnerable to crop incursions by wildlife. The hardware support needs to be supplemented with software assistance in terms of community training in operation and maintenance of the fencing devices;
- Install 50 units of (ultra-sonic) sound-based repellent and alarm devices in areas not covered by electric fencing;
- Provide powerful searchlights and other appropriate mechanical devices on a group

basis to all local communities in and around PWS to deter wildlife incursions, especially those of elephants;

- Enrich salt licks located at safe distance from agricultural settlements as well as enrich the vegetation (with elephant-preferred species) in the elephant corridors/passages that link these salt licks;
- Introduce community-based crop and livestock insurance schemes on a pilot scale in at least two communities, one in Senge gewog and the other in Nichula gewog. The schemes will need to integrate a coordinated and uniform system of reporting crop and livestock losses. They will also need to cover crop and livestock depredation by all major wildlife species;
- Introduce alternate cropping system on a pilot scale in at least two sites, one in Senge gewog and the other in Nichula gewog;
- Promote alternate livelihood activities that generate additional income for the local communities. These may include sustainable harvesting of NTFPs and, in the long run, community-based nature tourism.

Activities for Component 1.2: Anti-Poaching

- Enhance the frequency and coverage of field patrolling. Back-from-field reports will need to be mandatory to have documentation and records of poaching evidences and offences. Concurrently, field patrolling can also be used to collect evidences of species presence and species-habitat associations;
- Train a core group of 10 PWS staff in advanced anti-poaching techniques, including MIST/ M-STRIPE. Wildlife institutions in India, Nepal, Thailand, Malaysia or Indonesia may be appropriate providers of such training;
- Conduct training on first-aid, arms handling and field safety for PWS staff once every two years. The services of military and health personnel to impart such training will be desirable;
- Conduct a training workshop on communication and intelligence-sharing for all law enforcement/ security agencies (in and around PWS) each year. For such workshops, it would be useful to invite resource persons from agencies such as TRAFFIC and Wildlife Protection Society of India;
- Organize an inter-agency coordination meeting for anti-poaching between head

officials of various law enforcement/ security agencies (in and around PWS) each year;

- Advocate and infuse cross-border poaching as a key issue for deliberation in the High Level Border Coordination Meeting between Bhutan and India. Such advocacy will need to be backed up by a detailed analytical report on cross-border poaching and other advocacy materials;
- Organize field-level exchange/ coordination events between PWS staff and their India counterparts on a bi-annual basis (one event to host Indian counterparts and the other to visit Indian counterparts) to build field-level rapport and cooperation to address cross-border poaching issues;
- Develop procedural guidelines for dealing with poaching offences committed by non-nationals. This has relevance for all trans-boundary protected areas and will require policy-level intervention from the central authorities.

Activities for Component 1.3: Sustainable Grazing and Livestock Management

- Provide support/ incentives to interested farmers for swapping local cattle breed with improved cattle breeds. Support/ incentives could be financial or in-kind. Care must be taken to ensure that such support/ incentive is sustainable in the long run;
- Improve local veterinary services required by farmers to maintain improved cattle breeds. Financial support for medicines and appliances (that are crucial but cannot be covered from regular government budget) may be meaningful;
- Provide support/ incentive, financial or in-kind, to local communities to procure power tillers based on an agreed set of criteria and conditions with the objective of reducing the population of draught cattle;
- Introduce improved grazing practices, such as rotational grazing and development of private pastures, through training and extension support;
- Encourage homestead fodder tree plantations to support stall feeding;
- Designate community areas for grazing in the multiple use and buffer zones. Such areas will need to be operated based on a grazing management plan as stipulated in the Land Act of Bhutan 2007 and supporting regulations. This will therefore require participatory field surveys and community meetings.

4.2.2 Related to Objective 2

Objective 2

Strengthen the infrastructure for effective management of PWS and implementation of planned management interventions.

Activities for Component 2.1: Conservation Infrastructure Development

- Construct field outposts at Longashir, Nichula, Pingkhua, and Dhaneshri;
- Construct a field conservation research station at Phibsoo;
- Renovate office buildings and staff quarters at Phibsoo;
- Improve the access road to Phibsoo to enable quicker and safer travel, and year-round use.

Activities for Component 2.2: Equipments

- Equip PWS with adequate sets of equipments for camping (tents, rucksack, light sleeping bags, sleeping mats, etc), surveillance (binoculars), navigation (GPS, compass and maps), and protection (light-weight bullet proof vests);
- Equip PWS with equipments for radio communication (wireless radio sets and walkie-talkie) and mobility (4-wheel drive pick-up, tractor, motor bikes);
- Equip PWS with audio-visual equipments (LCD projector, digital camera) for conservation education and awareness-building.

4.2.3 Related to Objective 3

Objective 3

Enhance professional and public knowledge for local biodiversity conservation and related community development.

Activities for Component 3.1: Research and Information Development

- Carry out comprehensive surveys of mammals, birds and vegetation building upon past preliminary/ baseline surveys, and systematically analyze and document the results of these surveys;

- Conduct preliminary/ baseline surveys of herpeto-fauna, fish and butterflies, followed by comprehensive surveys;
- Conduct field studies on the socio-economic and ecological dynamics of human-wildlife conflicts in PWS and the effectiveness of existing mitigation measures, externally-supported as well as indigenous;
- Conduct studies on the ecology of PWS flagship/ keystone species such as the Asian elephant and spotted deer;
- Carry out habitat management trials in key natural habitats such as alluvial grasslands and sal-bearing forests and document the results of these trials;
- Carry out a study on the potential for community-based nature tourism in PWS;
- Establish an information resource facility within the proposed field research station at Phibsoo.

Activities for Component 3.2: Conservation Education and Awareness-Building

- Develop communication and awareness-building materials, such as brochures, posters and documentary, highlighting the conservation significance of PWS;
- Establish and support eco-clubs in at least two local schools, one in Senge gewog and the other in Nichula gewog. Support would include funds for organizing environmental activities in the schools, provision of communication/ awareness-building materials on conservation topics, and environmental talks by PWS staff and visiting environmentalists/ conservation experts (as and when opportunity arises);
- Organize two events of farmers' study tour to other protected areas in and around Bhutan. Royal Manas National Park (Bhutan), Buxa Tiger Reserve (India) and Jaldapara Wildlife Sanctuary (India) are suitable venues given the similarity in ecosystem and conservation issues;
- Conduct a conservation awareness campaign for local communities each year, focusing on different local themes (e.g. human-elephant coexistence) each year;
- Train a group of 15 PWS and gewog RNR extension staff in approaches and techniques for social mobilization and community action on conservation and related development issues. RECOFTC (in Bangkok), now known as the Centre for People and Forests, may be an appropriate training service provider in this subject.

5. Implementing and Financing the Management Plan

5.1 Institutional Arrangement

5.1.1 PWS Management Authority

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

The time table for the implementation of the planned activities is provided in Annex 4. The time table is indicative and, therefore, to be used as a guidance.

- Integrated Conservation and Development Section
- Environmental Education Section

A Finance and Administration Section will also be created for financial and administrative management of the PWS. Four field outposts will be created at Longashir, Nichula, Pingkhua and Dhaneshri to extend the coverage of conservation activities and delivery of associated public services.

The following table outlines the staff strength of the various sections/ entities under the PWS management authority and the corresponding components of the management plan:

Table 2: Staff Strength and Corresponding Components of Respective Sections/ Entities under PWS Management Authority

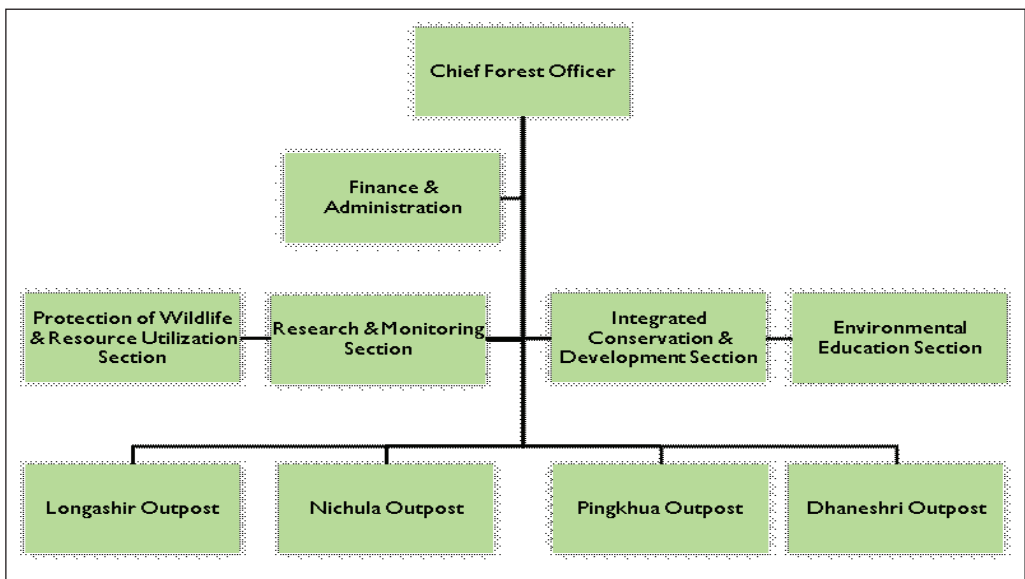
Section	Staff Strength	Component
Overall	Chief Forest Officer - 1	Leadership, coordination and overall management for all components
Protection of Wildlife and Resource Utilization	Senior Forest Ranger - 1 Forest Ranger - 1 Field Staff - 1	Anti-poaching and parts of sustainable grazing and livestock management

Research and Monitoring	Senior Forest Ranger - 1 Forest Ranger - 1 Field Staff - 1	Research and information development
Integrated Conservation & Development	Senior Forest Ranger - 1 Forest Ranger - 1 Field Staff - 1	Human-wildlife conflicts management, and sustainable grazing and livestock management
Environmental Education	Senior Forest Ranger - 1 Forest Ranger - 1 Field Staff - 1	Conservation education and awareness-building
Finance and Administration	Finance Officer - 1 Administrative Officer - 1	Infrastructure development and procurement of equipments
Field Outposts	Forester - 4 Field Staff - 12	All components within the jurisdictions of the respective outposts

Note: The total number of staff approved by the Royal Civil Service Commission for each operational protected area is 31.

