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# Chapter 1: Introduction

## 1.1 Bhutan: A brief back ground

Bhutan is a small, landlocked country with an area of 38,394 km2 situated on the southern slope of the Eastern Himalaya, bordering China to its North and India its south, east and west. The country is almost entirely mountainous with altitudes ranging from 7,500 to 150 masl. within a short north-south distance of 170 kilometres. Straddling the two major Indo-Malayan and Palearctic biogeographic realms, Bhutan is part of the Eastern Himalayan region which contains parts of three global biodiversity hotspots, 60 ecoregions, 330 Important Bird Areas, 53 Important Plant Areas, and a large number of wetlands and 29 Ramsar sites (ICIMOD, 2010).

[Insert: Land Cover Map of Bhutan, 2010]

## 1.2 Bhutan’s Conservation history

Formal conservation programs in Bhutan started as early as the 1960s, when Bhutan embarked on the Five Year Plan development cycle, with the designation of Northern and Southern Wildlife Circle and subsequent designation of the first protected area, Manas Wildlife Sanctuary, in 1966. The first act to be enacted in the country was the Forest Act of Bhutan 1969, followed by the National Forest Policy of 1974, the first policy in the country, which stipulated the requirement for the maintenance of a minimum of 60 percent of the total land area under forest cover. This has further been enshrined in the Constitution of the Kingdom of Bhutan. Currently, the country has 70.46 percent of the total area under forest cover (LCMP, 2010) and 51.44 percent, secured as protected areas and biological corridors.

Bhutan’s current status of conservation and biodiversity is a result of the far-sighted vision and leadership of our Kings and our rich tradition of living in harmony with nature throughout the centuries. This has been further strengthened through the formal adoption of the development philosophy of Gross National Happiness, which categorically states environmental conservation as one of the four pillars of Gross National Happiness. This effectively ensures that development is never achieved at the cost of the environment. Many policy documents and action plans have already been developed and are being implemented.

## 1.3 Overview of Biodiversity of Bhutan

***A: ECOSYSTEM DIVERSITY***

*I. Forest Ecosystems:*

Forests[[1]](#footnote-2) constitute the dominant ecosystem in Bhutan, with 70.46 percent [[2]](#footnote-3) (LCMP, 2010) of the country under forest cover. Further, as a result of variance in the altitudinal range, with corresponding variation in climatic conditions, the country supports a wide range of forest types and vegetation zones. Broadly speaking, the country can be divided into three distinct eco-floristic zones with different forest types (*Ref: Table* 1).

**Table 1: Eco-Floristic Zones (Adapted from Ohsawa (1987) and LCMP (2010)**

|  |  |  |
| --- | --- | --- |
| **Eco –Floristic Zones** | **Main Forest Types and dominant flora (plants)** | **Main fauna (animals)** |
| **Alpine Zone** Altitude – (4000 + masl) | Alpine meadows and scrubs dominated by Rhododendron scrubs, Juniper and medicinal plants and herb species such as *Aconitum, Gentiana, Nardostachys , Delphinium, Rhodolia, Meconopsis, Osnomas, Dactylorhiza, Ophiocordyceps sinensis, Picorrhiza, Frtillaria ,etc*. | Snow leopard, Lynx, Blue sheep, Himalayan  marmot, Tibetan wolf, Takin, Musk deer |
| **Temperate Zone**Altitude – (2000-4000 masl) | **Fir Forest – 3000 masl+**Fir forest consists either of largely pure stands of *Abies densa* or mixed with other species such as *Juniperus, Taxus and Larix.***Mixed Conifer Forest – 2500- 3500 masl**Mixed conifer forest includes mixed stands of spruce, hemlock, juniper, fir, larch, taxus**.** Some broadleaf are also common particularly *Quercus semecarpifolia, Quercus griffithii, Rhododendron spp., Acer spp., Betula sp.***Blue Pine Forest- 1500- 3200 masl**Blue pine forest consists of pure or dominant stands of blue pine. It is sometimes mixed with *Quercus semecarpifolia, Populus rotundifolia* and *Rhododendron spp.***Broadleaf mixed with Conifer – 2000-2500 masl**Consists of blue pine mixed with poplar, and other species such as *Castanopsis, Quercus, Persea, Litsea, Populus ciliate.* | Goral, Serow, Black bear, Grey langur, Red panda, Assamese macaque, Leopard |
| **Sub Tropical Zone** – (150-2000 masl) | **Broadleaf Forest – 1000-2000 masl**Represented by species of *Castanopsis, Lithocarpus, Schima, and Quercus.***Chir pine Forest – 700- 2000 masl**Pure stands of Chir pine or in association with *Quercus lanata*, *Quercus griffithii*, *Quercus glauca* and *Alnus nepalensis* along water courses.**Tropical Lowland Forest - <700 masl**Broadly classified as semi- evergreen but varies from almost totally deciduous on exposed dry slopes to almost evergreen in the moist valleys. Forests are multi- storied with high species diversity. Floristic composition consists of tropical species like *Shorea robusta, Terminalia myriocarpa, Bombax ceiba, Daubanga grandifolia, Sterculia villosa, Acacia catechu, Terminalia nudiflora.* | Water buffalo, Golden langur, Sambar deer, Tiger, Golden cat, Clouded leopard, Capped langur, Gaur |

**II. Aquatic Ecosystems:**

The aquatic ecosystems of Bhutan consist mainly of rivers, lakes, marshlands and hot springs.

*Rivers:*

Due to the presence of large number of glaciers and glacial lakes, high level of precipitation and the relatively well-preserved forests and watersheds, Bhutan is endowed with tremendous inland water resources in the form of rivers, rivulets, springs and streams. The four major river basins are Amo Chu (Torsa), Drangme Chu (Manas), Puna Tsang Chu (Sunkosh and Wang Chu). Drangme Chu, the largest river basin, drains more than one-third of the country's area.

[Insert: River systems of Bhutan table/map]

*Lakes*

There are large numbers of small and medium-sized lakes spread across the country. Rajbanshi and Csavas (1982) had listed some 52 lakes (and mentioned eight unexplored HAW in the Dagala area) in Bhutan from which about 24 lakes were above 3,000 masl. Further, Mool et al (2001) had recorded a total of 2,6743 glacial lakes in the country . An inventory of High Altitude Wetlands (HAWs[[3]](#footnote-4)) by the Ugyen Wangchuck Institute for Conservation and Environment (2010) reports about 3027 HAWs (2963 lakes and 63 marshes) covering 0.26 percent of the country’s total land cover with sizes varying from the smallest at 35 sqm to the largest at 1.5 sqkm. The HAWs in Bhutan include the supra-snow lakes, supra-glacial and glacial lakes, open water lakes (in alpine meadows) and marshes and serve as the main source of freshwater in Bhutan. The largest of all the lakes is the glacial lake at the terminus of Luggye glaciers at 4506 masl (UWICE & WWF, undated). However, currently, except for glacial lakes and High Altitude Wetlands (HAWs) there is inadequate assessment of the area and location of various lakes in other parts of the country.

*Marshlands*

In addition to rivers and lakes, marshlands in the form of depressions and water-logged areas, are envisaged to be a major part of the aquatic ecosystem in the country although no proper assessment has been carried out so far. UWICE reports 63 high altitude marshland. Marshlands are generally known to be rich in biota and good habitats for resident as well as migratory birds, reptiles, amphibians and fishes. The best-known marshland in the country is the Phobjikha valley (1244 ha.), where the globally threatened Black-necked Cranes roost in large numbers during winter[[4]](#footnote-5). The valley is also highly valued for its outstanding scenery and cultural ethnicity. Other important marshlands recognized as wetlands of international importance are Bumdeling (Ramsar site No. 2032) and Khotokha (141.5 ha) (Ramsar Site No. 2033) ([www.ramsar.org](http://www.ramsar.org) ).

*Hot Springs*

Hot springs, known as *Tshachu* in Dzongkha, are very popular in Bhutan. People in Bhutan mainly use hot springs for therapy of various ailments, especially those affecting bone and skin. So far, ten hot springs have been officially reported in the country but the number could be more. Hot springs are generally associated with rich microbial biodiversity, however there is very limited scientific understanding of the microbial biodiversity prevalent in the hot springs in the country.

**III. Agricultural Ecosystem**

The country is known to have six major agro-ecological zones corresponding with altitudinal range and climatic conditions. Table 2 gives an overview of the major agro-ecological zones along with characteristic features of these zones in terms of agriculture practices followed.

**Table 2: Agro-ecological Zones of Bhutan (Adapted from MoAF 9th FYP and BAP III)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Agro-ecological zone** | **Altitude****(m.a.s.l)** | **Rainfall (mm/annum)** | **Farming systems, major crops and agriculture produce** |
| Alpine | 3600-4600 | < 650 | Semi-nomadic people, yak herding, dairy products, barley, buckwheat, mustard and vegetables. |
| Cool Temperate | 2600-3600 | 650-850 | Yaks, cattle, sheep &horses, dairy products, barley, wheat & potatoes on dryland, buckwheat & mustard under shifting cultivation |
| Warm Temperate | 1800-2600 | 650-850 | Rice on irrigated land, double cropping with wheat and mustard, barley and potatoes on dryland, temperate fruit trees, vegetables, cattle for draft and manure, some machinery & fertilizers used. |
| Dry sub-tropical  | 1200-1800 | 850-1200 | Maize, rice, millet, pulses, fruit trees and vegetables, wild lemon grass, cattle, pigs & poultry. |
| Humid sub-tropical | 600-1200 | 1200-2500 | Irrigated rice rotated with mustard, wheat, pulses and vegetables, tropical fruit trees. |
| Wet sub-tropical | 150-600 | 2500-5500 | As for the humid zones-irrigated rice rotated with mustard, wheat, pulses and vegetables, tropical fruit trees. |

**B. SPECIES DIVERSITY**

**I. Wild species diversity**

**Vascular plants**

The country’s diverse ecosystems and eco-floristic zones harbour a rich array of vascular plants. The Flora of Bhutan records more than 5600 species of seed plants out of which approximately 94 per cent are native species and about 105 species are currently endemic to Bhutan. The Bhutanese flora is also rich in plant species with enormous commercial and scientific values. The Institute of Traditional Medicine Services uses more than 200 plant species for formulation of various kinds of traditional medicines and local healers use more than 160 species as recorded in the National TK database housed within National Biodiversity Center.

In terms of Pteridophyte diversity (Ferns and allies), currently 411 species in 27 families are recorded in the country (NBC, 2009).

**Non-vascular plants**

Although there are many species of non-vascular plants, such as sphagnum mosses, liverworts and hornworts, there is no detailed inventory of this group of plants, indicating a huge research and information gap in comprehending the biodiversity of the country. Currently, only 282 species under 156 genera of mosses are recorded from Bhutan (David Long paper-Journal of Bryology)

**Fungus**

In terms of fungal diversity in the country, currently, about 350 species have been identified and recorded, although the number could be much higher once a complete survey is carried out and species identity determined. The current number is based on a partial inventory carried in the country and only of those species whose identity is confirmed. Out of this, about 53 are edible mushroom species. Many of these edible mushrooms are local delicacies and contribute to the livelihoods and nutrition of the rural poor (NMC publication).

**Insect-Fungi**

The diversity and complexity of the associations of fungi and insects are poorly understood worldwide and more so in Bhutan. However, even with the limited studies on this group of organisms, more than 100 species are currently recorded, out of which sixty are already determined and several species are suspected to be new to science (NMC publication).

**Lichens and Lichenicolous fungus**

Lichens are a conspicuous element of the biodiversity all over Bhutan. However, very little studies are undertaken in this group. Currently only about 287 lichens and lichenicolous fungi are known from Bhutan, although experts estimate the occurrence of more than 1000 species. Most species are those common to the Himalayas, however, there are also some eastern North American species occurring in Bhutan. For example, the rare *Ropalospora chlorantha,* so far only known from eastern North America is reported to occur in Bhutan. *Lepraria nigrocincta* is another species first reported in the Northern Hemisphere from Bhutan while *Pyrrhospora bhutanensis* is described as new to science (Fungal diversity paper, 2002)

**Mammals**

Close to 200 species of mammals are known to occur in the country, including 27 globally threatened species (Table 3). Bhutan is also known to be rich in wild felids. It harbours 11 of the 36 global species record. Furthermore, in a study conducted in Royal Manas National Park in 2012, in an area as small as 74 sq.km, six felid species were recorded, which is about 16 percent of the global felid species, confirming Bhutan to be a hotspot for wild felids (Tempa et al 2013).

**Table 3: List of Globally threatened mammal species found in Bhutan.**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Species** | **Common name** | **Global Threat Category** |
| 1 | *Sus salvanius* | Pygmy Hog | Critically Endangered |
| 2 | *Trachypithecus geei* | Golden Langur | Endangered |
| 3 | *Trachypithecus pileatus* | Capped Langur | Endangered |
| 4 | *Cuon alpinus* | Dhole/ Wild Dog | Endangered |
| 5 | *Ailurus fulgens* | Red Panda | Endangered |
| 6 | *Panthera tigris tigris* | Bengal Tiger | Endangered |
| 7 | *Uncia uncia* | Snow Leopard | Endangered |
| 8 | *Elephas maximus* | Asian Elephant | Endangered |
| 9 | *Rhinoceros unicornis* | One-horned Rhinoceros | Endangered |
| 10 | *Bubalus bubalis* | Asiatic Water Buffalo | Endangered |
| 11 | *Caprolagus hispidus* | Hispid Hare | Endangered |
| 12 | *Platanista gangetica* | Ganges River Dolphin | Endangered |
| 13 | *Macaca assamensis* | Assamese Macaque | Vulnerable |
| 14 | *Melursus ursinus* | Sloth Bear | Vulnerable |
| 15 | *Ursus thibetanus laniger* | Himalayan Black Bear | Vulnerable |
| 16 | *Moschus chrysogaster* | Himalayan Musk Deer | Vulnerable |
| 17 | *Lutrogale perspicillata* | Smooth-coated Otter | Vulnerable |
| 18 | *Prionailurus viverrinus* | Fishing Cat | Vulnerable |
| 19 | *Pardofelis marmorata* | Marbled Cat | Vulnerable |
| 20 | *Neofelis nebulosa* | Clouded Leopard | Vulnerable |
| 21 | *Catopuma temmincki* | Asiatic Golden Cat | Vulnerable |
| 22 | *Cervus duvauceli* | Swamp Deer | Vulnerable |
| 23 | *Bos gaurus* | Gaur | Vulnerable |
| 24 | *Capricornis sumatraensis* | Serow | Vulnerable |
| 25 | *Budorcas taxicolor* | Takin | Vulnerable |
| 26 | *Myotis sicarius* | Mouse-eared Bat | Vulnerable |
| 27 | *Rattus sikkimensis* | Sikkim Rat | Vulnerable |

**Avifauna**

Bhutan is recognized as a part of several globally important bird areas, such as Sino-Himalayan mountain forests, Indo-Burmese forests, Indo-Gangetic grasslands, South Asian arid habitats, and Tibetan plateau wetlands (Bird Life International).This explains the rich bird diversity that Bhutan has within its small geographic area. Currently, around 700 species are estimated to be found in Bhutan out of which 18 are globally threatened. Of the three critically endangered species found in Bhutan (see table), the White-bellied heron is the most studied species with a population of 22 number out of the estimated global population of 50-200 birds.

**Table 3: List of globally threatened birds found in Bhutan.**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Species** | **Common Name** | **Category** |
| 1 | Gyps bengalensis | White-rumped Vulture | Cricically endangered |
| 2 | Ardea insignis | White-bellied Heron | Cricically endangered |
| 3 | Sarcogyps calvus | Red-headed Vulture | Cricically endangered |
| 4 | Aythya baeri | Baer's Pochard | Cricically endangered |
| 5 | Arborophila mandellii | Chestnut-breasted Partridge | Vulnerable |
| 6 | Tragopan blythii | Blyth's Tragopan | Vulnerable |
| 7 | Aceros nipalensis | Rufous-necked Hornbill | Vulnerable |
| 8 | Apus acuticauda | Dark-rumped Swift | Vulnerable |
| 9 | Grus nigricollis | Black-necked Crane | Vulnerable |
| 10 | Gallinago nemoricola | Wood Snipe | Vulnerable |
| 11 | Haliaeetus leucoryphus | Pallas's Fish-eagle | Vulnerable |
| 12 | Sitta formosa | Beautiful Nuthatch | Vulnerable |
| 13 | Prinia cinereocapilla | Grey-crowned Prinia | Vulnerable |
| 14 | Aquila clanga | Greater Spotted Eagle | Vulnerable |
| 15 | Aquila heliaca | Eastern Imperial Eagle | Vulnerable |
| 16 | Mulleripicus pulverulentus | Great Slaty Woodpecker | Vulnerable |
| 17 | Chlamydotis undulata | Houbara Bustard | Vulnerable |
| 18 | Saxicola insignis | White-throated Bushchat | Vulnerable |

Source: BirdLife International (2014) Country profile: Bhutan. Available from: http://www.birdlife.org/datazone/country/bhutan. Checked: 2014-07-15

**Herpetofauna**

In terms of herpetofauna, there are limited studies and documentation carried out in the country so far. Nevertheless compiling all the past records (Bauer & Günther 1992; Das & Palden 2000; Wangyal & Tenzin 2009; Wangyal 2011, 2012; Wangyal et al. 2012; Wangyal & Gurung 2012a,b; Wangyal 2013), Bhutan has 49 species of amphibians (47 anurans, one caudata, one caecilian) and 85 species of reptiles (59 snakes, 21 lizards, one crocodile, 6 turtles) recorded thus far.

**Invertebrates**

Invertebrate is one of the least studied groups in the country giving an incomplete picture of the diversity of this species-rich group of biodiversity. The information presented here are of those groups, which are studied to some extent. Although, Bhutan is reportedly expected to have 800 to 900 species of butterfly (van der Poel P and Wangchuk T, 2007), there is no annotated checklist to confirm the number. Of the expected 800 to 900 species, the Royal Society for Protection of Nature has catalogued 140 species with photographs in 2007, while UWICE further catalogued 42 species of swallowtails and 186 species of brush-footed butterflies/Nymphalids in 2012.

Insert table of globally rare butterflies recorded from Bhutan.

Odonates have been studied to some extent. Currently, from an inventory done in a few selected pockets in the country, 50 species of Odonata is recorded (Mitra, 2008). In case of hymenopterans, about six species of bees are recorded from Bhutan, out of which two are native honeybees (*Apis cerana and Trigona iridipennis*), while *Apis mellifera* is an exotic species introduced for commercial beekeeping. The other native bee species are *Apis laboriosa,Apis dorsata* and *Apis florea.*

**Fish Fauna**

Preliminary studies have reported a total of 91 freshwater native fish species (annexure 2: annotated checklist of fish in Bhutan) from Bhutan (Gurung, et al. (2013) inclusive of the 49 species identified earlier (Dubey, 1978). However, it is widely believed that the current list of fish species in Bhutan is a gross underestimate of the actual freshwater fish diversity. Amongst the native species identified so far, Snow trout (*Schizothorax* sp.) is considered to be endemic, while Golden Mahseer *(Tor putitora)* is considered endangered and is enlisted as totally protected species in the Forest and Nature Conservation Act, 1995. The National Centre for Riverine and Lake Fisheries has recently initiated a comprehensive scientific study of fish fauna in the country’s major water bodies.

As part of the conservation efforts initiated for native fish species, the National Centre for Aquaculture (NCA) in Gelephu is spearheading the development of breeding techniques of important native fish species and enhancement of fish stock (fish breeding and stocking). The Centre released the first lot of 1200 hatchery-bred Golden Mahseer fingerlings (March, 2013) in natural waters for augmentation of its natural population.

Apart from the currently known native species, there are nine introduced fish species (Annexure 2.1) being promoted to increase fish production to enhance national food security.

**Domestic Biodiversity**

*Crops*

As a country that is predominantly agricultural, Bhutan is rich in agricultural diversity. More than 100 species of agricultural crops are known to occur in the country (Annexure 3). The crop species diversity can be further broken down into numerous landraces that occur as a consequence of adaptation to microenvironments created by altitudinal and climatic variations. NBC has so far recorded 384 landraces of rice, 105 of maize, 36 of wheat, 10 of sweet buck wheat, 11 of bitter buckwheat, 32 of barley, 22 of amaranth and 36 of millets. Several of the varieties and land races represent adaptation to some of the highest agricultural lands in the world, with cultivation in the alpine agro-ecological zone extending up to 4,600 masl. While wheat is not an indigenous crop, varieties grown around Laya at 3839 masl, are adapted to higher altitudes and colder climatic conditions than wheat varieties in other parts of the world. Similarly, maize and barley have undergone a natural process of breeding and selection to evolve into high-elevation varieties.

In terms of Crop Wild Relatives (CWR), around 230 species belonging to 120 genera in 51 families are expected to occur in Bhutan (annexure 4) (Tamang, 2003). For example, *Fagopyrum debotrys*, a putative wild relative of buckwheat and *Setaria viridis* of Foxtail millet are reported from Bhutan. Further, at least three wild relatives of rice *Oryza minuta* and *Oryza rufipogon* are reported in the Flora of Bhutan, while *Oryza officianalis* Wall.ExWatt was recorded from Southern Bhutan in 2012 (Sanam Drubdey 2012).

*Livestock*

Although at the species level, the livestock diversity of Bhutan is not different from those commonly occurring elsewhere in the Himalayas, there are many livestock breeds with marked genetic differences. For example, amongst the cattle breeds, the *Nublang,* a traditional cattle breed of Bhutan believed to have originated in Sangbay geog of Haa, is genetically distinct from any other cattle breeds (NBC, MoAF 2008- AnGR of Bhutan). Mithun is a descendant of Gaur, which originated in Northeast India but has been bred in Bhutan since the 17thcentury. Mithuns are considered an important genetic resource due to the unique tradition of crossbreeding mithun (male) with *Nublang* (female) to reproduce *Jatsa* and *Jatsham*, which are superior compared to either of the parent breeds. Similarly, yaks in Bhutan have distinct genetic differences between the population in eastern and western Bhutan.

Horse breeds found in the country are also considered to be unique. These breeds are *Yuta, Boeta, Merak-Saktenpa,* and *Jata.* Bhutanese sheep have been genetically investigated and classified into three types, namely *Jakar*, *Sipsu* and *Sakten* types. In particular the *Jakar* type is unique to central Bhutan and is highly endangered as farmers are giving up sheep husbandry as they are no longer economically viable. Table #: Livestock Diversity of Bhutan.

**Table 4: Traditional livestock and poultry breeds of Bhutan**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Livestock Species**  | **Traditional Breeds and crosses** | **Exotic breed and crosses**  |
| 1 | Cattle (Bos indicus and Bos taurus) | Nublang | Jersey |
| Jaba | Brown Swiss |
| Bajo | Jersey crosses |
| Goleng | Brown Swiss crosses |
| 2 | Mithun (*Bos frontalis)* | Mithun/ Mithun crosses |   |
| 3 | Yak (Bos grunniens) | Yak,  |   |
| Yak Crosses (*Zo, Zom-* Dz.) |
| 4 | Buffalo (*Bubalis bubalis*) | Buffalo ( non descript) |   |
| 5 | Pigs (Sus scrofa) | *Jitupha-* Dz*/Sapha-* Sh. | Large black |
| *Dhompha-* Dz. | Saddle back |
|   | Duroc jersey |
| 6 | Chicken (*Gallus gallus)* | Pure black *(Yubja Naap-*Dz *)* | Ross 308 (Broiler strain) |
| Naked neck (*Khuilay-* Lh) | Hyline Brown (Layer strain ) |
| Hairy comb (*Belochem-* Dz*)* |   |
| Frizzled (*Pulom-* Dz*/Dumsey-* Lh*)* |   |
| Native white *(Yubja kaap-* Dz*)*  |   |
| Barred Yubja |   |
| *Jarizam-* Dz.*/ Kaurey-* Lh. |   |
| *Jatey-* Dz*/Sekini-* Lh |   |
| *Bailetey-* Lh.  |   |
| 7 | Goat (Capra hircus) | Goat( non descript) |   |
|
| 8 | Sheep (Ovis aries) | *Jakar type,*  | Comeback cross |
| *Sakten type* |   |
| *Sipsoo type* |   |
| 10 | Horse (Equus cabalus) | *Yuta* | Hequ |
|  *Boeta ,* |  Spiti |
| *Merak-Saktenpata,* | Haflinger crosses |

# 1.4 Values of biodiversity and ecosystem in the Bhutanese context

Biodiversity conservation has always been a pivotal part of Bhutan’s rich heritage. As an agrarian people, biodiversity holds great economic, social, ecological, cultural and spiritual importance and has always been a source of sustenance, tradition and spiritual well-being.

About 69 percent of Bhutan’s population living in rural areas depend directly or indirectly on natural resources highlighting their dependence on biodiversity and the ecosystem services provided by it. In the last five years (2008-2013), about 50 million cubic feet of timber has been allotted for commercial and rural purposes, out of which 16 million cft is allocated for firewood (Table 5: Insert table from Forestry facts, 2013). Firewood still remains a major source of energy in rural areas with 58.96 per cent of the energy coming from biomass, which is basically firewood (Dhital, 2009: Asia Pacific Forestry sector outlook study 2). Other significant biological resources utilized include more than 41 species of NWFPs such as edible mushrooms, medicinal plants, wild vegetables, bamboos and canes, with over 46 NWFP management groups formed in the country (Forestry facts and figures 2011). The most well known insect fungus, *Ophicordyceps sinensis,* found in the alpine meadows of the country is highly valued biological resources due to its medicinal properties. It plays a significant role in uplifting the livelihoods and economic prosperity of alpine dwellers due to its commercial value. In 2013, a total of 684 kgs of *Ophicordyceps sinensis* were auctioned and traded, fetching upto Nu. 1.2 million per kilogram, earning Nu. 4.79 million in royalties (www.moaf.gov.bt /2013)

The two major drivers of economic growth in the country are Hydropower and tourism, contributing \_\_\_\_ and \_\_\_\_\_ to the GDP. Hydropower is a major derivative of the ecosystem services provided by biodiversity through critical watersheds and abundant supply of clean water, with a potential to produce 20000 MW of electricity. Second to hydropower, the tourism industry is a major beneficiary of the pristine environment and rich biodiversity, earning the country \_\_\_\_\_\_\_\_ USD in revenue (Tourism Monitor, 2013). Bhutan’s tourism policy of ‘High Value, Low Impact’ ensures limited impact of tourism on the culture and environment. In terms of visitor profile, more than 77 per cent are cultural tourists and only about 19 per cent are nature-based tourists (TCB Monitor 2013), reflecting the huge untapped potential in nature tourism. This has led to recent government initiatives in promoting nature based tourism through opening more landscapes and trekking routes, promoting community-based nature tourism and training more nature guides.

A recent study by Kubiszewski et al., (2013) provides an initial estimate of the value of the ecosystem services in Bhutan using simple benefit transfer techniques. The study estimates the total ecosystem service mean value[[5]](#footnote-6)of Bhutan at approximately about USD 15.5 billion per year. The major contributing ecosystems in terms of essential ecosystems services are temperate forest, cropland, grassland, lakes/rivers and inland wetland, with forests as leading contributor. A significant finding of the study was that 53 percent of ecosystem services provided by Bhutan’s environment benefit those outside Bhutan.