However, the aforesaid relationship is not to suggest compartmental implementation of the planned interventions and activities. Rather, the various sections will need to

Figure 7: Organogram of PWS Management Authority



coordinate among themselves to ensure synergy between their activities. The Chief Forest Officer will provide leadership and guidance for the coordination and synergic implementation of the plan.

5.1.2 Partner Agencies

There are a wide range of potential agencies for partnership and collaboration. Some of the conspicuous partner agencies are listed below:

- Sarpang Forest Division (for anti-poaching and general forestry administrative matters);
- Sarpang Dzongkhag Administration (for anti-poaching, cross-border security, human-wildlife conflicts management, and sustainable grazing and livestock management);
- Gewog Administrations of Senge and Nichula (for human-wildlife conflicts management, sustainable grazing and livestock management, and conservation education);
- Gewog RNR Centres of Senge and Nichula (for human-wildlife conflicts management, sustainable grazing and livestock management, and conservation education);
- Royal Bhutan Police (for anti-poaching and cross-border security);
- Department of Revenue and Customs (for anti-poaching);
- Ugyen Wangchuck Institute for Conservation and Environment (for research and training);
- Royal Society for Protection of Nature (for research and conservation education).

5.1.3 Monitoring Agencies

The DoFPS will be the parent organization of the PWS management authority and therefore the overall monitoring and supervising agency. Specifically within DoFPS, the Wildlife Conservation Division will monitor the implementation of the management plan through periodic field visits and the regular system of progress reports. Other divisions of the DoFPS, namely the Nature Recreation and Ecotourism Division, Forest Resources Development Division, and Social Forestry Division will also provide monitoring and guidance where activities relate to their areas of work such as sustainable nature tourism, NTFPs, and community forestry.

5.2 Financial Outlay

The implementation of the PWS management plan will cost an estimated Nu. 39.556 million, not including general administrative costs in the form of staff salaries, service benefits and operational overheads.

Potential sources of funding include: World Wildlife Fund, Bhutan Trust Fund for Environmental Conservation, and the United Nations Development Programme. General administrative costs for staff salaries, service benefits and operational overheads will be met entirely from government sources.

The broad budget breakdown by component and year is given below while the detailed budget breakdown by activity is provided in Annex 5:

Table 3: Budget Outlay

Component	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Human-Wildlife Conflicts Management	0.505	1.315	1.627	0.500	0.228	4.175
Anti-Poaching	1.830	1.803	1.068	1.024	1.094	6.819
Sustainable Grazing and Livestock Management	0.080	0.285	0.272	0.229	0.211	1.077
Conservation Infrastructure Development	0.550	2.975	6.150	3.380	3.600	16.655
Equipments	1.350	0.700	0.180	1.200	0	3.430
Research and Information Development	0.850	1.100	0.550	0.500	0.100	3.100
Conservation Education and Awareness	0.550	1.093	1.456	1.099	0.102	4.300
Total	5.715	9.271	11.303	7.932	5.335	39.556

(All financial figures in the table are in Nu. million)

References

BirdLife International (2003) Saving Asia's Threatened Birds: A Guide for Government and Civil Society. Cambridge, UK: BirdLife International.

Constitution of the Kingdom Of Bhutan, 2008, Thimphu.

Dendup N (2010) Socio-economic Report of Phibsoo Wildlife Sanctuary. Nature Conservation Division, Department of Forests and Park Services, Thimphu.

Inskipp C et al (1999) Birds of Bhutan. Christopher Helm (Publishers) Limited, London.

MoA (1995) Forest and Nature Conservation Act of Bhutan, 1995. Ministry of Agriculture and Forests, Thimphu.

MoA (2006) Forest and Nature Conservation Rules of Bhutan, 2006. Ministry of Agriculture and Forests, Thimphu.

MoA (2009) Biodiversity Action Plan 2009. Ministry of Agriculture and Forests, Thimphu.

MoA (2009) Renewable Natural Resources Census 2009. Ministry of Agriculture and Forests, Thimphu.

Nature Conservation Division (2008) Enabling Biodiversity Conservation in Phibsoo Wildlife Sanctuary. A grant proposal submitted to the Gross National Happiness Commission Secretariat, Thimphu.

Rawat GS and Wangchuk S (1996) Preliminary Observations on the Flora and Vegetation

Figure 8: % Budget Share by Components

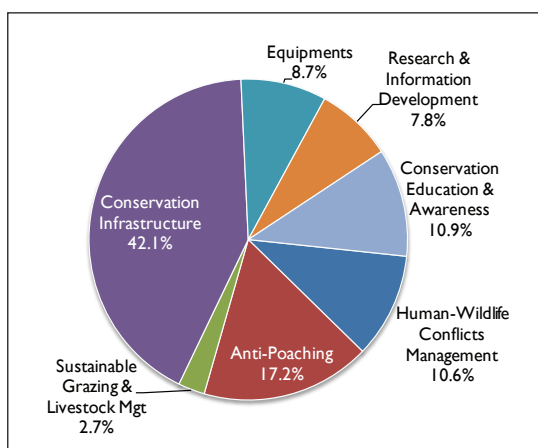
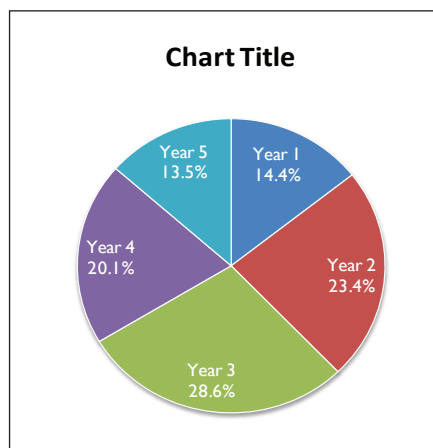


Figure 9: % Budget Share by Year



of Phibsoo Wildlife Sanctuary: An Interim Report. WWF Bhutan Programme and Nature Conservation Section, Forestry Services Division, Thimphu.

RGoB (1991) Master Plan for Forestry Development: Main Document. Department of Forestry, Ministry of Agriculture, Royal Government of Bhutan, Thimphu.

Thinley P and Jigme K (undated) Report of Mammal Survey in Phibsoo Wildlife Sanctuary.

Wangchuk T et al (2004) A Field Guide to the Mammals of Bhutan. Ministry of Agriculture, Thimphu.

WCD (-) Draft Bird Survey Report of Phibsoo Wildlife Sanctuary. Wildlife Conservation Division, Department of Forests and Park Services, Ministry of Agriculture and Forests.

Annex 1: List of Plant Species Recorded in Phibsoo Wildlife Sanctuary

Source: Rawat GS and Wangchuk S/ NCS, Forestry Services Division (1996)

(Habit: H=Herb; S= Shrub; T= Tree; ST= Small Tree; LT= Large Tree; C=Herbaceous Climber; L= Liana or Woody Climber; G= Grass; F= Fern; O= Orchid; B= Bamboo; W= Weed)

GROUP/FAMILY/SPECIES	HABIT
PTERIDOPHYTES	
<i>Adiantum caudatum</i> L	F
<i>Ampelopteris prolifera</i> (Retz.) Cop.	F
<i>Asplenium nitidum</i> Sw.	F
<i>Athyrium</i> sp.	F
<i>Cheilanthes farinosa</i> (Forsk.) Klf.	F
<i>Cyathia spinulosa</i>	F Tree fern
<i>Cyclosorus unitus</i> (L.) Ching	F
<i>Cyrtomium caryodideum</i> Wall. ex Hk.	F
<i>Dicranopteris linearis</i> Burm.	F
<i>Diplazium esculentum</i>	F
<i>Drynaria quercifolia</i> (L.) Sm.	F
<i>Equisetum debile</i> Roxb.	F
<i>Equisetum diffusum</i> D. Don	F
<i>Lycopodium clavatum</i>	F
<i>Lycopodium squarrosum</i> Forst.	F

<i>Lygodium flexuosum</i> (L.) Sw.	F	
<i>Lygodium japonicum</i> (Thunb.) Sw.	F	
<i>Nephrolepis cordifolia</i> L.	F	
<i>Pleopeltis juglandifolia</i> L.	F	
<i>Pleopeltis nuda</i> Hk. f.	F	
<i>Polystichum lentum</i> D. Don	F	
<i>Pteridium aquilinum</i> (L.) Kuhn.	F	W
<i>Pteris biaurita</i> L.	F	
<i>Pteris quadriaurita</i> Retz.	F	
<i>Selaginella</i> sp.	F	

ANGIOSPERMS

(A): MONOCOTYLEDONS

ARACEAE

<i>Alocasia fallax</i> Sch.	H
<i>Alocasia macrorhiza</i> (L.) G. Don	H
<i>Colocasia esculenta</i> L.	H
<i>Homalomena rubescens</i> (Roxb.) Kunth	H
<i>Lasia spinosa</i> (L.) Thw. H Tokchum (Dz.)	
<i>Pothos cathcarti</i> Schott	C
<i>Pothos scandens</i> L.	C
<i>Rhaphidophora eximia</i> Schott.	C
<i>Rhaphidophora glauca</i> (Wall.) Sch.	C

Rhaphidophora hookeri Schott

C

ARECACEAE (= PALMAE)

Calamus erectus Roxb.

S/L

Calamus tenuis Roxb.

L

Rare

Caryota urens L.

ST

Rare

Phoenix humilis

ST

Wallichia densiflora Mart.

S

AGAVACEAE

Agave angustifolia Haw.

S

Cultigen

ASPARAGACEAE

Asparagus racemosus Willd.

S

BROMELIACEAE

Ananas comosus (L.) Merrill.

H

Cultigen

COMMELINACEAE

Aclisia subumbellata (Cl.) Bru.

H

Commelina appendiculata C.B.Cl

H

Commelina paludosa Blume

H

Cyanotis cristata (L) A. & J.H.