## 1.5 Policy and legal framework

**The Constitution of the Kingdom of Bhutan 2008** decrees that the country maintain minimum of 60 per cent of the total land under forest cover for all time. Article 5.1 of the Constitution states that: "Every Bhutanese is a trustee of the Kingdom's natural resources and environment". The government is tasked to conserve and improve the environment and safeguard the country's biodiversity. It is further directed to secure sustainable development while promoting economic and social development.

Bhutan has a host of policies and regulations to safeguard the environment as summarised below:

**The National Forest Policy, 2011[[6]](#footnote-7)** ensures that Bhutan's forest resources and biodiversity are managed sustainably to provide a wide range of social, economic and environmental benefits while still maintaining the constitutional requirement of a minimum of 60 per cent of the country’s total land area under forest cover. Some of the main features of the policy include a science-based participatory approach to forest governance and sustainable forest management with emphasis on efficient and environment friendly technologies for value-addition and waste minimization.

The **Land Act of Bhutan 2007[[7]](#footnote-8)** provides for the leasing of State land for economic and other various activities. All *Tsamdro* (grazing) and *Sokshing* (forest land for collection of leaf litter) rights shall revert to the State and convert to leasehold uses with management plans giving preference to previous rights holders.

The **National Environment Protection Act (NEPA) 2007** provides for the establishment of an effective system to conserve and protect the environment through the National Environment Commission or its successors, designation of competent authorities and constitution of other advisory committees, so as to independently regulate and promote sustainable development in an equitable manner. The Act calls for the conservation of natural resources to be based on a participatory approach aimed at achieving an equitable sharing of the costs and benefits of conservation among resources users. It also promotes the use of clean energy and alternative technologies in order to reduce use of fuel wood/timber from primary forests. The Act also calls for conservation and protection of wetlands, alpine regions, watersheds, and other vulnerable ecosystems in addition to the existing protected areas.

The **Waste Prevention and Management Act of Bhutan 2009** requires all development activities that generate waste to be planned and executed in harmony and within the carrying capacity of the country's fragile ecological settings. The Act states that a person polluting the environment or causing ecological harm shall be responsible for the costs of avoidance, containment, abatement, medical compensation, mitigation, remediation and restoration.

The **Economic Development Policy of the Kingdom of Bhutan 2010** identifies a broad range of economic growth opportunities based on "Brand Bhutan" as a Unique Selling Point and recognizes the success of the country's environmental conservation in the country as one of the main drivers for developing the "Brand Bhutan" theme for which it calls for protection of biodiversity, genetic resources and promotion of indigenous knowledge. The vision of the EDP is “to promote a green and self reliant economy sustained by an IT enabled knowledge society guided by the philosophy of GNH”. It states that the economic development process will include environment mainstreaming in a phased manner to promote industrial growth and engage in environmentally friendly production. The EDP also provides incentives to promote green technology, micro-hydro projects, solar, wind, bio-mass and energy efficiency and conservation programs.

The **Water Act of Bhutan 2011** establishes water resources as a state property and ensures that it is protected, conserved and/or managed in an economically efficient, socially equitable and environmentally sustainable manner.

The **Biosecurity Policy of the Kingdom of Bhutan 2010** ensures the protection of the Bhutanese people and Bhutan’s biodiversity from the harmful effects of pests and diseases, invasive alien species, genetically modified organisms, toxic chemicals and food additives.

The **Seeds Act of Bhutan 2000** regulates the import and export of agriculture seeds and prevents introduction of unwanted plants and diseases. It also promotes the seed industry with the aim to enhance rural income and livelihood.

The **Bhutan Water Policy 2003** focuses on conservation of all forms of water resources and calls for integrated water resource management through extensive soil conservation, watershed area treatment, conservation of forests and increasing the forest area.

**The Biodiversity Act of Bhutan 2003** provides for the conservation and sustainable utilisation of biological resources and associated traditional knowledge and ensures *Sui Generis* protection of plant varieties. It also authorises the implementation of the Access and Benefit-sharing regime to derive additional benefits in a fair and equitable manner.

The **Environmental Assessment Act 2000** directs the government to ensure that environmental concerns are taken into account when formulating, renewing, modifying and implementing any policy, plan or program. It requires the issuance of environmental clearance as a pre-requisite to the approval of any development activity.

The **Pesticide Act of Bhutan, 2000** encourages the practice of organic agriculture and integrated pest management with a centralized system that controls and limits the import, sale and use of pesticides.

The **Forest and Nature Conservation Act of Bhutan 1995** covers forest management, prohibitions and concessions in State Forests, forestry leases, social and community forestry, transport and trade of forestry produce, protected areas, wildlife conservation, soil and water conservation, and forest fire prevention.

The **Plant Quarantine Act 1993** was enacted to prevent the introduction of pests not already present or widespread in the country; control those pests already present by restricting their spread and by endeavouring to eradicate them; provide facilities for services for import of plants and plant products; and extend cooperation in the prevention or movement of pests in international trade and traffic.

**DYT and GYT *Chathrims* 2002** are important policy instruments that decentralise powers to the grass-root level and mandate the locally elected bodies to exercise authority and functions for a number of activities, including environmental management.

## 1.6 International Cooperation for Biodiversity Conservation

In keeping with Bhutan’s strong environmental conservation history and commitment to the global process in addressing environmental concerns, it is now party to a total of ­­­­ 15 regional and international environment agreements and treaties as listed in Annexure 5.

## 1.7 Existing Institutional Arrangement

**The Ministry of Agriculture and Forests** is the central organization for the formulation and implementation of polices and legal frameworks related to biodiversity, forests, livestock and agriculture. The Ministry has taken the leadership in the development of all the Biodiversity Strategy and Action Plans of the country. The following Departments and Central agencies of the Ministry implement various biodiversity programs, including programmes of work on thematic and cross-cutting issues of CBD as specified below:

**The National Biodiversity Centre** is mandated tocoordinate the implementation of biodiversity conservation and sustainable utilization programs in the country, and specifically the objectives of the CBD. Currently it implements the programmes of work for thematic areas and cross-cutting issues namely Agricultural Biodiversity, Biodiversity information management, Access to Genetic Resources and Benefit-sharing, Global Strategy for Plant Conservation, Global Taxonomy Initiative (flora), Invasive Alien Species and Traditional Knowledge, Innovations and Practices -Article 8(j).

**The Department of Forests and Park Services** is the overall authority for the management of forest resources and wild biodiversity. It is responsible for *in situ* conservation of wild biodiversity through creation and management of protected area system; protection and management of forest and wildlife resources; and education and public awareness.

The **Department of Agriculture** is mandated to enhance food security and income through improved management of field crops, horticulture crops and medicinal plants. Access to markets, farm inputs, construction of farm roads, selection of improved technologies and sustainable land management; and integrated pest management are some of the means identified to achieve its national goals.

The **Department of Livestock** is responsible for coordination, administration and management of services related to livestock production, livestock input supply and livestock health. It works towards attaining food-security and self-sufficiency in livestock products by ensuring prompt delivery of appropriate technologies and services.

**The Bhutan Agriculture and Food Regulatory Authority** regulates the trade of restricted biological resources and its parts and prevents the introduction of pest, diseases and Invasive Alien Species, including Genetically Modified Organisms. It also ensures safety of food and food products in the country for public health.

*Apart from the Ministry of Agriculture and Forests, the other key stakeholders are:*

**The National Environment Commission (NEC),** chaired by the Prime Minister and composed of high-level multi-sectorial representatives is an independent authority and the highest decision-making body on all matters related to the environment and its management in the country. Currently, NEC is the primary national focal point to CDB.

**The Royal Society for Protection of Nature** (RSPN) is a registered Public Benefit Organization (PBO) under the Civil Society Organization (CSO) Authority of Bhutan since 2010. Since 1987, RSPN has been engaged in environmental conservation through environmental education and advocacy, conservation of natural resources and sustainable livelihoods. It also focuses on research and emerging issues such as climate change, solid waste and water management.

**The Bhutan Trust Fund for Environmental Conservation** is an independent grant-making

Organization that uses its annual investment income to finance field biodiversity programs for environmental conservation and the promotion of social welfare in the country.

## 1.8: Review of the past NBSAPs

There have been notable achievements since the formulation of the first Biodiversity Action Plan. In the thematic area of Policy and legislation, over 12 acts, policies and strategies supporting biodiversity conservation and use were developed. In the thematic component on the protection of biodiversity, the country declared 51.44 per cent as protected area network and two RAMSAR sites. In the thematic component on conservation of species diversity, amongst other achievements, notable ones include establishment of Human Wildlife Conflict (HWC) Endowment Fund and Species conservation program on Tiger, Snow Leopard, White-bellied heron and black-necked crane. To address the component on genetic diversity, major achievements include establishment of National Crop and Animal Genebanks. To promote sustainable use of biological resources, a national strategy for Non Wood Forest Products was implemented and 553 community forests established.

In terms of gaps, the lack of a coordination mechanism for the implementation of the Biodiversity Action Plan stands out as the most severe in ranking. The other gaps range from inability to implement the activities prioritized in the action plan due to limited resources and capacities to sometimes conflicting policies.

**Table 1** provides a comprehensive review of the past BAPs and identifies achievements and gaps in key biodiversity thematic areas and cross-cutting issues.

**Table 1: Review of Past Biodiversity Action Plans- Achievements, Observation and Gaps**

|  |  |  |  |
| --- | --- | --- | --- |
| **Biodiversity Thematic Areas** | **Key Strategies/ Actions Outlined**  | **Key Achievements** | **Gaps** |
| Policy, Legislation and Institutional development | 1. Development of biodiversity policy and legal frameworks
2. Strengthen institutional development and co-ordination mechanism at the national level
3. Enhance scientific knowledge base and technical capacity of staff
 | 1. Over 12 acts, policies and strategies supporting biodiversity conservation and use developed.
2. RNR Research Policy 2012 has devoted policy objective 5.1.4 to Research on Biodiversity.
3. New institutions established, namely National Biodiversity Centre, Nature Recreation and Ecotourism Division, Watershed Management Division.
4. BAFRA strengthened as a regulatory authority.
5. BAPs developed through consultative processes.
 | 1. Synergy and coherence among existing policies and acts on biodiversity.
2. Policy on introducing exotic varieties of crops and animals breeds, and exchange of germplasm.
3. Enforcement of policies and acts.
4. National co-ordination mechanism for the implementation of CBD objectives and BAPs.
5. Coordinated approach for fund mobilization for implementation of BAPs, reporting, and Monitoring &Evaluation mechanism.
 |
| Protection of components of biodiversity (ecosystems, habitats and biomes)  | 1. Protection and management of protected areas, biological corridors, buffer and enclave zones
2. Protection and management of protected areas and connecting biological corridors
3. Protection and management of conservation areas outside protected areas system
 | 1. 51.44 per cent of the country is declared as Protected Area Network
2. Proper management zonation completed in three parks – Sakteng Wildlife Sanctuary, Bumdeling Wildlife Sanctuary and Royal Manas National Park.
3. Management of Phobjikha Conservation area and Royal Botanical Park.
4. Declaration of two RAMSAR sites –Bumdeling and Khotokha
 | 1. Operationalization of Khaling Wildlife Sanctuary and Biological Corridors.
2. Zonation of remaining parks and management plans for biological corridors.
3. Adequate financial and human resources for the development and implementation of management plans.
4. Legal status for Conservation Areas outside Protected Areas.
 |
| Promote the conservation of species diversity  | 1. Conservation of globally threatened species and their habitats
2. Control and reduction of poaching of wildlife and illegal trade in their parts and products
3. Develop strategies to mitigate impacts of climate change on flagship species.
 | 1. Species conservation programs carried out on Tiger, Snow leopard, White-bellied Heron, and Black-necked Crane.
2. Strengthened transboundary cooperation for control and reduction of poaching and illegal trade- SAWEN, TRAFFIC.
3. Study on endemic plants of Bhutan initiated.
4. Assessment of fish diversity initiated.
5. National Forest inventory initiated
 | 1. Targeted conservation program only for four species out of 27 globally threatened species found in the country.
2. Adequate resources for research and enforcement.
 |
| Maintain genetic diversity  | 1. Expansion of *ex-situ* conservation of Crop and Animal Genetic Resources.
2. Promote on-farm conservation of traditional crops and livestock breeds.
3. Promote *in-situ* conservation of wild crop relatives.
4. Promoting development and commercialization of under-utilized crops and species
 | 1. National crop and animal gene bank established at NBC
2. Conservation of indigenous livestock breed of Nublang and Jakar Sheep
3. On-farm conservation of cultivated crops institutionalized.
4. Integration of participatory conservation of indigenous crops and breeds into research and extension system.
5. Community seed banks on crops piloted.
6. Cultivation and commercialization of buckwheat.
 | 1. Crop and livestock production programs aimed at increased yield/production without regard to maintaining genetic diversity.
2. Facilities for conservation of recalcitrant seeds.
3. Studies on extent and status of genetic diversity including characterization.
4. Effective conservation programs on domestic animal breeds.
5. Inventory of crop wild relatives and their habitats.
6. Resources for promotion of conservation initiatives.
 |
| Education and Awareness on biodiversity values | 1. Development of Bhutan Integrated Biodiversity Information System.
2. Development of national biodiversity information system for monitoring state of biodiversity resources.
3. Promote public awareness of the value of biodiversity conservation and use.
4. Scientific research to improve the status of knowledge.
 | 1. Development of Bhutan Biodiversity Portal.
2. Institutionalized annual celebration of significant environment days on global calendar.
3. Number of IEC materials developed.
4. Organization of Biodiversity fairs through community participation.
5. Promoting values of agriculture through school agriculture program and introduction of agriculture text books for high schools.
6. Establishment and institutionalization of nature clubs in schools and colleges.
7. Park festivals introduced.
8. Environment Education manual for schools initiated
9. Integration of Environmental Studies into the curriculum of PP to X
10. Waste management activities initiated.
 | 1. Contribution of Available updated data and information to the Bhutan Biodiversity Portal.
2. Coordinated approach to raising awareness on biodiversity and its values.
3. Effective didactic materials on biodiversity values.
4. Research and dissemination of results.
 |
| Promotion of Sustainable Use  | 1. Development and implementation of integrated conservation and development programs
2. Promote sustainable agriculture through diversification of crop production and broader diversity of crops
3. Promote sustainable land management technologies to protect the productivity and stability of various land uses
4. Implementation of community and private forestry programmes enhancing local community involvement in forest management whilst enhancing socio-economic benefits in terms of increased availability of and access to forest products.
5. Management of forest resources for sustainable production and utilization.
6. Product diversification of traditional crops.
 | 1. Integrated Conservation and Development Programs in protected areas implemented (NG to give figures for nos.of ICDP)
2. Guidelines for Resource Assessment and management of 10 Non Wood Forest Products, 2008.
3. Revised Interim Framework for Collection and Management of Non Wood Forest Products, 2011.
4. National Strategy for Non Wood Forest Products, 2008-2018 developed.
5. National Strategy for Community Forestry, 2010 developed.
6. 553 community forests established
7. 5.4 per cent of the forest area brought under sustainable forest management and 19 FMUs established.
8. Forest management code of Bhutan 2004 developed.
9. Management of areas outside FMU System initiated.
10. Sustainable Land Management (SLM) Program adopted and promoted at national level. A total of 10826.90 acres of vulnerable land improved and over 8320 acres of *Tseri* (shifting cultivation) land converted to more sustainable land use.
11. National Organic Strategy developed.
12. Product diversification in buckwheat, soya bean and maize initiated.
 | 1. Cross Sectorial issues on use of natural resource base.
2. Sustainability of ICDP.
3. Regular monitoring and evaluation of natural resource base/ carrying capacity, including NWFPs and Community Forests (CF).
4. Elite capture and inequitable sharing of resources and benefits from CFs.
5. Cost effective SLM technologies
6. Implementation of National Organic Strategy.
7. Management plan for timber extraction outside FMUs.
8. Support for informal seed system.
 |
| Address Threats to biodiversity  | 1. Implement programs and develop legislations to reduce the rate of deforestation, minimize loss of land for development (urbanization, roads, and industries) and reduction of land for mining and quarry.
2. Reduction of grazing pressure on natural ecosystem.
3. Enforcement of environmental impact assessment requirements.
4. Harmonization of biodiversity conservation and infrastructure development /urban development plans.
5. Development and implementation of comprehensive forest fire management programs.
6. Development and implementation of measures to mitigate the impacts of climate change on natural ecosystem
 | 1. Land Act revised; Water Act 2011, The Environment Assessment Act 2000, Waste prevention and Management Act of Bhutan 2009, National Environment Protection Act, 2007 enacted; National Forest Policy revised; Biosecurity Policy developed.
2. The Environmental Friendly Road Construction (EFRC) manual developed.
3. Institutionalization of forest fire volunteers program and establishment of Community Fire Management groups.
4. Regional Climate Change Summit 2011 led by Bhutan to address impact of Climate Change on Biodiversity, Food Security, Water and Energy.
5. Sectorial (Renewable Natural Resources) Adaptation Plan of Action for Climate Change 2013 developed.
6. 2nd National Adaptation Plan of Action for climate change, 2013 developed.
7. Ecotourism program and REDD+ activities initiated.
8. Establishment of Human-Wildlife Conflict Endowment fund.
 | 1. Monitoring and evaluation of compliance after issuance of clearances for development activities.
2. Environmental safeguards and mitigation measures to reduce adverse impacts of development activities on biodiversity.
3. Funds and capacity to implement EFRC.
4. Baseline data, information and knowledge on climate change and adaptation measures.
5. Coordinated approach to address threats to biodiversity from climate change.
6. Expansion and sustainability of Human-Wildlife Conflict Endowment Fund.
 |
| Control threats from invasive alien species  | 1. Development and implementation of measures to protect natural ecosystems against invasive species
 | 1. Preliminary inventory of alien invasive species conducted.
2. Quarantine check points at strategic locations established.
 | 1. Specific provision on invasive species in Plant Quarantine Act
2. Technical and institutional capacity to monitor and manage invasive species.
3. Resource to manage porous border.
4. Awareness on invasive species.
 |
| Maintain goods and services from biodiversity to support human well-being  | 1. Promote biodiversity resources to support local livelihood based on the principles of Community Based Natural Resources Management (CBNRM).
2. Enhancement and systematization of sustainable nature tourism products in Bhutan.
3. Promote research and development in sustainable use of biodiversity resources.
 | 1. Granting of harvesting rights to local communities on *Cordyceps* (legalization of collection of *Cordyceps* to highland dwellers in 2006)
2. Decentralization of common property resource user rights.
3. Payment for Environmental Services initiated.
4. Watershed Roadmap of the country developed.
5. Eco-tourism guidelines developed.
6. MoU between MoAF and TCB to promote eco-tourism
7. Introduction of five Eco-tourism trails benefiting local communities.
8. Two Nature and Recreational parks created.
9. Bioprospecting Program established.
 | 1. Valuation of ecosystem goods and services.
2. Capacities of the local communities in natural resource management.
3. Capacity in community-based tourism management.
4. Capacity to carry out high-end research and development of biological resources in the country.
 |
| Protect traditional knowledge, innovations and practices  | 1. Systematic documentation and protection of traditional knowledge associated with biodiversity
 | 1. Bio-prospecting and TK unit established at NBC.
2. TK database developed and inventory of TK associated with biodiversity initiated.
 | 1. Technical capacity for protection and utilization of TK associated with biological resources.
 |
| Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources  | 1. Development of comprehensive biodiversity policy and legal framework
2. Development of institutional mechanism and technical capacity for bio-exploration
3. Development of regional and international collaboration for bioprospecting
 | 1. Biodiversity Act 2003
2. ABS policy (Draft 2012)
3. Bhutan Access and Benefit Sharing Fund established in 2010.
4. Five ABS agreements executed.
 | 1. Legal and technical capacities of stakeholders.
2. Endorsement of ABS Policy.
3. Revision of the Biodiversity Act of Bhutan, 2003 in line with the Nagoya Protocol and ABS Policy of Bhutan.
4. Formalization of National institutional mechanism for implementation of ABS.
 |

## 1.9: Lessons learned from the earlier NBSAP(s)

The process for preparation of BAPs has progressed since the release of BAP I in 1998 to BAP III in 2009. The following are the major lessons learnt from the development and implementation of past BAPs:

1. The BAP development process brought together different stakeholders under one umbrella, which was instrumental in preparing comprehensive and integrated biodiversity action plans.
2. The Action Plans provided a good reference on biodiversity and emerging issues, assisting preparation of project proposals for funding by institutions and individuals.
3. While the past BAPs had strategies and actions outlined to address the issues related to biodiversity, lack of clear targets and indicators, including monitoring and evaluation mechanism, made it difficult to assess progress and achievements.
4. Lack of fund projections and mobilization strategy for the actions outlined in the past BAPs led to poor implementation.
5. The past BAPs lacked a communication and outreach approach, which resulted in lack of ownership and poor implementation by partners.
6. Relevant institutions established to support the implementation of actions outlined in BAPs were not delegated with rightful authorities and opportunities.
7. The lack of a national mechanism for coordination, fund mobilization and implementation of various programs of works under CBD also resulted in poor implementation of past BAPs.

## 1.10: Process of developing the updated NBSAP

Unlike the past BAPs (which was developed by consultants through the support of technical working groups), the current NBSAP is prepared by a National Task Force representing key biodiversity stakeholders in the country under the coordination of the National Biodiversity Centre. The process was adopted to strengthen national capacity, ease mainstreaming of strategies and actions in sectorial development plans and programs, and promote ownership of the NBSAP as a guiding document. The development and finalization of NBSAP 2014 involved the following process:

1. Review of existing biodiversity conservation and use programs in the country and understanding of 2020 Aichi Targets.
2. Formulation of NBSAP 2014 framework and conceptual features.
3. Review of past BAPs to understand the progress of implementation of programmes of work and thematic areas, and identification of gaps and opportunities.
4. Identification of current threats and trends affecting biodiversity conservation and sustainable use.
5. Taking stock of baseline information
6. Identification and prioritization of issues related to biodiversity in setting national targets.
7. Setting of national targets and indicators based on the national context and guided by the 2020 Aichi Targets.
8. Development of strategies and actions to achieve the set national targets.
9. National consultation workshops in a participatory and inclusive manner through group discussions, questionnaires, quiz, etc to identify and incorporate national/local issues and prioritize national targets.
10. Presentation and discussion of the draft NBSAP 2014 to conservation institutions in the Asia region.
11. Sharing of the draft NBSAP with biodiversity target and indicator champions in international organizations to get their feedbacks and comments.
12. Presentation of the draft NBSAP to policy makers for further review and consensus.
13. Endorsement of the revised NBSAP by the government and its adoption as the national guiding document on biodiversity management in the country.

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# Chapter 2: Threats to Biodiversity: Direct and Indirect pressures affecting biodiversity

## 2.1: Direct pressures

One of the major factors of natural habitat loss affecting the terrestrial ecosystems of Bhutan is land use conversion while forest fire is the major factor for habitat degradation and fragmentation. Over grazing on rangelands and unsustainable agricultural practices are some of the factors leading to soil erosion and subsequent land degradation.

### 2.1.1: Land use conversion

Given the fast pace of socio-economic development[[8]](#footnote-9) in the country forest areas are either lost or cleared for various activities such as construction of hydro-power and transmission lines, roads, schools, hospitals, mining and quarrying, etc. A total of 38577 acres of Government Reserved Forest (GRF) has been allocated for developmental activities from 2008 to 2013 (Forestry facts and figures, 2013). Out of the total forest land converted for various uses, land allotted for construction of power transmission lines and road make up 49 per cent, while land leased for other purpose account to 30 per cent (Table 6: Insert table 26 of the Forestry facts and figures 2013). Pressures from mining on ecosystem and biodiversity result mainly from clustering of mines within a certain geographical area as reflected by the fact that 36 percent of the mines in Bhutan are concentrated within one district (BEO, 2008). These activities not only lead to loss of natural habitat vis-à-vis forest land but also trigger habitat fragmentation and degradation, impacting negatively on biodiversity and often resulting in human-wildlife conflict.

Further, construction of hydropower development is seen as one of the key threats to aquatic biodiversity due to fragmentation of river ecosystem resulting in destruction of habitats and spawning ground and physical barriers to fish migration..

### 2.1.2: Forest Fire

Forest fire is one of the main causes of forest degradation and loss of forest and its associated biodiversity in Bhutan. DoFPS has recorded an average of ­­­­47 fire incidents annually in the last five years(Forestry Facts and Figure 2013) causing damage to a total of 47501 acres of forest land. Although the incidence of forest fire is seen to decline over the years with just 34 cases in 2012-2013 in comparison to 74 in 2008-2009, the area destroyed has increased from 4211.3 acres to 12175.2 acres in those years (Table 7: Insert forest fire trend from Forestry facts and Figure 2013). Therefore, forest fire still remains a serious threat. While forest fires are not always detrimental to biodiversity, especially in fire adapted ecosystem or when used as management tool, however, recurrent forest fires can lead to gradual degeneration of the site and obliteration of associate species, rendering the site vulnerable to land degradation and ecosystem change. Forest fires in Bhutan generally spread to steep, inaccessible areas beyond the intended ecosystem/habitat and ravages everything in its path, leading to detrimental effects that far outweigh any potential benefits. Moreover, the causes of fires are mostly man-made such as increasing area for cattle foraging, preventing wildlife invasions and other accidental cases.

### 2.1.3: Timber and Fuel wood

The current trend of timber extraction is of serious concern given the fact that most of the timber resources are supplied on ad-hoc basis from unmanaged forest. The estimated annual timber supplied is about 9.9 million cft, while the annual allowable cut is about 4.5 million cft! (Calculations based on Forestry facts and figure 2013). Fuel wood is one of the major constituents with about 3.2 million cft supplied annually. Therefore, the sustainable limits of these forest resources, particularly those supplied from unmanaged forests are not known.

### 2.1.4: Overgrazing

There is a general perception in Bhutan that rangelands are degrading due to overgrazing while some others believe that vegetation change may have resulted from other factors such as forest fire, lack of fire (discontinuation of the use of fire in range land management regimes in the alpine region,) extreme weathers and natural events (Gyamtsho, 1996; Gibson, 1991).

While detailed assessment of rangeland resources and their potential have not yet been made and there is a lack of quantitative data to support widespread claims of overgrazing and resulting rangeland degradation (Gyeltshen, undated), the current estimated density of livestock (cattle and yaks) at 221 animals per km2 of pasture land, translating to about 11 animals/acre of pasture land, is considered slightly above the carrying capacity of 10 animals/acre of pasture land (Kezang Wangchuk 2013), possibly leading to over grazing resulting in poor quality of pasture..