H

Murdannia loriforme (Hassk) Rolla

H

CYPERACEAE

Carex stramentata Boott & Boek. sedge

Cyperus bervifolius (Rottl) Hassk

Cyperus compactus Retz

Cyperus compressus L

Cyperus cyperoides (L) O.Ktze

Cyperus paniceus (Rottb.) Boeck

Eriophorum comosum

Fimbristylis dichotoma (L) Vahl

Scleria terrestris (L.) Fass.

DIOSCOREACEAE

Dioscorea belophylla Voigt. ex Hain. C Yam

Dioscorea esculenta (Lour) Burkill C

Dioscorea hispida Dennst. C

Dioscorea pentaphylla L. C

DRACAENACEAE

Dracaena spicata Roxb. S

HAEMODORACEAE

Ophiopogon intermedius Gaertn. H

HYPOXIDACEAE

Curculigo orchioides Gaertn H

MARANTACEAE

Phrynium pubinerve Bl H

MUSACEAE

Musa balbisiana Col. H

Musa sp H

ORCHIDACEAE

Aerides odoratum Lour. O Epiphyte

Arundina graminifolia O Rare, ground

Coelogyne fuscescens Lindl. O Epiphyte

Cymbidium aloifolium Roxb. O

Dendrobium acinaciforme Roxb O

Dendrobium anceps Sw. O

Dendrobium aphyllum (Roxb.) Cl. O

Dendrobium moschatum (Buch-Ham) Sw. O

Eulophia mannii Hk.f. O

Eulophia stricta Lindl. O

Luisia inconspicua (Wall ex Hk.f.) O

Peristylus goodyeroides Lindl. O Terrestrial

Pholidota imbricata (Roxb) Lindl O Epiphyte

Rhynchostylis sp.	O	„
Vanda teres Lindl	O	„

PANDANACEAE

Pandanus odoratissimus (Lamk.) L.	S
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POACEAE

Apluda mutica L	G	
Arundinella benghalensis	G	
Arundo donax L.	G	
Axonopus rotundifolius	G	Exotic
Bambusa nutans Wall. ex Munro	B	
Capillipediummassimile(Steud) A.	G	
Cephalostachyum latifolium Munro	B	
Chrysopogon aciculatus (Retz) Trin	G	
Cynodon dactylon (L) Pers	G	
Cyrtococcum oxyphyllum (Steud) Stap	G	
Dendrocalamus hamiltoni Nees	G	
Digitaria abludens (Roem & Schult)	G	
Digitaria purpurea	G	
Echinochloa colonum (L) Link	G	
Eleusine indica (L) Gaertn	G	
Eragrostis tenella (L) P.Beauv.	G	

<i>Erianthus longisetosus</i> Anders	G
<i>Imperata cylindrica</i> (L) P.Beauv	G
<i>Imperata cylindrica</i> var. <i>major</i>	G
<i>Isachne</i> sp.	G
<i>Neyraudia reynaudiana</i> (Kunth) Keng	G
<i>Oplismenus compositus</i> (L) P.Beauv	G
<i>Panicum auritum</i> Presl ex Nees	G
<i>Paspalum orbiculare</i> Forst	G
<i>Phragmites karka</i>	G
<i>Pogonatherum crinitum</i> (Thunb) Kunth	G
<i>Pogonatherum rufobarbatum</i> Griff	G
<i>Pseudostachyum polymorphum</i>	B
<i>Saccharum benghalense</i> Roxb	G
<i>Saccharum spontaneum</i> L	G
<i>Sclerostachya fusca</i> (Roxb) Aa.Camus	G
<i>Setaria glauca</i> (L) P.Beauv	G
<i>Setaria palmifolia</i> (Koen) Stapf	G
<i>Sporobolus diander</i> (Retz) P.Beauv	G
<i>Sporobolus fertilis</i> (Steud) Clayton	G
<i>Themeda gigantea</i> Nees ex Steud	G
<i>Thysanolaena maxima</i> (Roxb) O.Ktze	G

SMILACACEAE

<i>Smilax orthoptera</i> A. DC.	C
<i>Smilax prolifera</i>	C

TYPHACEAE

<i>Typha elephantina</i> Roxb.	H	Rare
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ZINGIBERACEAE

<i>Alpinia allughas</i> (Retz) Rose	H
<i>Alpinia malaccensis</i> (burm.) Rose.	H
<i>Costus speciosus</i> (Koen) Sm.	H
<i>Curcuma aromatica</i> Salisb.	H
<i>Globba clarkei</i> Baker	H
<i>Globba multiflora</i> Wall. ex Baker	H
<i>Hedychium spicatum</i>	H

B): DICOTYLEDONS

ACANTHACEAE

<i>Adhatoda zeylanica</i> Medic.	S
<i>Aechmenthera tomentosa</i> Nees	S
<i>Barleria cristata</i> L.	H
<i>Dicliptera roxburghiana</i>	H
<i>Eranthemum nervosum</i> R. Br.	H
<i>Eranthemum palatiferum</i> Nees	S

Goldfussia discolor Nees	H
Lepidagathis incurva Buch-Ham	H
Phlogacanthus thyrsoiflorus Nees	S
Strobilanthus auriculatus Nees	S
Strobilanthus sp.	S

ACERACEAE

Acer oblongum DC.	T	Scarce
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AIZOACEAE

Glinus lotoides L.	H
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ALANGIACEAE

Alangium chinense (Lour.) Harms.	T
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AMARANTHACEAE

Achyranthes aspera L.	H
Aerva sanguinolenta (L.) Bl.	H
Alternanthera sessilis (L) R.Br.	H
Amaranthus gracilis Desf.	H
Amaranthus spinosus L.	H
Amaranthus viridis L.	H
Celosia argentea L.	H

Cyathula prostrata (L.) Bl. H

Deeringia amaranthoides (Lamk) Merr H

ANACARDIACEAE

Spondias axillaris Roxb T

Drimycarpus racemosus T

Lanea coromandelica L. T

Mangifera indica L. T

Mangifera sylvatica Roxb. T Amp

Pegia nitida Colebr. L Lahara amp

Rhus paniculata Hk.f. S

Spondias mangifera Willd. T

ANNONACEAE

Annona reticulata L. S Cultigen

Artabotrys caudatus Hk.f. & T. S

Fissistigma polyanthum (Hk.f.&T) Me S

Milusa macrocarpa Hk.f. & T. T

M. roxburghiana (Wall.) Hk.f. & T. T

Polyalthia simiarum (Hk.f.Thoms) T

APIACEAE

Centella asiatica L. H

Hydrocotyle javanica Thunb. H

Oenanthe stolonifera Wall. H

APOCYNACEAE

Alstonia scholaris (L.) R.Br. T

Beaumontia grandiflora Wall. C

Cryptolepis buchananii R.& S. C

Holarrhena antidysenterica (Rth)ADC ST

Ichnocarpus frutescens (L.) R.Br. C

Tabernaemontana divaricata (L) R.Br S

Trachelospermum lucidum K. Sc. C

Vallisneria spiralis (L.) O. Ktz. C

Vinca rosea L. S Garden escape

Wrightia arborea (Dennst.) Mab. T

AQUIFOLIACEAE

Ilex godjam (Colebr.) Hk.f. T Rare

ARALIACEAE

Aralia foliolosa Seem. ST

Brassaiopsis hainla (D.Don) Seem ST

Trevelia palmata ST

Schefflera venulosa S

ARISTOLOCHIACEAE

<i>Aristolochia tagala</i> Cham.	C	Rare
<i>Aristolochia cathcartii</i> Hk.f.	C	Rare

ASCLEPIADACEAE

<i>Calotropis gigantea</i> (L.) Dr.	S	
<i>Discidia bengalensis</i> Colebr.	C	

ASTERACEAE (=COMPOSITAE)

<i>Ageratum conyzoides</i> L.	H	W
<i>Artemisia vulgaris</i> Cl.	S	
<i>Bidens pilosa</i> L.	H	
<i>Blumea fistulosa</i> (Roxb.) Kurz.	H	
<i>Blumea sessiliflora</i> Decais.	H	
<i>Cotula hemisphaerica</i> (Roxb.) Wall.	H	
<i>Crassocephalum crepidioides</i>	H	
<i>Dichrocephala integrifolia</i> (L.f.)Kt	H	
<i>Elephantopus scaber</i> L.	H	
<i>Emilia sonchifolia</i> (L.) DC.	H	
<i>Eupatorium adenophorum</i>	H	W
<i>Eupatorium odoratum</i> L.	H	W
<i>Gnaphalium leuteo-album</i> L.	H	
<i>Gnaphalium purpureum</i> L.	H	
<i>Gynura nepalensis</i> DC.	H	

<i>Inula cappa</i> DC.	S	
<i>Inula</i> spp.	S	
<i>Lactuca rostratata</i> (Thunb.) Miq.	H	
<i>Mikania cordata</i> (Burm. f.) Roxb.	H	W
<i>Sonchus asper</i>	H	
<i>Tridax procumbens</i> L.	H	
<i>Vernonia cinerea</i> L. var <i>cinerea</i>	H	
<i>Vernonia volkamerifolia</i>	S	

BALSAMINACEAE

<i>Impatiens balsamina</i>	H	
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BARRINGTONIACEAE

(=LECYTHIDACEAE)

<i>Careya arborea</i> Roxb.	T	
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BEGONIACEAE

<i>Begonia nepalensis</i> (A. DC.) Warb.	H	
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<i>Begonia</i> sp.	H	
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BIGNONIACEAE

<i>Oroxylum indicum</i> (L.) Vent.	ST	
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<i>Stereospermum chelonioides</i> DC.	T	
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<i>S. suaveolens</i> L	T	
BISCHOFIACEAE		
<i>Bischofia javanica</i> Bl.	T	
BIXACEAE		
<i>Bixa orellana</i> L.	S	Cultigen
BOMBACACEAE		
<i>Bombax ceiba</i> L	T	
BORAGINACEAE		
<i>Cynoglossum furcatum</i> Wall.	H	W
BRASSICACEAE		
<i>Brassica campestris</i> L.	H	
<i>Lepidium virginicum</i> L.	H	
<i>Rorippa benghalensis</i> (DC.) Hara	H	
BUDLEJACEAE		
<i>Budleja asiatica</i> Lour.	S	
BURSERACEAE		
<i>Canarium strictum</i> Roxb.	T	
<i>Garuga floribunda</i> Decne	T	
CAESALPINIACEAE		