### 2.1.5: Forest offences and wildlife poaching

The most common forest offence reported pertains to illegal trade and transport of timber (Forestry facts and figures 2013). Other offences include wildlife poaching, illegal harvesting of NWFP, fishing, retaliatory killings, forest fire, etc. The driving factors are booming construction sector, lucrative market for high value medicinal species, and expansion of farm roads. (Table 8: Insert wildlife offence figure from Forestry 2011/2013).

### 2.1.6: Unsustainable agricultural practices

Factors contributing to unsustainable agriculture practice are farming on steep slope, increasing and imbalance use of inorganic fertilizer, slash and burn cultivation, and increasing use of chemical pesticides (NAP- UNCCD 2008). These factors are of concern when we consider the fact that only 2.93 per cent of the country’s area is cultivated agricultural land (LCMP, 2010)

Problems from steep slope agriculture arise mainly due to the fact that 31 percent of farming is on land with more than 50 percent slope. Imbalance in use of inorganic fertilizer is largely due to high use of urea (nitrogen supplying compound) which is affordable compared to other inorganic fertilizers. This has resulted in an increasing gap between the application of N (Nitrogen) and that of P (Phosphorus) and K (Potassium), creating an imbalance in soil nutrient management with the average national NPK ratio of 6:1:1 (NAP, 2008).

Slash-and-burn cultivation, known as *tseri* in Bhutan, is an age-old farming practice prevalent among many farming communities of the country especially in the east and south-central regions. While it does not cause major environmental degradation if carried out using traditional knowledge and practices, a change in farming practice such as prolonged cultivation and shortening of fallow cycles can lead to decline in productivity and stability of the land. The government has currently imposed a ban on *tseri* cultivation.

Although increasing use of chemical pesticides is identified as one of the unsustainable agriculture practices, the impacts of chemical pesticides on land and environment is not yet known (NAP, 2008).

### 2.1.7: Pollution

Pollution is an emerging concern and different sources of pollution are all indicative of the rapid socio-economic development, urbanization, increasing population densities in localized areas and industrialization. Solid waste is a major source of land pollution. Domestic sewage, waste oil and effluents from automobile and industries are the major water pollutants. CO2 emissions from industries, energy sector and vehicles and ambient dust from industries are the main sources of air pollution. Measures in place to control and manage pollution include adoption and enforcement of vehicle emission and industrial discharge and emission standards 2004 to control air and water pollution. The Clean Technology and Environmental Management (CTEM) Fund was also established to support industries which existed before the enactment of the Environmental Assessment Act 2000, to upgrade pollution abatement equipment to meet the industrial emission standards. Furthermore, Waste Prevention and Management Act 2009 address pollution from all kinds of waste (BEO, 2008).

Bhutan started using synthetic agro-chemicals like fertilizers and pesticides in agriculture in the 1960’s as a way to increase food production. The use of these chemicals is however restricted to the regions that are accessible by roads and mainly for a few major food and cash crops such as potato, apple, rice and maize. The import and use of synthetic agrochemicals and fertilizers are regulated by government and currently only about 30 per cent of farmers use inorganic fertilizers, which is mostly mixed with farm yard manure. Although the import of agro-chemical and fertilizers have been rising, the rate of inorganic fertilizer application at the current estimated rate of 24.6 kg/ha cropped land is also considered low compared to global fertilizer application rate. The use of pesticides also show an increasing trend due to the increasing use of herbicide *Butalchlor* and *Metribuzin* for weed control in rice and potato respectively (NOP master plan).

### 2.1.8: Invasive species

Global Invasive Species database records 46 Invasive Species from Bhutan out of which 11 are alien (Table 8: List of invasive species recorded from Bhutan-Global invasive database). There has been no systematic and comprehensive inventory of IAS in Bhutan, apart from some scattered studies and a pilot inventory carried out by the National Biodiversity Centre which recorded more than 30 invasive plant species, out of which eight species were categorized as major invasive plant species (Annexure 6).

There is also no assessment carried out on the socio-economic and environmental impacts of IAS. However, the spread of some of the IAS such as *Trifolium repens* (white clover*)*, *Ageratina adenophora*, *Chromolaena odoratum, Eichhornia crassipes*, into the local landscape and water bodies is well known. Concerns also arise from the accelerated establishment of IAS due to changing climate and native plant species, such as *Potamogeton distinctus* becoming invasive, which is reported to reduce rice yield by 35 percent (<http://www.rcbajo.gov.bt/technology/plant_protection.php-> accessed on 22nd April 2014).

**Table 2: List of Invasive Species recorded from Bhutan.**

## 2.2.1: Human Wildlife Conflict

### 2.2.2: Climate change

Although there are no systematic studies of climate change impacts, there are observations of Bluepine (*Pinus wallichiana*) encroachment into spruce/maple/birch forests and decline of *Abies densa* forests on the mountain tops in the 1980s due to moisture stress (Gratzer et al, 1997). Such affects could be further exacerbated due to increased incidences of moisture stress from rising temperature. Concerns are similar for the montane cloud forests of Bhutan which occur around 2500 m in the inner deep dry valley slopes of Dochula-Bajo series (Wangda & Ohsawa, 2010) and around 2000 m along the mid hills of Gedu-Darla series (Wangda et al, in press). These are vulnerable to change in temperature and human disturbances which could lead to habitat loss for some important relict plant species like *Taxus, Magnolia, Tetracentron* and endangered bird species such as hornbills.

Other threats to biodiversity which could be exacerbated due to climate change include loss of agro-biodiversity, increased incidence of pests and diseases, accelerated establishment of Invasive Alien Species (IAS), forest fires and bio-cultural loss.

### 2.2.3: Population

The total population of the country was estimated at 672,425 in 2005 (Population and Housing Census of Bhutan, 2005). Despite gradual decrease in population growth rate from 3.1 per cent in 1994 to 1.3 per cent in 2012, population is projected to grow to around 818, 791 in 2020 (11th FYP doc.) The population density will increase from 16 persons (2005 estimate) to about 21 persons per square km (11th FYP doc). Although the overall population is still low, the limited arable and habitable land could result in demographic pressures on the natural environment.

### 2.2.4 Poverty

According to the “Poverty Analysis Report 2012”, poverty incidence has declined from 31.7 percent in 2003 to 12 percent in 2012. Rural poverty has decreased from 38.3 to 16.7 percent. Nevertheless, all three reports of 2003, 2007 and 2012 reveal poverty to be a rural phenomenon. This is significant considering that rural poor are dependent on natural resources for their livelihood, often engaging in unsustainable harvesting of timber and non-wood forest products resulting in depletion of these resources.

# Chapter 3: Issues and opportunities in Biodiversity conservation, sustainable use and equitable sharing of benefits arising from the use.

## Awareness on biodiversity and biodiversity values

In terms of Bhutan’s efforts in environmental education and public awareness program, it has a well recognized history as early as the late 1980s. Both government and non-governmental agencies have been actively involved in running these programmes through establishment of school nature clubs and School Agriculture Programs; awareness-raising through different forms of media; celebration of national social forestry day and significant environment days on global calendar. However, such awareness has been ad hoc and limited to the basic understanding on environment, forests, protected areas, waste management, conservation activities, etc. The National Environment Protection Act 2007 mandates National Environment Commission (NEC) and its Secretariat to raise environmental education, advocacy and awareness. The past biodiversity action plans of Bhutan and other national documents such as the Tiger Action Plan for the Kingdom of Bhutan 2006-2015, and National Acton Plan on Biodiversity Persistence and Climate Change, 2011, reiterate the need for improving and up scaling Environmental Education in a coordinated manner. Despite the explicit directives provided by the Act and the national documents to implement environmental education and awareness programs at various levels, there is still a lacuna in the system in reaching out to the public at large. What has been lacking quintessentially is a well-planned and coordinated mechanism amongst the relevant biodiversity stakeholders to ensure that the environmental education and awareness program elevates the public understanding of the importance of biodiversity and their role in conserving it. This has resulted in lack of information on the level of public understanding of biodiversity and its values and formulation of appropriate awareness programs.

## 3.2: Valuation of Biodiversity and ecosystem services.

While the overall value of forests and the environment has always been recognized and reflected in many national documents and planning guidelines and the inherent respect that people hold for the environment is well understood, till date there has not been a proper assessment of such values. Even the critical watersheds supplying clean and abundant water for the generation of hydropower, a major driver of economic growth and a revenue generator in the country has been overlooked. Recognizing this, the government has taken recent initiatives to establish Gross National Happiness Accounts, covering ecological capital, cultural capital, human capital, social capital and economic capital (11th FYP doc.). However, these efforts are still at a very nascent stage given the limited capacities in terms of technical, financial and human resources in the country and the lack of an institutional mechanism to coordinate and lead programs for valuation of biodiversity and ecosystem services.

The valuation of biodiversity and ecosystem service needs to be addressed in the face of rapid socio-economic development vis-a-vis the conservation efforts to uphold the constitutional mandate to maintain 60 percent of the land under forest cover.

## 3.3 Protected area management

Forest ecosystems are preserved through a network of protected areas which are ecologically representative of the major ecosystems ranging from sub-tropical grasslands and mixed deciduous forests to alpine ecosystem. Humans are an integral part of the protected area landscape in the country. The greatest conservation challenge that Bhutan faces is to operate the parks at the highest standard with sustainable financing while maintaining a balance between conservation and sustainable utilization.

Currently most of the protected area boundaries have not been clearly demarcated and zonated for management interventions resulting in ad *hoc* planning of services/ facilities and resource extraction often conflicting with conservation goals and Rules (NCD, Zoning of protected areas - a priority , 2009). The lack of physical demarcation of the different zones also poses a challenge in ensuring legal protection to these areas in case of encroachment/land conversion. The lack of adequate scientific information on the protected areas is also one of the prevailing issues that needs to be addressed.

## 3.4: Conservation of species.

Species conservation plans are limited to few endangered species like Tiger, Snow Leopard, White-bellied Heron, and Black-necked Crane due to limited funds and capacities. Although, higher floral and faunal diversity have been accounted, there is still a lack of an overall national level red list assessment to guide legal protection and national conservation plans.

Completion of the inventory, documentation and assessment of lower groups of biodiversity is also a major task that needs to be carried out for comprehensive information on the country’s biodiversity.

## 3.5: Management of native genetic diversity

In terms of genetic diversity, the ongoing programs are limited to inventory, documentation, collection and preservation of Bhutan’s crop and animal genetic resources for food and agriculture but it is far from complete. Parallel on-farm conservation programs have been implemented largely with donor funding since 2003, in collaboration with the RNR -RDCs and the DoA and DoL. Work on native horticultural crops and Crops Wild Relatives is yet to be initiated. The assessment at the genetic level has been carried out only for some of the livestock breeds and none of the crop varieties.

The other growing concern is the loss of genetic diversity due to factors such as increasing trend of rural-urban migration, human-wildlife conflict, reduced farm labour, introduction of exotic breeds/varieties etc. A better understanding of the genetic diversity that the country possesses and the loss of genetic diversity have to be addressed urgently in light of food and nutrition security of the country, especially in the face of emerging challenges such as climate change and loss of resilient farming system.

## 3.6: Incentives related to biodiversity.

In order to boost agriculture in the pursuit of food and nutrition security and to reduce the high import dependency, the provision of subsidy on agriculture inputs was initiated as early as 1961 (DoA, 2008) with support ranging from input supplies to fertilizers to irrigation facilities. The gradual phasing out of subsidies started in the 7th FYP with the removal of input support on land terracing. Further, in the 8th FYP, the RGOB removed the support on transportation costs of agriculture inputs such as fertilizers, seeds and plant protection chemicals. Presently, the different forms of direct incentives covered in the agriculture and livestock sector include free supply of seeds and seedlings of promotional crops and fodder; supply of improved breeds of animals and chicken, veterinary drugs, farm machinery, plant protection chemicals, and in-organic fertilizers at a subsidized rate. Farm roads and irrigation are the other two key production incentives for the Renewable Natural Resources (RNR) Sector, with a total of Nu. 1600 million allocated in the 11th FYP.

In the Forestry sector, the direct incentives include provision of subsidized timber for rural household construction, traditional harvesting rights for Non-Wood Forest Products (NWFP), compensation for livestock lost to predation by key flagship wildlife species. Subsidized timber is also allocated for community infrastructure and construction of Dzongs and Lhakhangs.

The other incentive in place is the Integrated Conservation and Development Projects (ICDPs) in the protected areas, with the government having spent a total of Nu. 58.70 million and Nu. 55.14 million in the 9th and the 10th FYPs respectively. ICDPs are implemented in various forms such as providing CGI roofing and solar lights; building bridges, mule tracks and other community facilities; livestock and agriculture intensification programmes; scholarships to students; capacity building and environmental education programmes

In addition to the direct incentives, the provision of free agriculture, livestock and forestry extension services, subsidized loans for agriculture enterprise and development of infrastructure for farmers’ markets and roadside vendors are the main indirect incentives. Other forms of incentives that have a bearing on the sustainable conservation of environment and biodiversity include a 15 per cent income tax rebate for any business firms that undertake environment- friendly up gradation of their business beyond the minimum standard required by the law, exemption of sales and custom duties on any labour saving devices and, a 15 year income tax holiday for waste management and recycling entities (MoF 2010) and progressive green tax on vehicles(11th FYP doc.).

Despite the long history of subsidies in the country, no review on their impacts has been carried out till date. The sustainability of ICDP initiatives, status of NWPFs, impacts of subsidized rural timber on the forest resource, impacts of inorganic fertilizers and agro-chemicals need to be critically assessed.

On the other hand, the lack of incentives in the areas of agro-biodiversity conservation for farmers to maintain traditional varieties of crops and breeds of livestock for a resilient, diversified farming system is an issue that needs to be addressed urgently. There is also a need to develop and diversify the crop insurance scheme as the loss of crop and livestock from predation by wild animal, natural calamities and emerging pest and diseases are rapidly encouraging the communities to abandon their land and homes to move into urban areas. Developing and diversifying crop insurance against all such risks will serve as a positive incentive towards the sustainable management of agro-biodiversity resources.

## 3.7 Sustainable use of biodiversity

The RNR sector is the second largest contributor to national GDP at 15.7 per cent (RNR stats 2013). It is accorded high priority since it directly contributes to poverty alleviation, sustainable rural livelihood, food and nutritional security and other environmental services. Although Hydropower is the main contributor to the national GDP at 20 percent, its sustenance hinges on the overall sustainability and management of the Renewable Natural Resources, particularly the forests and critical watersheds it sustains. Therefore, in the 11th FYP, the MoAF has placed high priority on sustainable utilization, conservation and management of natural resources.

In forestry, guided by the National Forest Policy, 2011, the priorities are to improve management of State Forests[[9]](#footnote-10); enhance biodiversity conservation through sustainable production of environmental goods and services; and strengthen forest governance and participation for sustainable resource management and effective delivery of services.

In Agriculture, Organic farming was accorded strong national impetus in the 10th FYP with Bhutan declaring its aspiration to go 100 percent organic by 2020 (NOP master plan), in line with the GNH principles to make agriculture sustainable and environment friendly. This initiative is further up scaled in the 11th FYP with interventions in all the sub-sectors. Other key interventions include improved irrigation and the promotion of Sustainable Land Management (SLM) technologies, including integrated soil and nutrient management to reduce soil erosion and degradation, increase crop diversity and fodder availability (Bhutan Climate Summit, 2011Food security paper).

In livestock, the emphasis is on enhancing self sufficiency of livestock products, promotion of green livestock farming practices for climate change adaptation and mitigation and minimizing the degradation of rangeland and pastures through “zero” grazing policy and reduction of unproductive breeds.

Although policies are in place with focus on sustainable management in agriculture, forestry and livestock sectors, there is a palpable lack of necessary tools, technologies and capacities to confront the emerging challenges. The natural resource demand, particularly for timber and NWFPs is escalating, emphasizing the need to bring more areas under sustainable timber production and to develop and implement harvesting guidelines for NWFP based on actual resource assessment. Community forestry also demands adequate knowledge and skills to ensure sustainability in order to achieve both conservation and livelihood objectives. Expansion of SLMP technologies to ensure the protection of limited arable land and rehabilitation of degraded land and habitat are the gaps that need to be addressed. Improvement in rangeland management and development of sustainable initiatives for feed and fodder are some recurrent issues requiring attention.

## 3.8: Science-based knowledge, information and technology related to biodiversity.

Biodiversity inventories and documentation are carried out within the context of individual projects and institutions guided by their specific objectives and collection standards, often in isolation. More critical is the fact that these data hardly gets shared or are easily accessible. This situation has resulted in duplication of efforts, lack of consolidation, and difficulty in analysis to generate information, which is a great impediment to the meaningful use of these data. This issue of difficulty in accessing data and information has been raised in many fora and document, including stakeholder consultation workshops. Currently, recognizing this drawback, a consortium and citizen science-based approach to managing biodiversity data through a web-portal is under way. However, it is far from achieving its intended objectives.

In terms of technologies related to biodiversity management, despite development and adoption of various technologies for biodiversity management, there is still a gap as well as an opportunity for improvement. Some of the recurring technological issues include developing and adopting efficient and cost effective management tool to address Human-Wildlife Conflict and forest fire; improved timber felling and sawing techniques; efficient wood/timber treatment techniques; efficient technologies for harvesting, processing and marketing of NWPFs, etc.

## 3.9: Traditional knowledge and customary practices associated with biodiversity.

# Chapter 4: National Biodiversity Strategy, principles, priorities and targets.

## 4.1 Long term vision

To be drafted after final discussion with all the stakeholders

## 4.2 Principles governing the strategy

- Core values and beliefs underlying the NBSAP.

* There is an integral link between Bhutan’s biological resources and the economic, social and spiritual wellbeing of the Bhutanese people who hold Nature in trust for the benefit of the planet and the current and future generations. Thus, the need for conservation and sustainable use.
* There is an urgent need to nurture a participatory, people-centric conservation approach to ensure that the responsibility and accountability for conservation is equally shared by the people and the state.
* The biological diversity of Bhutan must be assessed, documented, valuated and understood so that benefits can be tapped and equitably shared.
* The need to strengthen science so that biodiversity management is backed by strong scientific reasoning.
* Need to strengthen national capacities for strengthening sustainability of conservation initiatives.

## 4.3: National Targets

National targets are based on the issues, threats, gaps and opportunities identified through a series of stakeholder consultation workshops carried out throughout the country (Annexure 7). It is also based on the result of the review of the past Biodiversity Action Plans and guided by the national priorities and Aichi Biodiversity targets (Annexure 8).

1. National Target 1: By 2018, at least 60 percent of the population are aware of values of biodiversity and steps they can take to conserve and use it sustainably.
2. National Target 2: By 2018, establish national capacity for valuation of biodiversity and ecosystem services to integrate into national development planning and policy making process and national accounting system, as appropriate.
3. National Target 3: By 2020 incentives harmful to biodiversity are reformed and positive incentives are enhanced.
4. National Target 4: By 2020, relevant stakeholders adopt the principles of sustainable production and consumption of natural resources and have kept the impacts of use of natural resources well within safe ecological limits.
5. National Target 5: By 2018, high-biodiversity value habitats are mapped, the rate of losses is accounted, trends monitored and overall loss and fragmentation reduced.
6. National Target 6: By 2020, baseline for fish and key aquatic biodiversity established for implementation of sustainable management plans, as appropriate.
7. National Target 7: Areas under agriculture and forestry are managed through the adoption of sustainable management practices, ensuring conservation of biological diversity.
8. National Target 8: By 2020, pollution from different sources, including from use of fertilizers and agro-chemicals affecting biodiversity and ecosystem functions are maintained within the national environmental standards.
9. National Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
10. National target 10: By 2020, potential impacts of climate change on vulnerable ecosystems identified and adaptation measures strengthened.
11. National Target 11: Maintain the current Protected Area System with enhanced management effectiveness and financial sustainability.
12. National Target 12: By 2020, the information on conservation status of prioritized taxonomic groups available and actions are taken to improve the status of prioritized species.
13. National Target 13: By 2018 genetic diversity of key cultivated plants and domesticated animals, including that of crop wild relatives are documented and conserved.
14. National Target 14:  By 2020, key ecosystems and ecosystem services are identified, assessed and safeguarded for human well-being.
15. National Target 15: By 2020, priority degraded ecosystems and habitats are identified and rehabilitated.
16. National Target 16: By 2015, the Nagoya protocol is implemented through ABS legislative, administrative and institutional frameworks, which are consistent with the Nagoya Protocol.
17. National Target 17: By 2015, revised National Biodiversity Strategy and Action Plan (NBSAP) adopted for implementation as a national guiding document for conservation and sustainable use of biodiversity.
18. National Target 18: By 2020, TK and customary practices of communities, relevant to biodiversity conservation and sustainable use are documented and used, and where appropriate revived and protected.
19. National Target 19: By 2020, science-based knowledge and technologies related to biodiversity are improved, made accessible and applied, where appropriate.
20. National Target 20: By 2016, funding requirement for implementation of NBSAP identified and funds mobilized.

# Chapter 5: The National Biodiversity Action Plan:

## National Target 1: By 2018, at least 60 percent of the population are aware of values of biodiversity and steps they can take to conserve and use it sustainably.

**Rationale**

Currently, about 66 percent of the population interacts with Protected Areas (PAs), where environmental education is part of the protected area management as mandated by environmental legislations. However, these programmes are *ad hoc* and limited to raising awareness on environmental rules and regulations or basic understanding of the environment and environmental problems. There are also a number of on-going Environmental Education programs targeting different sections of the population. However, what has been lacking quintessentially is an institutionalized mechanism to ensure that the public understanding of the importance of biodiversity and their role in conserving it, as well as environmental legislations are elevated.

Thus, as a first step, it is crucial to ascertain the proportion of the population aware of biodiversity and its values, which will guide in assessing of the efficacy of the existing awareness initiatives, and identify gaps and target groups. In targeting 60 percent of the population, efforts will be focussed primarily on the population living within the PAs. Existing Environmental Education programmes will be strengthened to target the population outside the protected areas, including private and corporate sectors.

**Strategies and Actions:**

***Strategy 1: Ascertain the existing awareness on the values of biodiversity in the country.***

Action 1.1: Assessment of general population on awareness of biodiversity values.

Action 1.2: Identify the gaps and target groups.

***Strategy 2: Implement National Environmental Education master plan, with special focus on biodiversity values.***

Action 2.1 Identify agencies involved in environment education and awareness raising programs and set up a coordination mechanism for education and awareness.

Action 2.2: Develop and implement National Environmental Education Master Plan.

Action 2.3: Review current environmental studies curriculum of both formal and non-formal education sector to incorporate biodiversity components as per the National Environmental Education Master Plan.

***Strategy 3: Strengthen capacity in biodiversity education and awareness.***

Action 3.1: Conduct a capacity needs assessment and develop capacities for implementing environmental education and awareness raising programs.

**Indicators:**

1. Trends in the proportion of population aware of biodiversity (To be measured through a survey in agreed time-interval, after getting the baseline)

2. Trends in implementation of the Environmental Education Master plan by agencies and institutions.

3. Trends in the implementation of biodiversity-related Corporate Social Responsibility initiatives.

## National Target 2: By 2018, establish national capacity for valuation of biodiversity and ecosystem services to integrate into national development planning and policy making process and national accounting system, as appropriate.

**Rationale:**

Currently, the valuation of biodiversity and ecosystem services is limited to national capacity building initiatives for REDD readiness, Payment for Environmental Services, National Forestry Inventory, and ad hoc valuation of some protected areas and ecosystem services. However, there is a lack of systematic valuation of biodiversity and ecosystem services in the country. This has been mainly due to inadequate national capacity and institutional mechanism to coordinate and lead programs for valuation of biodiversity and ecosystem services.

Therefore, the focus of this target will be to build national capacities for valuation of biodiversity and ecosystem services, and incorporation of these values into the national planning and policy making process and accounting system, where appropriate.

**Strategies and actions.**

***Strategy 1: Set up institutional mechanism for valuation of biodiversity and ecosystem values.***

Action 1.1: Identify lead agency to coordinate biodiversity and ecosystem services valuation initiatives.

Action 1.2: Take stock of initiatives in valuation of biodiversity values and ecosystem services.

Action 1.3: Develop institutional arrangements for implementing biodiversity and ecosystem valuation programs, including developing linkages with institutions outside the country.

***Strategy 2: Build capacity for valuation of biodiversity and ecosystem services.***

Action 2.1: Assess current capacity, gaps and needs for valuation of the prioritized biodiversity and ecosystem services.

Action 2.2: Build relevant capacity in valuation of the prioritized biodiversity and ecosystem services and integration of values into national planning and policy making process and accounting system.

***Strategy 3: Incorporate biodiversity values into environmental policy, legislations, guidelines and development plans.***

Action 3.1: Review and where relevant recommend for revision/amendment of relevant policies and legislations such as Environment Assessment Act to incorporate biodiversity and ecosystem values.

Action 3.2: Incorporate biodiversity and ecosystem values into relevant national guidelines such as the five year development plan and Environmental Impact Assessment.

**Indicators:**

1. Trends in the capacity for valuation of biodiversity and ecosystem services (no. of people/institutions with capacity to valuate biodiversity and ecosystem services).
2. Trends in the number of valuation studies in the country.

3. Trends in the number of legislations/guidelines with biodiversity values integrated.

## National Target 3: By 2020 incentives harmful to biodiversity are reformed and positive incentives are enhanced.

**Rationale**

The different forms of incentives provided in the renewable natural resources sector (RNR) are mainly targeted at realizing the goals of food and nutritional security, enhancement of rural livelihood and reduction of the high import dependency. Even though, these incentives are relatively small, they are considered positive in terms of their contribution but their impacts on biodiversity are yet to be assessed.

In the Forestry sector, subsidized timber and the right to collect NWFPs are generally perceived to be harmful since these resources are extracted on an *ad-hoc* basis from unmanaged forests. The ICDP is seen as a positive incentive, albeit with sustainability issues.

Therefore, the focus of this target is on ascertaining the impacts of incentives on biodiversity for appropriate interventions.

**Strategies and Actions**

***Strategy 1: Reform incentives affecting biodiversity negatively***

Action 1.1: Review and identify harmful incentives.

Action 1.2: Reform harmful incentives as appropriate.

***Strategy 2: Strengthen incentives promoting conservation and sustainable use of biodiversity.***

Action 2.1: Review and redefine ICDPs considering sustainability, equity, community ownership and participation.

Action 2.2: Explore incentives such as PES, Community-Based Sustainable Tourism (CBST), Eco-tourism and agro-tourism for conservation and sustainable use of biodiversity by the local communities.

Action 2.3: Revisit and prioritize Crop Promotional Program to strengthen agro-biodiversity conservation, development and management at community level.

Action 2.4: Pilot Crop and Livestock Insurance Schemes for sustainable management of agro-biodiversity.

Action 2.5: Recognize and celebrate the role of the custodians of agro-biodiversity and promote conservation stewardship.

***Indicators***

1. Number of harmful incentives identified and reformed.
2. Number of positive incentives strengthened.

## National Target 4: By 2020, relevant stakeholders adopt the principles of sustainable production and consumption of natural resources and have kept the impacts of use of natural resources well within safe ecological limits.