<i>Acrocarpus fraxinifolius</i> Arnott.	T	
<i>Bauhinia malabarica</i>	ST	
<i>Bauhinia purpurea</i> L.	T	
<i>Bauhinia scandans</i> L.	L	
<i>Bauhinia variegata</i> L.	T	
<i>Caesalpinia cucullata</i> Roxb.	C	
<i>Cassia alata</i> L.	S	
<i>Cassia fistula</i> L.	T	
<i>Cassia mimosoides</i> L.	H	
<i>Cassia tora</i> L.	H	W
<i>Delonix regia</i> (Hk.) Raf.	T	W

CACTACEAE

<i>Opuntia vulgaris</i> Mill.	S	
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CANNABACEAE

<i>Cannabis sativa</i> L.	H	W
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CAPPARACEAE

<i>Capparis assamica</i> Hk.f. & T.	ST	
<i>Capparis olacifolia</i> Hk.f.& T.	S	
<i>Crataeva religiosa</i> Forst.	T	

CAPRIFOLIACEAE

Viburnum colebrookianum Wall. S

CARYOPHYLLACEAE

Drynaria cordata L H

Polycarpon prostratum (Forsk.) Asch H

Stellaria media (L.) Vill. H

CELASTRACEAE

Celastrus paniculatus Willd. S

Rare *Euonymus*

attenuatus Laws. S

Xylosma longifolium Clos. S

CHENOPODIACEAE

Chenopodium album L. H

Chenopodium ambrosioides L. H

CLUSIACAE (= GUTTIFERAE)

Calophyllum polyanthum Choisy T

Garcinia sopsopia (Ham.) Mab. T

Garcinia xanthochymus Hk. f. T

Rare *Mesua ferrea* L. T

Rare COMBRETACEAE

<i>Combretum acuminatum</i>	L
<i>Combretum flagrocarpum</i> Cl.	L
<i>Combretum punctatum</i> Bl.	L
<i>Terminalia bellirica</i> (Gaertn) Roxb.	T
<i>Terminalia chebula</i> Retz.	T
<i>Terminalia myriocarpa</i>	T
<i>Terminalia tomentosa</i>	T

CONVOLVULACEAE

<i>Argyreia capitata</i> (Vahl) Arn. ex Ch	C
<i>Argyreia nervosa</i> (Burm.f.) Boj.	C
<i>Argyreia roxburghii</i> Choisy	C
<i>Ipomoea kingii</i> Prain.	C
<i>Ipomoea</i> spp.	C
<i>Merremia umbellata</i> (L.) Hall	C

CORDIACEAE

<i>Cordia dichotoma</i> Forst.f.	T
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CRASSULACEAE

<i>Kalanchoe pinnata</i> (Lamk.) Pers.	H
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CUCURBITACEAE

<i>Gymnopetalum cochinchinense</i> (Lour)K.	C
<i>Hodgsonia macrocarpa</i> (Bl.) Cogn.	L
<i>Melothria maderaspatana</i> (Linn) Cogn	C

CUSCUTACEAE

<i>Cuscuta reflexa</i> Roxb.	C
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DATISCAEEAE

<i>Tetrameles nudiflora</i> R. Br.	T
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DILLENIAEEAE

<i>Dillenia indica</i> L.	T
<i>Dillenia pentagyna</i> Roxb	T
<i>Tetracera sarmentosa</i> Cl.	C

DIPTEROCARPACEAE

<i>Shorea robusta</i> Gaertn.	T
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EBENACEAE

<i>Diospyros montana</i> Roxb.	ST	Rare
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EHRETIACEAE

<i>Ehretia acuminata</i> R. Br.	ST
<i>E. wallichiana</i> Hk. f. & T.	ST

ELAEAGNACEAE

Elaeagnus pyriformis Hk.f. S

ELAEOCARPACEAE

Echinocarpus assamicus Benth T

Elaeocarpus tectorius (Lour.) Poir T

Elaeocarpus varunua Masters. T

Sloana sterculiacea (Benth) Rehd. T

EUPHORBIACEAE

Alchornea tiliifolia (Benth) Muell ST

Antidesma acuminatum Wight S

Antidesma diandrum (Roxb.) Roth. S

Aporusa octandra (D.Don) Vick. T

Baccauria ramiflora Lour. T

Baliospermum axillare Bl. S

Bischofia javanica Bl. T

Bridelia retusa Spreng T

Bridelia sikkimensis Gehr. S

Bridelia tomentosa Bl. T

Croton bonplandianus Bail. S

Croton caudatus Geisel C

Croton joufra Roxb. S

Croton roxburghii Balak. S

<i>Cleidion spiciflorum</i> (Burm.f.) Merr	ST	
<i>Euphorbia antiquorum</i> L.	S	Exotic
<i>Euphorbia hirta</i> L.	H	
<i>Flueggea virosa</i> (Willd.) Voig.	S	
<i>Glochidion assamicum</i> (Mueller)Hk.f.	T	
<i>Glochidion oblatum</i> Hk.f.	T	
<i>Homonoia riparia</i> Lour.	S	
<i>Jatropha curcas</i> L	S	
<i>Macaranga denticulata</i> (Bl.) Muell-A	T	
<i>Mallotus philippinensis</i> (Lamk) Muel	ST	
<i>Mallotus roxburghianus</i> Muell.	S	
<i>Mallotus</i> sp.	S	
<i>Ostodes paniculata</i> Bl.	S	
<i>Phyllanthus debilis</i> Willd.	H	
<i>Phyllanthus emblica</i> L.	T	
<i>Phyllanthus parviflora</i> D. Don	S	
<i>Phyllanthus reticulatus</i> Poir.	S	
<i>Sapium baccatum</i> Roxb.	T	
<i>Sapium insigne</i> Benth.	T	
 FABACEAE (=PAPILIONACEAE)		
<i>Abrus pulchellus</i> Thw.	C	
<i>Butea monosperma</i> (Lamk.) Taub.	T	

<i>Butea parviflora</i> Roxb.	L
<i>Cantharospermum scarabaeoides</i> (L.)B	H
<i>Crotalaria albida</i> Heyne ex Roxb	H
<i>Crotalaria anagyroides</i> H.B. & K	H
<i>Crotalaria pallida</i> Aiton	H
<i>Dalbergia pinnata</i> (Lour.) Prain.	ST
<i>Dalbergia rimosa</i> Roxb.	S
<i>Dalbergia sericea</i> G.Don	T
<i>Dalbergia sissoo</i> Roxb.	T
<i>Dalbergia stipulacea</i> Roxb.	S
<i>Derris robusta</i> (Roxb ex DC) Benth.	C
<i>Desmodium gangeticum</i> (L.) DC.	H
<i>Desmodium laxum</i> DC.	H
<i>Desmodium khasianum</i> Prain	S
<i>Desmodium multiflorum</i> DC.	H
<i>Desmodium pulchellum</i> (L.) Benth.	H
<i>Desmodium triangulare</i> (Retz.) Merr.	H
<i>Desmos dumosus</i> (Roxb.) Saff.	C
<i>Erythrina stricta</i> Roxb.	T
<i>Erythrina suberosa</i>	T
<i>Flemingia macrophylla</i> (Willd.) Prai	S
<i>Flemingia strobilifera</i> (L.) R.Br.	S
<i>Indigofera dosua</i> D. Don	H

<i>Lablab purpureus</i> (L.) Sw.	C
<i>Mastersia assamica</i> Benth.	L
<i>Millettia extensa</i> (Benth.) Baker	C
<i>Millettia pachycarpa</i> Benth.	C
<i>Mucuna imbricata</i> Baker	C
<i>Mucuna macrocarpa</i> Wall.	C
<i>Puereria phaseoloides</i> (Roxb.) Benth	C
<i>P. sikkimensis</i> Prain	C
<i>Shuteria involucrata</i> (Wall.) Wt. & Arn	C
<i>Tephrosia candida</i> (Roxb.) Dc.	S
<i>Uraria picta</i> Desv.	H
<i>Vigna trilobata</i> (L) Verd.	H

FAGACEAE

<i>Castanopsis hystrix</i>	T
<i>Castanopsis indica</i> (Roxb.) A. DC.	T
<i>Castanopsis tribuloides</i> (Sm.) A.DC.	T
<i>Lithocarpus elegans</i> (Blume)	T
<i>Lithocarpus fenestratus</i> (Roxb.) Reh	T

FLACOURTIACEAE

<i>Casearia graveolens</i> Dalz.	ST
<i>Gynocardia odorata</i> R. Br.	ST

Flacourtia jangomas (Lour.) Rae. ST

GESNERIACEAE

Aeschynanthus parasitica Cl. C

Aeschynanthus superba Cl. C

HAMAMELIDACEAE

Altingia excelsa Nor. T

HIPPOCASTANACEAE

Aesculus assamica Griff. T

HIPPOCRATEACEAE

Reissantia arborea (Roxb.) Hara C

ICACINACEAE

Natsiatum herpeticum Buch-Ham. C

JUGLANDACEAE

Engelhardia spicata Blume T

LAMIACEAE

Acrocephalus indicus H

Anisochilus pallidus Wall. H

<i>Anisochilus polystachys</i> Benth.	H
<i>Anisomeles indica</i> (L.) Ktz.	H
<i>Coleus</i> spp.	H
<i>Hyptis suaveolens</i> (L.) Poit.	H
<i>Ocimum basilicum</i> Linn	H
<i>Mentha piperata</i>	H
<i>Perilla frutescens</i>	H
<i>Plectranthus ternifolius</i> D.Don	S
<i>Pogostemon auricularius</i> (L.) Hassk.	H
<i>Teucrium viscidum</i> Bl.	H

LAURACEAE

<i>Actinodaphne obovata</i> (Nees) Bl.	T
<i>Alseodaphne owdenii</i> Park.	T
<i>Beilschmiedia dalzellii</i> (Meis.) Kos	T
<i>Cinnamomum cecidophne</i>	T
<i>Cinnamomum obtusifolium</i> Nees	T
<i>Cinnamomum tamala</i> Nees	T
<i>Litsea glutinosa</i> (Lour) C.B. Robins	T
<i>Litsea laeta</i> (Nees) Hk. f.	ST
<i>Litsea monopetala</i> (Roxb) Pers.	T
<i>Litsea salicifolia</i> (Nees) Hk.f.	T
<i>Neolisteia cuipala</i> (D. Don) Kost	S

<i>Persia glaucescens</i> (Nees) Long	T	
<i>Phoebe attenuata</i> Nees	T	
<i>Phoebe goalparensis</i>	T	Rare
<i>Phoebe lanceolata</i> (Nees) Nees	T	

LECYTHIDACEAE

<i>Careya arborea</i> Roxb.	T	Kumbhi
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LEEACEAE

<i>Leea acuminata</i> Wall. ex Cl.	S	
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<i>Leea aequata</i> L.	S	
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<i>Leea alata</i> Edgew.	S	
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LORANTHACEAE

<i>Dendrophthoe falcata</i> (L.f.) Ett	S	
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<i>Viscum monoicum</i> DC	S	
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LYTHRACEAE

<i>Lagerstroemia parviflora</i> Roxb.	T	
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<i>Lagerstroemia speciosa</i> (L.) Pers.	T	
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<i>Woodfordia fruticosa</i> Kurz.	S	
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MAGNOLIACEAE

<i>Magnolia pterocarpa</i> Roxb	T	
<i>Michelia champaca</i> L	T	
<i>Michelia doltsopa</i> DC.	T	Rani champ
<i>Michelia velutina</i> DC.	T	Goge champ
<i>Talauma hodgsonii</i> Hk. f. & T.	T	

MALPIGHIACEAE

<i>Hiptage benghalensis</i> (L.) Kurz.	L	
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MALVACEAE

<i>Abelmoschus pungens</i> Roxb.	H	
<i>Hibiscus</i> sp.	H	
<i>Kydia calycina</i> Roxb.	T	
<i>Malvastrum coromandalicum</i>	H	W
<i>Sida acuta</i> Brum.f.	H	W
<i>Sida cordata</i> (Burm. f.) Bors.	H	W
<i>Sida rhombifolia</i> L.	H	W
<i>Urena lobata</i> L	S	

MELASTOMACEAE

<i>Medinilla erythrophylla</i> Lindl.	S	
<i>Melastoma malabathricum</i> L.	S	
<i>Osbeckia rostrata</i> D.Don.	S	

<i>Osbeckia stellata</i> Ker - Gaw	S
<i>Oxyspora cernua</i> (Roxb.) Tr	S

MELIACEAE

<i>Aglaia perviridis</i> Hier.	T	
<i>Aphanamixis polystachya</i> (Wall) Park	T	
<i>Aphanamixis wallichii</i>	T	
<i>Chisocheton paniculatus</i> (Roxb.) Hie	T	
<i>Chukrasia tabularis</i> A.Juss.	T	
<i>Dysoxylum binectariferum</i> (Roxb) Hk.	T	
<i>Dysoxylum excelsum</i> Bl.	T	
<i>Dysoxylum grande</i> Hier.	T	
<i>Heynia trijuga</i> Roxb.	ST	
<i>Melia azedarach</i> L.	T	Cultigen
<i>Sphaerosacme decandra</i> (Wall.) Pen.	T	
<i>Toona ciliata</i>	T	
<i>Walsura tubulata</i>	T	

MENISPERMACEAE

<i>Cissampelos pariera</i> L	C
<i>Cocculus laurifolius</i> DC	S
<i>Parabaena sagittata</i> Hk. f. & T.	C
<i>Tinospora cordifolia</i>	C

Stephania japonica C

MIMOSACEAE

Acacia catechu Willd. T

Acacia oxyphylla Grah. ex Craib. T

Acacia pennata (L.) Willd. L

Acacia rugata (Lamk.) Voigt. C

Acacia sherriffii Baker T

Albizia chinensis (Osb.) Mer T

Albizia lebbek (L.) Benth T

Albizia odoratissima (L.f.) Benth. T

Albizia procera (Roxb) Benth. T

Entada rheedii Spreng. C

Mimosa himalayana Gamble S

Mimosa pudica L H

MORACEAE

Artocarpus chama Hamilton T

Artocarpus heterophyllus Lamk. T Cultigen

Ficus benghalensis L. T

Ficus cyrtophylla Miquel T

Ficus drupacea Thunberg T

Ficus elastica Horn. T

<i>Ficus glaberrima</i> Blume	T
<i>Ficus heterophylla</i> L.f.	T
<i>Ficus hirta</i>	S
<i>Ficus hispida</i> L.f.	T
<i>Ficus mysorensis</i>	T
<i>Ficus nemoralis</i>	T
<i>Ficus religiosa</i> L	T
<i>Ficus rumphii</i> Blume	T
<i>Ficus sarmentosa</i> J.E. Smith	S
<i>Ficus semicordata</i> Buch.-Ham.	T
<i>Ficus subincisa</i> Sm.	ST Lutey Khanieu
<i>Ficus virens</i> Aiton	T
<i>Maclura cochinchinensis</i> (Lour.) Cor	T
<i>Morus australis</i> Poiret	T
<i>Morus macroura</i> Miquel	T
<i>Streblus asper</i> Lour.	T
MORINGACEAE	
<i>Moringa oleifera</i> Lamk.	T
MYRISTICACEAE	
<i>Knema tenuinervia</i> de Wilde	T
MYRSINACEAE	
<i>Ardisia solanacea</i> Roxb.	S

<i>Maesa indica</i> (Roxb) DC	S	
<i>Myrsine semiserrata</i>	S	
MYRTACEAE		
<i>Syzygium cumini</i> (L.) Skeels	T	
<i>Syzygium claviflorum</i> (Roxb.) Long	T	
<i>Syzygium formosum</i> (Wall.) Mas.	T	
<i>Syzygium jambos</i> (L.) Alston	T	Rare
<i>Syzygium oblatum</i> (Roxb.) Wall.	T	
<i>Syzygium praecox</i> (Roxb.) Rath	T	
<i>Syzygium ramocissimum</i> Wall. ex Duth	T	
<i>Syzygium smalianum</i> (Brandis) Long	T	

NYCTAGINACEAE

<i>Boerhavia coccinea</i> Miller	H	
<i>Nyctanthes arbor-tristis</i>	S	Cultigen

OLACACEAE

<i>Erythralium scandens</i> Bl.	C	
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OLEACEAE

<i>Jasminum pubescens</i> Willd.	S	
<i>Jasminum anastomosans</i> Wall. ex DC.	S	
<i>Jasminum caudatum</i> Wall. ex Lindl.	S	

ONAGRACEAE

Ludwigia octovalvis H

OXALIDACEAE

Biophytum reinwardtii (Zucc.) Klotz H

Oxalis corniculata L H

Oxalis corymbosa DC. H

PIPERACEAE

Piper betleoides C.DC. C (climbing shrub)

Piper longum L. C (climbing shrub)

Piper mullesua D.Don S

Piper pedicellatum C. DC. C

Piper rhytidocarpum Hk. f. & T. C

PLUMBAGINACEAE

Plumbago zeylanica L S Rare

POLYGALACEAE

Polygala chinensis L H

POLYGONACEAE

Persicaria hydropiper (L.) Spach. H

Persicaria orientalis (L.) Spach. H

<i>Polygonum barbatum</i> L	H
<i>Polygonum capitatum</i>	H
<i>Polygonum chinense</i> L.	H
<i>Polygonum plebeium</i> R. Br.	H
<i>Polygonum posumbu</i> D.Don	H
<i>Polygonum strigosum</i> Br.	H

PROTEACEAE

<i>Helicia nilagirica</i>	T
<i>Heliciopsis terminalis</i> (Kurz) Sleu	ST

RANUNCULACEAE

<i>Clematis acuminata</i> DC	C
<i>Clematis gouriana</i> Roxb.	C
<i>Ranunculus</i> spp.	H

RHAMNACEAE

<i>Gouania leptostachya</i> DC	C
<i>Hovenia acerba</i> Lindl.	T
<i>Rhamnus nepalensis</i> (Wall.) Laws.	C
<i>Ventilago madraspatana</i> Gaertn.	C
<i>Zizyphus mauritiana</i> Lamk	S
<i>Zizyphus rubiginosa</i> Long & Rae	S

RHIZOPHORACEAE

Carallia brachiata (Lour) Merr T

ROSACEAE

Prunus ceylanica (Wight) Miq. ST

Rubus biflorus S

Rubus insignis Hk.f. S

Rubus niveus S

Rubus paniculatus Sm. S

RUBIACEAE

Anthocephalus chinensis (Lamk) Rich S

Borreria articularis (L.) K. H

Cephalanthus occidentalis L T Kalikath

Coffea bengalensis Roxb. S

Hedyotis costata (Roxb.) Kurz. S

Hedyotis scandens D.Don S

Hymenodictyon exelsum Wall. T

Hyptianthera stricta S

Ixora acuminata Roxb. S

Morinda angustifolia Roxb S

Paedara foetida L. C

Biri lahara

<i>Pavetta indica</i> L.	S
<i>Psychotria denticulata</i> Wall	S
<i>Randia spinosa</i> (Thunb.) Poir.	S
<i>Thecagonum ovalifolium</i>	H
<i>Uncaria pilosa</i> Roxb	C
<i>Uncaria sessilifructus</i> Roxb.	S

RUTACEAE

<i>Acronychia pedunculata</i> (L.) Miq	T	
<i>Aegle marmelos</i> Cor	T	Rare
<i>Citrus latipes</i> (Sw.) Tam.	S	
<i>Clausena pentaphylla</i> DC.	S	
<i>Glycosmis arborea</i> (Roxb) Corr.	S	
<i>Glycosmis cymosa</i> (Kurz) Nar.	S	
<i>Micromelum integerrimum</i> (Roxb.) WA	S	
<i>Murraya koenigii</i> (L.) Spreng	S	
<i>Murraya paniculata</i> (L.) Jack	S	
<i>Toddalia asiatica</i> (L.) Lamk.	C	
<i>Zanthoxylum armatum</i> DC.	S	
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	T	

SABIACEAE

<i>Meliosma simplicifolia</i> (Roxb) Walp	T
<i>Sabia lanceolata</i> Colebr.	S

SAPINDACEAE

<i>Allophyllus chartaceus</i> (Kurz) Radl	S
<i>Lepisanthus senegalensis</i> (Poir) Lee	S
<i>Litchi chinensis</i> Sonner	ST
<i>Sapindus rarak</i> DC.	T

SAPOTACEAE

<i>Bassia butyracea</i> Roxb.	T
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SAURAUACEAE (= ACTINIDIACEAE)

<i>Saurauja armata</i> Kurz	S
<i>Saurauja fasciculata</i> Wall	S
<i>Saurauja napaulensis</i> DC.	ST
<i>Saurauja roxburghii</i> Wall.	T

SCROPHULARIACEAE

<i>Limnophila heterophylla</i> Benth	H
<i>Lindernia ciliata</i> (Colsm) Pennell.	H
<i>Lindernia ruelloides</i> (Colsm) Pennell	H
<i>Veronica</i> spp.	H

SIMAROUACEAE

<i>Ailanthus integrifolia</i> Lamk.	T
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Brucea mollis Kurz. T

SOLANACEAE

Solanum erianthum D. Don S

(= *S. verbascifolium* non L.)