**Rationale:**

Some of the natural resources that are under severe consumption pressures are timber and fuel wood for construction and energy, the overharvesting of NWFPs as well as the pressure exerted on landscapes due to unsustainable agriculture practices, overgrazing by domestic animals and concentration of mines in certain areas. These pressures, if left unchecked, will have severe ramifications on the fragile ecosystem and biodiversity.

The lack of relevant data and knowledge to ascertain the safe ecological limits of these vulnerable production sectors is a well-known gap. Therefore this target will focus on assessing the operation of key natural resources-based production sectors within safe ecological limits and sustainability where necessary to encourage adoption of sustainable production by these sectors.

**Strategies and Actions:**

***Strategy 1: Strengthen science-based management of natural resources.***

Action 1.1: Carry out studies on ecological limits of vulnerable production and consumption sectors.

Action 1.2: Initiate and promote interdisciplinary research in sustainable production and consumption of natural resources for developing natural resources management plans.

***Strategy 2: Promote sustainable use and consumption of natural resources.***

Action 2.1: Carry out resource mapping of wood and NWFPs and develop sustainable management guidelines.

Action 2.2: Promote the use of efficient technologies for harvesting, processing and marketing of forest resources.

Action 2.3: Promote alternative sources to timber to reduce pressure on natural resources.

Action 2.4: Integrate traditional use of natural resources (grazing, leaf litter, fodder) with sustainable management plans.

Action 2.5: Promote and encourage community participation in the implementation of sustainable management plans of natural resources.

**Strategy 3: Strengthen capacity in natural resources management.**

Action 3.1: Assess capacity gaps in natural resource management.

Action 3.2: Strengthen capacity based on the capacity gap analysis.

**Indicators.**

1. Availability of information on safe ecological limits of vulnerable production and consumption sectors.
2. Trends in development, adoption and implementation of sustainable management plans.

## National Target 5: By 2018, high-biodiversity value habitats are mapped, the rate of losses is accounted, trends monitored and overall loss and fragmentation reduced.

**Rationale:**

Many of the high-biodiversity value habitats such as primary forests, high altitude wetlands, and home-range of flagship species fall within the protected area system. However, some other high-biodiversity value habitats such as Important Bird Areas (IBA), Key Biodiversity Areas (KBA), Ramsar Sites, Areas rich in crop-wild relatives are yet to be mapped in order to understand their status and to implement appropriate conservation measures.

Currently, there is no concrete data to ascertain the rate of habitat loss although land use conversion and forest fire are considered as leading factors. Therefore, the focus of this target will be to firstly map the high-value biodiversity habitats and assess the extent of degradation and fragmentation for appropriate interventions.

**Strategies and actions**

***Strategy 1: Map high-biodiversity value habitats.***

Action 1.1: Develop guidelines and criteria to identify high-biodiversity value habitats.

Action 1.2: Identify and map high-biodiversity value habitats.

***Strategy 2: Reduce the loss of high-biodiversity value habitats.***

Action 2.1: Account for the extent and rate of habitat loss due to fragmentation and degradation.

Action 2.2: Implement appropriate interventions, including policy recommendations for designation and protection of high-biodiversity value habitats, where necessary.

***Strategy 3: Address the major causes of habitat loss where possible***

Action 3.1: Strengthen national fire management program in terms of human capacity, research, technology, equipment, coordination, surveillance and response system, etc.

Action 3.2: Scale up community-based forest fire management approaches.

Action 3.2: Enhance awareness on forest fire and other potential factors causing habitat loss.

**Indicators**

1. Availability of information on high-biodiversity value habitats.
2. Availability of baseline information on the extent and rate of habitat loss.
3. Trends in forest fire incidences.

## National Target 6: By 2020, baseline for fish and key aquatic biodiversity established for implementation of sustainable management plans, as appropriate.

**Rationale:**

There are only a few scientific studies carried out till date to determine fish and other aquatic species composition of natural water bodies in Bhutan. The imminent threat to aquatic biodiversity arises from the large hydropower projects in the major rivers of Bhutan due to destruction of habitat, spawning ground and disturbance to migration route. Given the current threat and inadequate knowledge of Bhutan’s ichthyofaunal diversity, more extensive freshwater fish diversity surveys including habitat and biology, migratory pattern and spawning /breeding habitats, is necessary. Similar studies also need to be initiated for other key aquatic species. Once the baseline information is established, efforts will be made to develop sustainable management plans as appropriate.

**Strategies and actions**

***Strategy 1: Strengthen information base for fish and key aquatic biodiversity for conservation and sustainable utilization.***

Action 1.1: Conduct nationwide inventory and documentation of fish.

Action 1.2: Develop and implement sustainable management plans for fish.

Action 1.3: Initiate inventory and documentation of key aquatic biodiversity.

***Strategy 2: Strengthen institutional and technical capacity in the conservation and sustainable utilization of fish and aquatic biodiversity.***

Action 2.1: Identify lead agency to coordinate inventory of aquatic biodiversity.

Action 2.2: Strengthen institutional and technical capacity in fish and aquatic biodiversity conservation and sustainable utilization.

**Indicators:**

1. Availability of consolidated information on fish and key aquatic biodiversity.
2. Trends in the number of management plans for fish species.

## National Target 7: Areas under agriculture and forestry are managed through the adoption of sustainable management practices, ensuring conservation of biological diversity.

**Rationale**

Forestry legislations require all areas under state forest to be strategically guided by sustainable management plans. However, as of now, only 8.6 percent of the total areas under forests have well formulated resource management plans. Although resource allocations for rural uses are also done within the protected areas, the management plans are conservation-centric and lack resource management strategies. The overall impact of the lack of sustainable management plans leaves these areas highly vulnerable to degradation due to factors such as over-extraction of forest resources, land use conversion and overgrazing. Therefore, the progressive inclusion of unmanaged forest areas under a sustainable management regime still remains one of the key challenges.

In agriculture, the National Action Plan to Combat Land Degradation addresses unsustainable agricultural practices through appropriate management strategies which are harmonized under this target.

Therefore, this target will focus on strengthening sustainable management practices in the areas under forests and agriculture to ensure the conservation and sustainable utilization of biological diversity.

**Strategies and Actions**

***Strategy 1: Improve management of State Forest for sustainable production of goods and services.***

Action 1.1: Bring areas under State Forest outside the FMUs and without management plans progressively under sustainable management regimes.

Action 1.2: Review and update codes of best practices and guidelines for holistic sustainable forest management.

Action 1.3: Institute a Monitoring and Evaluation mechanism to assess the efficacy of the management plans in terms of sustainability.

***Strategy 2: Strengthen good governance for sustainable management of forests***

Action 2.1: Promote transparency through access to information and consultative/participatory approaches.

Action 2.2: Enhance institutional capacity for sustainable management of resources and effective delivery of services.

Action 2.3: Strengthen capacity and empower local communities for sustainable management of resources.

***Strategy 3: Promote sustainable agricultural practices that ensures conservation of biological diversity***

Action 3.1: Assess major farming systems for richness in biodiversity using biodiversity indices.

Action 3.2: Introduce appropriate measures based on the results of the assessment to enhance the conservation of biodiversity.

Action 3.3: Promote organic farming as per the National Organic Development master plan.

Action 3.4: Promote SLM practices supporting biodiversity conservation such as Integrated Pest Management, Integrated Soil Fertility Management Practices, Irrigation water management technologies, improved pasture management and fodder development.

Action 3.5: Explore innovative approaches to incentivize the adoption of sustainable agricultural practices through product diversification, niche marketing, premium pricing for organic products and products derived from sustainable sources, etc

**Indicators**

1. Trends in area of state forest under sustainable management practices.
2. Trends in area under organic agriculture.

## National Target 8: By 2020, pollution from different sources, including from use of fertilizers and agro-chemicals affecting biodiversity and ecosystem functions are maintained within the national environmental standards.

Currently except in areas around main industrial estates and localized water pollution, the ambient air and water quality at macro level is found to be in good state. Adequate measures are also in place to address pollution from all sources. However, the overriding issue of concern is the weak implementation and enforcement of environmental standards and inadequate monitoring.

Although agro-chemical and fertilizers are potential sources of pollution of both land and water, especially if used without proper management practices, currently there is no report on the extent of the impacts of these agro-chemicals on land and environment in general, except for sporadic observations.

Therefore, this target will focus on strengthening national mechanism to implement and monitor standards for all sources of pollution, including agro-chemicals and fertilizers.

**Strategies and Actions**

***Strategy 1: Major pollutants affecting environment are maintained as per the National environmental standards.***

Action 1.1: Strengthen implementation of environmental standards for all major pollutants.

Action 1.2: Strengthen monitoring and reporting mechanism for all major sources of pollution.

Action 1.5: Strengthen environment performance reporting system by industries.

***Strategy 2: Strengthen research and technical capacity for documenting, monitoring and assessing the impacts of major pollutants.***

Action 2.1: Document and quantify major pollutants.

Action 2.2: Develop capacities to assess and monitor major pollutants.

Action 2.3: Strengthen research and technologies to assess and monitor impacts of major pollutants on environment, including biodiversity.

Action 2.4: Establish national baseline for river water quality.

**Indicators:**

* Trends in level of pollution at point source (to measure discharge and emission at point source).

## National Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

**Rationale:**

Since there is no comprehensive inventory and assessment of IAS in the country, there is limited knowledge on IAS and its impacts. Therefore, this target will focus on understanding the diversity of IAS and its impacts, instituting measures for control and/or eradication of prioritized IAS and development of technical capacity.

**Strategies and Actions:**

***Strategy 1: Improve understanding on IAS and native species with potential for invasiveness.***

Action 1.1: Complete national inventory of IAS and native/naturalized species with potential for invasiveness along with the distribution and pathways of introduction.

Action 1.2: Develop modules on invasive species for incorporation in the training curricula of relevant institutions.

Action 1.3: Promote education and awareness on invasive species and their impacts.

Action 1.4: Build technical capacity on invasive species management.

***Strategy 2: Develop and implement measures to protect natural and agriculture ecosystems against IAS.***

Action 2.1: Assess the threats of IAS and native invasive species and prioritize high-risk species.

Action 2.2: Develop management strategies for established high-risk species, taking into account the effects of climate change.

Action 2.3: Develop and implement guidelines to manage and regulate entry and introduction of IAS.

Action 2.4: Incorporate IAS issues into relevant policies and Laws

Action 2.5: Develop institutional framework for invasive species management, including regional collaboration.

**Indicators:**

* Trends in availability of information on IAS.
* Trends in prevention and control on spread of IAS (To be measured through no. of intervention for prevention and control of IAS, including capacity and management strategies developed and implemented)

## National target 10: By 2020, potential impacts of climate change on vulnerable ecosystems identified and adaptation measures strengthened.

**Rationale:**

Although adaptation to climate change cuts across almost all the targets and actions are reflected accordingly in targets 9, 11, 12, 13, 14 and 15; target 10 is identified separately with specific focus on enhancing understanding of the impacts of climate change on biodiversity and ecosystems. Currently, apart from a few scattered studies and community perceptions, there is still a huge gap in research and understanding on the impacts of climate change on biodiversity and ecosystems in the country. This drawback has been recognised and actions to address this issue prioritised in national documents such as Biodiversity persistence and climate change, 2011 and the Second National Communication to the UNFCCC. Short-term adaptation measures have been implemented through the National Adaptation Plan of Action (NAPA) under UNFCCC.

Therefore, this target underscores, first, the need for strengthening national efforts in understanding the impacts of climate change on biodiversity and ecosystems at the country level, and second, for enhancing resilience and adding value to regional and international efforts.

***Strategy 1: Elevate understanding on the impacts of climate change on biodiversity and ecosystems.***

Action 1.1: Develop a national network of long-term climate monitoring stations for the generation of comprehensive climate data.

Action 1.2: Promote inter-disciplinary research on climate change, biodiversity, and ecosystems.

Action 1.3: Institute a national mechanism to collate and share data and information generated from research for development and implementation of adaptation measures and policy decisions.

Action 1.4: Conduct systematic awareness and educational programs on impacts of climate change on biodiversity,

***Strategy 2: Strengthen climate change adaptation measures.***

Action 2.1: Develop a policy on climate change with special focus on food security, biodiversity and water.

Action 2.2: Develop appropriate long-term ecosystem-based adaptation measures to minimize impacts of climate change on vulnerable ecosystems, biodiversity and communities

Action 2.3: Strengthen implementation of immediate targeted actions for prioritized ecosystems.

Action 2.4: Integrate long-term ecosystem-based adaptation measures into national plans and programs

**Indicators:**

1. Trends in availability of information on species and ecosystems most vulnerable to impacts of climate change.
2. Climate change policy developed.

## National Target 11: Maintain the current Protected Area System with enhanced management effectiveness and financial sustainability.

**Rationale:**

The key issues in protected area management are incomplete physical boundary demarcation and zonation, resulting in *ad hoc* planning of services/ facilities and resource extraction often conflicting with conservation goals and Rules. Although biological corridors have been declared, they lack legal status and protection from development activities.

The lack of sustainable financing mechanism to operate the parks at the highest standard while maintaining a balance between conservation and sustainable utilization is major challenge

Therefore, the focus of this target is to maintain the current Protected Area System with enhanced management effectiveness and financial sustainability.

**Strategies and Actions**

***Strategy 1: Enhance management effectiveness of protected areas system.***

Action 1.1: Evaluate management effectiveness of Protected Areas and Biological Corridors.

Action 1.2: Complete zonation of PAs

Action 1.3: Enhance local community participation in the management of PAs.

Action 1.4: Review the functionality of Biological Corridors for demarcation, operationalization and legal protection.

Action 1.5: Monitor and assess the status and trends of biodiversity within protected area systems.

Action 1.6: Promote and support transboundary management and regional partnership initiatives.