Solanum crassipetalum Wall. H

Solanum nigrum L. H

Solanum toruvum Sw. H

Solanum violaceum Ort. S

SONNERATIACEAE

Duabanga grandiflora (Roxb ex DC) Wa T

STAPHYLEACEAE

Turpinia nepalensis Wall. ex W.A. S

Turpinia pomifera (Roxb) DC. T

STERCULIACEAE

Byttneria aspera C

Byttneria grandiflora DC C

Firmiana colorata T

Pterospermum acerifolium Willd T

Pterygota alata (Roxb.) R. Br. T

<i>Sterculia villosa</i> Roxb	T	
TAMARICACEAE		
<i>Tamarix diocia</i> Roxb.	T	
THEACEAE		
<i>Camellia kissii</i> Wall.	S	
<i>Camellia sinensis</i>	S	Cultigen
<i>Eurya acuminata</i> DC.	S	
<i>Schima wallichii</i> (DC) Ker.	T	
THUNBERGIACEAE		
<i>Thunbergia coccinea</i>	C	
THYMELIACEAE		
<i>Aquillaria malaccensis</i> Lamk.	T	Rare
TILIACEAE		
<i>Grewia elastica</i> Royle	T	
<i>Grewia eriocarpa</i> Juss.	ST	
<i>Grewia glabra</i> Bl.	T	
<i>Grewia multiflora</i> Juss.	T	
<i>Grewia sapida</i> Roxb.	T (?shrub)	

Triumfetta rhomboidea Jacq. H

ULMACEAE

Celtis tetrandra Roxb. T (?perennial herb)

Trema politoria Planch. T

Trema tomentosa (Roxb.) Hara S

URTICACEAE

Boehmeria glomerulifera Miq. S

Boehmeria macrophylla Hornemann S

Boehmeria malabarica Wedd. S

Boehmeria sidaefolia Wedd. S

Debregeasia wallichiana Wedd ST

Elatostema hookerianum Weddell H

Elatostema rupestre (D. Don) Weddell H

Elatostema sessile Forster H

Girardiana diversifolia (Link) Frii H Nettle

Laportea terminalis Wight S Nettle

Lecanthus peduncularis (Royle) Wedd H

Oreocnide rubescens (Bl.) Miq. S

Pilea anisophylla Leveille H

Pilea caveana Grier. & Long H

Pilea glaberrima (Blume) Blume H

<i>Pouzolzia hirta</i> (Blume) Hasskarl	H	
<i>Pouzolzia pentandra</i> Benn.	H	
<i>Sarcochlamys pulcherrima</i> Gaud.	S	
<i>Urtica parviflora</i> Roxb.	H	Nettle

VACCINIACEAE

<i>Agapetes saligna</i> Hk. f.	S	Epiphyte
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VERBENACEAE

<i>Callicarpa macrophylla</i>	S	
<i>Callicarpa arborea</i>	ST	
<i>Caryopteris paniculata</i>	S	
<i>Caryopteris wallichiana</i> Sch.	S	
<i>Clerodendrum viscosum</i> Vent.	S	
<i>Gmelina arborea</i> Roxb.	T	
<i>Holmskioldia sanguinea</i> Retz.	S	
<i>Lantana camara</i> L	S	
<i>Premna bengalensis</i> Cl.	T	
<i>Premna latifolia</i> Roxb.	T	
<i>Tectona grandis</i>	T	
<i>Vitex altissima</i>	T	
<i>Vitex glabrata</i> R.Br.	S	
<i>Vitex negundo</i> L	S	

VITACEAE

<i>Caryota aponica</i>	C
<i>Cayratia pedata</i> (Lour) Gagnep.	C
<i>Cissus adnata</i> Roxb.	C
<i>Tetrastigma bracteolatum</i> (Wall.) Pl	C
<i>Tetrastigma campylocarpum</i> (Kurz) Pla	C
<i>Tetrastigma leucostaphylum</i> (Dennst)	C
<i>Tetrastigma serrulatum</i> (Roxb.) Pl.	C

Annex 2: List of Mammalian Species Recorded in PWS and their Conservation Status

Source: Thinley P and Jigme K/ Wildlife Conservation Division, DoFPS (2010)

Species	Scientific Name	IUCN Red List Status	FNCA 1995	CITES Appendix
Asiatic Gold Cat	<i>Pardofelis temminckii</i>	Near threatened		I
Bat	<i>Species not determined</i>			
Chital	<i>Axis axis</i>	Least concern	Schedule I	No status
Large Indian Civet	<i>Viverra zibetha</i>	Near threatened		III
Comon Langur	<i>Semnopithecus entellus</i>	Least concern		I
Dhole	<i>Cuon alpinus</i>	Endangered		II
Elephant	<i>Elephas maximus</i>	Endangered	Schedule I	I
Gaur	<i>Bos gaurus</i>	Vulnerable	Schedule I	I
Malayan Giant Squirrel	<i>Ratufa bicolor</i>	Near threatened		II
Golden Langur	<i>Trachypithecus geei</i>	Endangered	Schedule I	I
Hog deer	<i>Axis porcinus</i>	Endangered		I
Leopard	<i>Panthera pardus</i>	Near threatened	Schedule I	I
Indian gray Mongoose	<i>Herpestes edwardsii</i>	Least concern		III
Barking deer	<i>Muntiacus muntjac</i>	Least concern		No status
Indian crested porcupine	<i>Hystrix indica</i>	Least concern		No status
Rhesus Macaque	<i>Macaca mulatta</i>	Least concern		No status
Sambar	<i>Rusa unicolor</i>	Vulnerable		No status
Tiger	<i>Panthera tigris</i>	Endangered	Schedule I	I
Wild pig	<i>Sus scrofa</i>	Least concern		No status
Yellow Throated Marten	<i>Martes flavigula</i>	Least concern		III

Annex 3: List of Bird Species Recorded in PWS

Source: Wildlife Conservation Division, DoFPS, 2010

Common Name	Scientific Name
Aberrant Bush Warbler	<i>Cettia flavolivacea</i>
Ashy Bulbul	<i>Hemixos flavala</i>
Ashy Drongo	<i>Dicrurus leucophaeus</i>
Asian Barred Owlet	<i>Glucidium brodiei</i>
Asian Fairy Bluebird	<i>Irena puella</i>
Asian Palm Swift	<i>Cypsiurus balasiensis</i>
Asian Pied Starling	<i>Sturnus contra</i>
Barred Cuckoo Dove	<i>Macropygia unchall</i>
Bar-winged Flycatcher-shrike	<i>Hemipus picatus</i>
Bay Woodpecker	<i>Blythipicus pyrrhotis</i>
Black Bulbul	<i>Hypsipetes leucocephalus</i>
Black Eagle	<i>Ictinaetus malayensis</i>
Black Stork	<i>Ciconia nigra</i>
Black-backed Forktail	<i>Enicurus immaculatus</i>
Black-crested Bulbul	<i>Pycnonotus jocosus</i>
Black-hooded Oriole	<i>Oriolus tenuirostris</i>
Black-naped Monarch	<i>Hypothymis azurea</i>
Black-throated Sunbird	<i>Aethopyga saturate</i>
Blue Rock Thrush	<i>Monticola solitaries</i>
Blue-bearded Bee-eater	<i>Nyctyornis athertoni</i>
Blue-throated Barbet	<i>Megalaima asiatica</i>
Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>
Blue-winged Minla	<i>Minla cyanouroptera</i>
Blyth's Kingfisher	<i>Alcedo Hercules</i>
Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>
Bronzed Drongo	<i>Dicrurus aeneus</i>
Brown Dipper	<i>Cinclus pallasii</i>
Buff-barred Warbler	<i>Phylloscopus pulcher</i>
Chestnut-headed Tesia	<i>Tesia castaneocoronata</i>
Chestnut-tailed Starling	<i>Sturnus malabaricus</i>
Citrine Wagtail	<i>Motacilla citreola</i>
Collared Falconet	<i>Microhierax caerulescens</i>
Common Buzzard	<i>Buteo buteo</i>
Common Green Magpie	<i>Cissa chinensis</i>

Common Hawk Cuckoo	<i>Hierococcyx varius</i>
Common Hoopoe	<i>Upupa epops</i>
Common Iora	<i>Aegithina tiphia</i>
Common Kingfisher	<i>Alcedo atthis</i>
Common Myna	<i>Acridotheres tristis</i>
Common Sandpiper	<i>Actitis hypoleucos</i>
Common Stonechat	<i>Saxicola torquata</i>
Common Tailorbird	<i>Orthotomus sutorius</i>
Crested Bunting	<i>Melophus lathami</i>
Crested Kingfisher	<i>Megaceryle lugubris</i>
Crested Serpent Eagle	<i>Spilornis cheela</i>
Crimson Sunbird	<i>Aethopyga siparaja</i>
Crow-billed Drongo	<i>Dicrurus annectans</i>
Fire-breasted Flowerpecker	<i>Dicaeum ignipectus</i>
Golden Babbler	<i>Stachyris chrysaea</i>
Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>
Golden-spectacled Warbler	<i>Seicercus burkii</i>
Great Barbet	<i>Megalaima virens</i>
Great Hornbill	<i>Buceros bicornis</i>
Greater Flameback	<i>Chrysocolaptes lucidus</i>
Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>
Greater Yellownape	<i>Picus flavinucha</i>
Green Imperial Pigeon	<i>Ducula aenea</i>
Green Sandpiper	<i>Tringa ochropus</i>
Grey Bushchat	<i>Saxicola ferrea</i>
Grey Peacock Pheasant	<i>Polyplectron bicalcaratum</i>
Grey Treepie	<i>Dendrocitta formosae</i>
Grey-backed Shrike	<i>Lanius tephronotus</i>
Grey-cheeked Warbler	<i>Seicercus poliogenys</i>
Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>
Hill Myna	<i>Gracula religiosa</i>
Hill Prinia	<i>Prinia atrogularis</i>
Indian Peafowl	<i>Pavo cristatus</i>
Indian Roller	<i>Coracias benghalensis</i>
Large Niltava	<i>Niltava grandis</i>
Large Woodshrike	<i>Tephrodornis gularis</i>
Large-billed Crow	<i>Corvus macrorhynchos</i>
Lemon-rumped Warbler	<i>Phylloscopus chloronotus</i>

Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>
Lineated Barbet	<i>Megalaima lineate</i>
Little Forktail	<i>Enicurus scouleri</i>
Little Heron	<i>Butorides striatus</i>
Little Pied Flycatcher	<i>Ficedula westermanni</i>
Little Spiderhunter	<i>Arachnothera longirostra</i>
Maroon Oriole	<i>Oriolus traillii</i>
Mountain Bulbul	<i>Hypsipetes mcclllandii</i>
Mountain Hawk Eagle	<i>Spizaetus nipalensis</i>
Mountain Imperial Pigeon	<i>Ducula badia</i>
Olive-backed Pipit	<i>Anthus hodgsoni</i>
Orange-bellied Leafbird	<i>Chloropsis hardwickii</i>
Oriental Magpie Robin	<i>Copsychus saularis</i>
Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>
Oriental Turtle Dove	<i>Streptopelia orientalis</i>
Oriental White-eye	<i>Zosterops palpebrosus</i>
Paddyfield Pipit	<i>Anthus rufulus</i>
Pin-tailed Green Pigeon	<i>Treron apicauda</i>
Plumbeous Water Redstart	<i>Rhyacornis fuliginosus</i>
Puff-throated Babbler	<i>Pellorneum ruficeps</i>
Red Collared Dove	<i>Streptopelia tranquebarica</i>
Red Junglefowl	<i>Gallus gallus</i>
Red-headed Trogon	<i>Harpactes erythrocephalus</i>
Red-tailed Minla	<i>Minla ignotincta</i>
Red-vented Bulbul	<i>Pycnonotus cafer</i>
Red-wattled Lapwing	<i>Vanellus indicus</i>
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
River Lapwing	<i>Vanellus duvaucelii</i>
Rock Pigeon	<i>Columba livia</i>
Rose-ringed Parakeet	<i>Psittacula krameri</i>
Rufous-bellied Niltava	<i>Niltava sundara</i>
Rufous-fronted Babbler	<i>Stachyris rufifrons</i>
Rufous-necked Hornbill	<i>Aceros nipalensis</i>
Rufous-necked Laughingthrush	<i>Garrulax ruficollis</i>
Scarlet Minivet	<i>Pericrocotus flammeus</i>
Shikra	<i>Accipiter badius</i>
Silver-eared Mesia	<i>Leiothrix argentauris</i>
Slaty-backed Forktail	<i>Enicurus schistaceus</i>

Small Niltava	<i>Niltava macgrigoriae</i>
Smoky Warbler	<i>Phylloscopus fulgiventer</i>
Spangled Drongo	<i>Dicrurus hottentottus</i>
Speckled Piculet	<i>Picumnus innominatus</i>
Spotted Dove	<i>Streptopelia chinensis</i>
Spotted Forktail	<i>Enicurus maculates</i>
Streaked Spiderhunter	<i>Arachnothera magna</i>
Striped Tit Babbler	<i>Macronous gularis</i>
Sultan Tit	<i>Melanochlora sultanea</i>
Wedge-tailed Green Pigeon	<i>Treron sphenura</i>
Whiskered Yuhina	<i>Yuhina flavicollis</i>
White Wagtail	<i>Motacilla alba</i>
White-bellied Yuhina	<i>Yuhina zantholeuca</i>
White-capped Water Redstart	<i>Chaimarrornis leucocephalus</i>
White-crested Laughingthrush	<i>Garrulax leucolophus</i>
White-throated Fantail	<i>Rhipidura albicollis</i>
White-throated Kingfisher	<i>Halcyon smyrnensis</i>
White-vented Myna	<i>Acridotheres cinereus</i>
Wreathed Hornbill	<i>Aceros undulates</i>
Yellow-bellied Fantail	<i>Rhipidura hypoxantha</i>

Annex 4: Indicative Time Table

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
Component 1.1: Human-Wildlife Conflicts Management					
➤ Construction of solar-powered electric fences in at least two locations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Installation of 50 units of (ultra-sonic) sound-based repellent and alarm devices in areas not covered by electric fencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Provision of powerful searchlights and other appropriate mechanical devices on a group basis to all local communities to deter wildlife incursions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Enrichment of salt licks which are distant from agricultural settlements and vegetation in the elephant corridors/ passages linking the salt licks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Introduction and operationalization of community-based crop and livestock insurance schemes in at least two communities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Promotion of alternate cropping system on a pilot scale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Promotion of alternate livelihood activities (e.g. sustainable harvesting of NTFPs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
Component 1.2: Anti-Poaching					
➤ Increased frequency of long-distance patrolling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Training for a core group of 10 (ten) PWS staff in advanced anti-poaching techniques in two batches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ First-aid and arms handling training for all PWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Annual training workshops on communication and intelligence-sharing for all law enforcement agencies (in and around) PWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Annual inter-agency coordination workshops between head officials of all law enforcement and civil administrative bodies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Preparation of advocacy materials (detailed analytical report and visual presentation) to support infusion of cross-border poaching as a major issue of deliberation in the High Level Border Coordination Meeting between India and Bhutan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
➤ Preparation of annual report on cross-border poaching in PWS to support deliberation at the High Level Border Coordination Meeting between India and Bhutan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Field-level exchange/ coordination events between PWS staff and their Indian counterparts on a half-yearly basis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Component 1.3: Sustainable Grazing and Livestock Management					
➤ Support/ incentives to interested farmers for swapping unproductive cattle breeds with improved cattle breeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Support for improvement of local veterinary services required by farmers to maintain improved cattle breeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Support to local communities for procurement of power tillers with the objective of reducing draught cattle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Introduction of improved grazing practices through training and extension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Promotion of homestead fodder tree plantations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Designation of community areas for grazing and facilitation of the preparation of grazing management plans for the designated areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
Component 2.1: Infrastructure Development					
➤ Construction of park outpost at Longashir	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Construction of park outposts at Nichula, Pingkhua and Dhaneshri	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Construction of a field conservation research station at Phibsoo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Renovation and maintenance of office buildings and staff quarters in PWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Improvement of access road (36 km) to PWS head office at Phibsoo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Component 2.2: Equipments					
➤ Procurement of equipments for camping, surveillance and navigation	<input type="checkbox"/>	<input type="checkbox"/>			
➤ Procurement of radio communication equipment (wireless radio sets and walkie-talkie)	<input type="checkbox"/>	<input type="checkbox"/>			
➤ Procurement of 3 (three) motor bikes and 1 (one) tractor)	<input type="checkbox"/>				
➤ Procurement of a four-wheel drive pick-up			<input type="checkbox"/>		
➤ Procurement of audiovisual equipments for conservation education and awareness-building			<input type="checkbox"/>		
Component 3.1: Research and Information Development					
➤ Comprehensive surveys of mammals, birds and vegetation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
➤ Preliminary baseline surveys of herpeto-fauna, fish and butterflies	<input type="checkbox"/>	<input type="checkbox"/>			
➤ Field-based studies on the socio-economic and ecological dynamics of human-wildlife conflicts in PWS and the effectiveness of existing mitigation measures		<input type="checkbox"/>	<input type="checkbox"/>		
➤ Studies on the ecology of PWS flagship/ keystone species		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Habitat management trials (alluvial grasslands and sal-bearing forests)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Study on the potential of community-based nature tourism in PWS		<input type="checkbox"/>			
➤ Establishment of information resource facility within the proposed field conservation research station at Phibsoo			<input type="checkbox"/>	<input type="checkbox"/>	
Component 3.2: Conservation Education and Awareness-Building					
➤ Development of communication and awareness-building materials highlighting the conservation significance of PWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Establishment of, and support to, eco-clubs in at least two local schools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Farmers' study to other protected areas in and around Bhutan	<input type="checkbox"/>		<input type="checkbox"/>		

Component/ Activity	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
➤ Conservation awareness campaign for local communities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Installation of park signage/ information boards at various locations in PWS	<input type="checkbox"/>				
➤ Training for a group of 15 PWS and gewog RNR extension staff, in three batches, in approaches and techniques for social mobilization and community action to address conservation problems and needs		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Annex 5: Detailed Budget by Activity and Year

(All figures are in Ngultrum)

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Component 1.1: Human-Wildlife Conflicts Management							
Construction of solar-powered electric fences in at least two locations	Materials, labour and maintenance training	300,000	400,000	750,000	0	0	1,450,000
Installation of 50 units of (ultra-sonic) sound-based repellent and alarm devices	Materials, labour and maintenance training	0	250,000	0	285,000	0	535,000
Provision of powerful searchlights and other appropriate mechanical devices	Materials	25,000	25,000	25,000	25,000	25,000	125,000
Enrichment of salt licks and vegetation along elephant corridors/ passages	Materials and labour	80,000	85,000	91,000	98,000	105,000	459,000
Introduction and operationalization of crop and livestock insurance schemes	Seed money, development of by-laws, and community finance management training	0	400,000	600,000	0	0	1,000,000

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Promotion of alternative cropping system	Materials and extension support	25,000	75,000	75,000	0	0	175,000
Promotion of alternative sustainable livelihoods	Materials and extension support	75,000	80,000	86,000	92,000	98,000	431,000
Sub-total Component 1.1		505,000	1,315,000	1,627,000	500,000	228,000	4,175,000
Component 1.2: Anti-Poaching							
Increased frequency and coverage of patrolling	Field allowance	700,000	750,000	800,000	860,000	920,000	4,030,000
Training in advanced anti-poaching techniques for 10 PWS staff, in two batches (out-of-country, within the region)	Travel, subsistence and direct training costs	850,000	910,000	0	0	0	1,760,000
Training in first-aid, arms handling and field safety for all PWS staff (in-country, on-site)	Subsistence and logistic costs of participants and honorarium for resource persons	100,000	0	115,000	0	0	215,000
Annual training workshops on communication and intelligence-sharing for all law enforcement agencies in and around PWS	Subsistence and logistic costs of participants and honorarium for resource persons	50,000	53,000	57,000	61,000	65,000	286,000

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Annual inter-agency coordination meeting between head officials of all law enforcement agencies and civil administrative bodies in and around PWS	Subsistence and logistic costs of participants	30,000	32,000	34,000	37,000	39,000	172,000
Advocacy materials (detailed analytical report and visual presentation) to support infusion of cross-border poaching as a major issue of deliberation in the High Level Border Coordination Meeting between India and Bhutan	Data analysis, report writing and production of advocacy materials	50,000					50,000
Annual reports on cross-border poaching in PWS to aid its deliberation at the High Level Border Coordination Meeting	Data analysis and report writing		5,000	5,000	5,000	5,000	20,000
Field-level exchange/ coordination events between PWS staff and their Indian counterparts	Subsistence and logistic costs of participants	50,000	53,000	57,000	61,000	65,000	286,000
Sub-total Component 1.2		1,830,000	1,803,000	1,068,000	1,024,000	1,094,000	6,819,000
Component 1.3: Sustainable Grazing and Livestock Management							

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Support/ incentives to interested farmers for swapping unproductive cattle breeds with improved cattle breeds	In-kind incentives	0	80,000	80,000	80,000	80,000	320,000
Support for improvement of local veterinary services required by farmers to maintain improved cattle breeds	Equipment and medicines	0	25,000	25,000	25,000	25,000	100,000
Support to local communities for procurement of power tillers with the objective of reducing draught cattle	In-kind incentives	0	25,000	0	25,000	0	50,000
Introduction of improved grazing practices	Material, labour and training	50,000	53,000	57,000	61,000	65,000	286,000
Promotion of homestead fodder tree plantations	Material, labour and training	30,000	32,000	35,000	38,000	41,000	176,000
Designation of community areas for grazing and facilitation of the preparation of grazing management plans for the designated areas	Logistics for field surveys and community meetings, and extension support for grazing management plan	0	70,000	75,000	0	0	145,000
Sub-total Component 1.3		80,000	285,000	272,000	229,000	211,000	1,077,000

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Component 2.1: Infrastructure Development							
Construction of park outpost at Longashir	Material, labour and equipment hire	0	2,500,000	0	0	0	2,500,000
Construction of park outpost at Nichula, Pingkhua and Dhaneshri	Material, labour and equipment hire	0	0	2,650,000	2,850,000	3,040,000	8,540,000
Construction of field conservation research station at Phibsoo	Material, labour and equipment hire	0	0	3,000,000	0	0	3,000,000
Renovation and maintenance of office buildings and staff quarters in PWS	Material, labour and equipment hire	200,000	100,000	100,000	100,000	100,000	600,000
Improvement of access road (36 km) to Phibsoo head office	Material, labour and equipment hire	350,000	375,000	400,000	430,000	460,000	2,015,000
Sub-total Component 2.1		550,000	2,975,000	6,150,000	3,380,000	3,600,000	16,655,000
Component 2.2: Equipments							

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Procurement of equipments for camping, surveillance, and navigation	Tents, rucksacks, jungle boot, light sleeping bags and mats, first-aid kits, binoculars, GPS, PWS topo maps, compass, light-weight bullet proof vests	700,000	0	0	0	0	700,000
Procurement of radio communication equipments	Wireless radio sets and walkie talkie	0	700,000	0	0	0	700,000
Procurement of 3 motorbikes and 1 tractor		650,000	0	0	0	0	650,000
Procurement of a four-wheel drive pick-up		0	0	0	1,200,000	0	1,200,000
Procurement of audiovisual equipments for conservation education and awareness-building	LCD projector, digital camera	0	0	180,000	0	0	180,000
Sub-total Component 2.2		1,350,000	700,000	180,000	1,200,000	0	3,430,000
Component 3.1: Research and Information Development							
Comprehensive surveys of mammals, birds and vegetation	Field logistics and technical assistance	500,000	300,000	0	0	0	800,000

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Preliminary baseline surveys of herpetofauna, fish and butterflies	Field logistics and technical assistance	300,000	200,000	0	0	0	500,000
Field studies on the socio-economic and ecological dynamics of human-wildlife conflicts	Field logistics and technical assistance	0	300,000	0	0	0	300,000
Ecological studies on PWS flagship/keystone species (e.g. elephant and spotted deer)	Field logistics and technical assistance	0	0	300,000	400,000	0	700,000
Habitat management trials (e.g. in alluvial grasslands and sal-bearing forests)	Field logistics and materials	50,000	100,000	100,000	100,000	100,000	450,000
Study on the potential of community-based nature tourism in and around PWS	Technical assistance	0	200,000	0	0	0	200,000
Establishment of information resource facility within the proposed field research station at Phibsoo	Materials and equipment	0	0	150,000	0	0	150,000
Sub-total Component 3.1		850,000	1,100,000	550,000	500,000	100,000	3,100,000
Component 3.2: Conservation Education and Awareness							
Development of communication and awareness-building materials on the conservation significance of PWS	Production costs of brochures, posters and a documentary	100,000	100,000	0	0	0	200,000

Component/ Activity	Type of expected inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Establishment of, and support to, eco-clubs in at least two local schools	Financial support	80,000	50,000	50,000	50,000	50,000	280,000
Farmers' study tour to other protected areas in and around Bhutan	Subsistence and travel costs	300,000	0	400,000	0	0	700,000
Conservation awareness campaign for local communities	Logistics and honorarium for facilitators	40,000	43,000	46,000	49,000	52,000	230,000
Installation of park signage/ information boards at various locations in PWS	Material and labour	30,000	0	0	0	0	30,000
Training for a group of 15 PWS and gewog RNR extension staff, in three batches, on social mobilization approaches and techniques (out-of-country within the region)	Travel, subsistence and direct training costs	0	900,000	960,000	1,000,000	0	2,860,000
Sub-total Component 3.2		550,000	1,093,000	1,456,000	1,099,000	102,000	4,300,000
Total (all components)		5,715,000	9,271,000	11,303,000	7,932,000	5,335,000	39,556,000

Total budget requirement of Nu. 75.451 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 4 Below)

Table 4: Details of Total Budget Requirement for 5 years in Nu. Millions (July, 2012 to June, 2017)

Costs for Activity	Y1	Y2	Y3	Y4	Y5	TOTAL (Nu. in millions)
1. Administration Costs	6.69	6.89	7.49	7.49	6.39	34.950
2. HWC	0.505	1.315	1.627	0.5	0.228	4.175
3. Anti-Poaching	1.83	1.83	1.068	1.024	1.094	6.846
4. Sustainable Grazing & Livestock Management	0.08	.285	0.272	0.229	0.211	1.077
5. Infrastructure Development	0.550	2.975	6.150	3.380	3.600	16.655
6. Equipments	1.350	0.700	0.180	01.200	0	3.430
7. Research & Information Development	0.850	1.100	0.550	0.500	0.100	3.100
8. Conservation Education and Awareness	0.550	1.093	1.456	1.099	1.020	5.218
TOTAL	12.405	16.188	32.196	15.422	12.643	75.451

Table 5: Details of Administration Costs (Nu. in Millions)

Particulars	Y1	Y2	Y3	Y4	Y5	Total
1. Pay & Allowances	2.30	2.30	2.30	2.30	2.30	11.500
2. Travel Allowances	3.13	3.13	3.13	3.13	3.13	15.650
3. Utilities	0.14	0.14	0.14	0.14	0.14	0.700
4. Rental of Property	0.10	0.10	0.11	0.11	0.00	0.420
5. Supplies & Materials	0.30	0.30	0.30	0.30	0.30	1.500
6. Maintenance of Property	0.52	0.54	0.60	0.60	0.60	2.860
7. Operational Expenses	0.20	0.20	0.20	0.20	0.20	1.000
Total	6.69	6.71	6.78	6.78	6.67	33.63

Annexure 6: A Set of General Purpose Success Indicators

- PWS 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. Bengal tiger
 - ii. Asiatic Elephant
 - iii. Spotted deer
 - iv. Common pea fowl
 - v. Golden langur
 - vi. Agar tree
 - vii. Rufous- necked hornbill
- Monitoring protocols developed and implemented for five key species:
 - i. Bengal tiger
 - ii. Asiatic Elephant
 - iii. Spotted deer
 - iv. Golden langur
 - v. Rufous- necked hornbill
- Research undertaken and completed on the impact of climate change on invasive species inside PWS.
- Research undertaken and completed on the impact of climate change on the sub-tropical Himalayan forest eco-system.

- Research undertaken and completed on the impact of climate change on the seasonal and perennial water bodies.
- Research undertaken and completed on the easternmost limit of spotted deer and their habitat associations.
- Mapping and delineation completed of the habitats of Bengal tiger, Asiatic elephant, Spotted deer, Agar tree, Golden langur and other endemic plant and animal species within PWS.
- Greater understanding of the threats to the key species and their habitats and investigation of possible mitigation measures.
- Hot-spot poaching areas in PWS identified and mapped for all of PWS.
- Research conducted is used to aid and assist in the implementation of informed and effective management measures.
- Practical zoning for the Sanctuary 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