***Strategy 2: Establish sustainable financing measures for the Protected Area System***

Action 2.1: Develop and implement REDD- plus activities to support conservation financing.

Action 2.2: Institutionalize and upscale Payment for Ecosystem Services (PES) initiatives.

Action 2.3: Upscale nature recreation and ecotourism programs with a financial plough-back mechanism.

Action 2.4: Explore additional innovative financing sources.

**Indicators**

* Trends in number of parks with zonation completed.
* Trends in the number of biological corridors operationalized (To be measured by number of BC which are operationalized with mgt. Plan)
* Trends in financial resources mobilized for PAs.

## National Target 12: By 2020, the information on conservation status of prioritized taxonomic groups available and actions are taken to improve the status of prioritized species.

**Rationale:**

Bhutan is yet to carry out a national-level evaluation of the conservation status its biodiversity which has resulted in inadequate legal protection of threatened species and implementation of species-based conservation programs. Further, the lack of evaluation makes it difficult to understand the status of the globally threatened species at a national level and the actions that are required to improve its conservation status. It also limits national actions for those species which might be of concern at the national level.

Therefore, the focus of this target will be to understand the conservation status of the globally threatened species and of nationally important taxonomic groups and species in the country. Evaluation will be followed by development and implementation of species-based conservation action plans for prioritized species.

**Strategies and Actions.**

***Strategy 1: To understand the status of prioritized taxonomic groups and species and the factors affecting them.***

Action 1.1: Develop a national mechanism and evaluate the conservation status of prioritized taxonomic groups and species.

Action 1.3: Update the National Red List of prioritized taxonomic groups

***Strategy 2: Strengthen conservation programs for prioritized species.***

Action 2.1: Prioritize species for conservation based on nationally agreed criteria.

Action 2.2: Develop and implement species-based conservation management plan for prioritized species.

Action 2.3: Enhance capacity in species-based conservation and monitoring.

**Indicator:**

1. Trends in availability of updated National Red List of prioritized taxonomic groups.
2. Trends in species-based conservation programs implemented.

## National Target 13: By 2018 genetic diversity of key cultivated plants and domesticated animals, including that of crop wild relatives are documented and conserved.

The documentation and conservation of the local diversity of cultivated plants and domesticated animals are far from being complete mainly due to the lack of technical and institutional capacities. Considering the significant role that local agrobiodiversity can play in developing resilient farming systems for adaptation to emerging challenges, this target focuses on strengthening the systematic documentation of local diversity of cultivated plants, including crop wild relatives and domesticated animals. This will be followed by development of strategic action plans, enabling policy framework and institutional mechanisms for conservation and sustainable utilization of local agrobiodiversity.

**Strategies and Actions**

***Strategy 1: Strengthen national capacities in documentation and management of agro-biodiversity conservation and sustainable utilisation.***

Action 1.1: Strengthen technical capacities and infrastructure for *ex-situ* conservation of agro-biodiversity, including crop wild relatives.

Action 1.2: Develop capacity to undertake diversity studies of crops and domesticated animals.

Action 1.3: Strengthen capacities in on-farm management of crops and domesticated animals and *in-situ* conservation of crop-wild relatives.

***Strategy 2: Strengthen documentation and management of agro-biodiversity.***

Action 2.1 Complete documentation and assessment of key cultivated crops and domesticated animals, including crop wild relatives.

Action 1.2: Develop and implement management plans of prioritised crops and livestock species.

Action 1.3: Identification and declaration of heritage sites of significant crop varieties and crop wild relatives.

Action 1.4: Review current legal and policy framework to address agrobiodiversity conservation and sustainable use.

Action 1.5: Strengthen and diversify *ex-situ* and *in-situ* conservation approaches, including incentives to conserve.

**Indicators**

1. Trends in the availability of information on the diversity and status of key cultivated crops and domesticated animals.
2. Trends in *ex- situ* and in-situ conservation programs (To be measured in terms of accession for ex-situ and for in-situ- no.of on-farm conservation initiatives)

## National Target 14:  By 2020, key ecosystems and ecosystem services are identified, assessed and safeguarded for human well-being.

**Rationale:**

Even though the Bhutanese have upheld strong environmental conservation ideals recognizing the values of ecosystem and its services for their well-being and sustenance putting monetary value to ecosystem services, especially to non-monetary services, has neither been a tradition nor a strong research focus. This has led to the undermining of the actual value of various ecosystems and ecosystem services and thereby the lack of identification and protection of these ecosystems.

Therefore, this target in synergy with Target 2 will focus on identifying key ecosystems and assessing their status and valuation of the services provided. An important element will also be to identify poor and vulnerable sections including women and children dependent on these ecosystem services. Subsequently, appropriate strategies will be put in place to safeguard these ecosystems and ecosystem services for the well being of Bhutanese as well as regional neighbours.

**Strategies and Actions**

***Strategy 1: Safeguard key ecosystem and ecosystem services.***

Action 1.1: Identify key ecosystems providing essential ecosystem services.

Action 1.2: Initiate valuation of the essential ecosystem services.

Action 1.3: Identify vulnerable groups, including women and children, affected by degradation of key ecosystems.

Action 1.4: Develop and implement strategies to safeguard key ecosystems and vulnerable groups, including women and children.

**Indicators**

1. Trends in availability of information on the key ecosystems and ecosystem services.
2. Trends in safeguard measures for key ecosystem services (will be measured by the number of key ecosystems/habitats that are conserved to ensure continued provisioning of ecosystem service or by number of safeguard measures/management plans implemented).

## National Target 15: By 2020, priority degraded ecosystems and habitats are identified and rehabilitated.

**Rationale**

While there is baseline information on the acreage[[10]](#footnote-11) and location of degraded[[11]](#footnote-12) and bare areas[[12]](#footnote-13) in the country, what is lacking is information on stages or degree of degradation as well as the kinds of ecosystems which are degraded. The lack of this crucial information has implications on the existing restoration and rehabilitation programs. There is also no institutional mechanism in place to oversee habitat and ecosystem degradation issues in a holistic approach. The National Action Plan (NAP) to combat land degradation is mandated to address the issue on land degradation, therefore the actions proposed in this target are envisaged to complement the NAP on land degradation.

In view of the economical costs as well as natural barriers to rehabilitate all degraded ecosystems and areas in the country, this target will focus on understanding the degree and causes of degradation for implementation of appropriate and feasible rehabilitation measures in prioritized degraded areas and ecosystems.

**Strategies and Actions:**

***Strategy 1: Set up a national mechanism to address habitat and ecosystem degradation in a holistic approach.***

Action 1.1: Establish an institutional mechanism to coordinate rehabilitation programs in the country, including monitoring and evaluation.

Action 1.2: Strengthen institutional mandates and capacities to coordinate, implement and monitor rehabilitation program for all types of ecosystems, including aquatic.

***Strategies 2: Rehabilitate prioritized degraded areas and ecosystems.***

Action 2.1: Map degraded areas and ecosystems, including degree and causes of degradation, based on the existing baseline data.

Action 2.2: Develop criteria for prioritisation of degraded areas and ecosystems for rehabilitation.

Action 2.3: Develop strategies for rehabilitation programs.

Action 2.4: Explore and implement relevant rehabilitation measures such as plantation (afforestation and reforestation), agro-forestry, reclamation and application of codes of best practices.

Action 2.5: Strengthen enforcement of mandatory requirements for rehabilitation of disturbed areas due to developmental activities.

**Indicators**

* Trends in the availability of information on the degree of degradation of degraded areas and ecosystems.
* Trends in rehabilitation of prioritized degraded areas and ecosystems (To be measured in acreage of areas rehabilitated).

## National Target 16: By 2015, the Nagoya protocol is implemented through ABS legislative, administrative and institutional frameworks, which are consistent with the Nagoya Protocol.

**Rationale:**

Bhutan became the 24th country to ratify the Nagoya Protocol in 2013 and is in the process of finalizing its ABS policy, in line with the Nagoya Protocol. While efforts are underway to establish the policy and regulatory framework for the implementation of the ABS regime in Bhutan, progress has been slow due to the limited understanding of ABS in the country coupled with inadequate institutional, legal and technical capacities. Therefore there is an urgent need to prepare for the effective implementation of the NP through the harmonization of national legislations and strengthening of national capacities for the implementation of an ABS regime that ensures the fair and equitable sharing of benefits from the sustainable utilization of biological resources in the country.

**Strategies and Actions:**

***Strategy 1: Develop national policy and legal framework for the implementation of the Nagoya Protocol.***

Action 1.1: Adopt the National Access and Benefit Sharing policy (ABS)

Action 1.2 Review and recommend for amendment/revision of the Biodiversity Act of Bhutan, 2003 to align with the National ABS policy.

Action 1.3: Develop regulation to facilitate implementation the Biodiversity Act of Bhutan as appropriate

***Strategy 2: Strengthen the implementation of a fair and equitable ABS model.***

Action 2.1: Establish appropriate institutional, legal and administrative measures for the implementation of the ABS regime.

Action 2.2: Strengthen education and awareness on ABS regime.

Action 2.3: Explore and pilot ABS ventures at local, national and international levels.

Action 2.4: Strengthen the Bhutan ABS fund for empowering local communities to engage in biodiversity conservation.

Action 2.5: Strengthen national capacities to implement the ABS regime.

**Indicators**

1. National ABS policy and regulatory framework in place.
2. Trends in ABS ventures.

## National Target 17: By 2015, revised National Biodiversity Strategy and Action Plan (NBSAP) adopted for implementation as a national guiding document for conservation and sustainable use of biodiversity.

**Rationale:**

Acknowledging the drawbacks of the past Biodiversity Action Plans, the focus of this target is to ensure that the current revision is taken up in an inclusive, interactive and consultative manner with relevant stakeholders in the country for identification and prioritization of actions and ownership of the document.

To achieve the national targets, the NBSAP will be adopted as national guiding documents for biodiversity planning and management with an effective coordination mechanism for NBSAP implementation, including systematic monitoring and evaluation mechanism.

**Strategies and Actions**

***Strategy 1: Adopt the revised NBSAP as national guiding document on biodiversity conservation and sustainable use program.***

Action 1.1: Revise NBSAP in line with the national priorities and Aichi Biodiversity Targets through a participatory and inclusive approach.

Action 1.2: Adopt NBSAP as a national guiding document for biodiversity conservation and sustainable use programs.

Action 1.3: Mainstream actions prioritized in NBSAP into relevant stakeholder plans and programs.

Action 1.4: Raise awareness on NBSAP and prioritized national targets as detailed out in the chapter on communication and outreach plan.

***Strategy 2: Establish a national mechanism for implementation of the NBSAP.***

Action 2.1: Establish a dedicated coordination unit for NBSAP implementation and resource mobilization, including monitoring and reporting (as detailed out in chapter 5 on institutional arrangement).

Action 2.4: Develop and implement an effective monitoring and evaluation plan for the achievement of national biodiversity targets.

**Indicators**:

1. Updated NBSAP adopted as national guiding document for biodiversity conservation and sustainable use.
2. National coordination mechanism for NBSAP implementation in place.
3. Trends in NBSAP actions integrated into relevant sectorial plans and programs.

## National Target 18: By 2020, TK and customary practices of communities, relevant to biodiversity conservation and sustainable use are documented and used, and where appropriate revived and protected.

**Rationale:**

While there is general political good will and government support for the inclusive and participatory approach to the integration of TK held by communities in the implementation of the ABS regime, the process has been slow due to limited human, technical, legal and financial resources. The current understanding of the implementation of the ABS regime and more importantly, the fair and equitable sharing of benefits between the TK holding communities is poor since the ABS regime in Bhutan is fairly new. In line with the emerging scenario on TK associated with GR, this target identifies the programme of work required to document, protect and utilise TK and customary practices of communities, relevant to biodiversity conservation and sustainable use.

**Strategies and Actions**

***Strategy 1: Promote Traditional Knowledge (TK) and customary practices relevant to biodiversity conservation and sustainable use.***

Action 1.1: Inventory and document TK and customary practices relevant to biodiversity conservation and sustainable use.

Action 1.2: Explore innovative measures to strengthen and incentivize TK and customary practices that promote biodiversity conservation and sustainable use.

Action 1.3: Strengthen measures to prevent mis-appropriation of TK associated with genetic resources and customary practices.

***Strategy 2: Build national capacities for the protection, preservation and utilization of TK and customary practices relevant to biodiversity conservation and sustainable use.***

Action 2.1: Build capacities on TK, ABS, Intellectual Property (IP), interphases between international obligations regarding TK and ABS, development/strengthening of community protocols, documentation of customary practices, negotiations, contract agreements, etc.

Action 2.3: Promote targeted awareness and education series on ABS,TK and customary practice for the general public, the political wing, the academia, the private sector and the local communities.

**Indicators**

* Trends in documentation of TK associated with genetic resources (no. of TK documented each year)
* Trends in the availability of information on customary practices and community protocols related to management of Biological resources.
* Trends in ABS agreements related to TK associated with genetic resources.

## National Target 19: By 2020, science-based knowledge and technologies related to biodiversity are improved, made accessible and applied, where appropriate.

**Rationale:**

Despite Bhutan’s unquestionable commitment to conservation of its natural heritage, there has been a huge lag in terms of generating and applying science based knowledge and technologies related to biodiversity. This gap has been recognized since the formulation of the first Biodiversity Action Plan (BAP) as well as in subsequent national documents on biodiversity management.

What is crucial at this stage is to build collaborative initiatives/programs with international/regional conservation agencies to enhance technical expertise, knowledge, resources and funds availability to bridge the biodiversity information gap. This could result in holistic and integrated research programs that generate information for government decision-making, policy changes, awareness and education programs.

In terms of adoption of environmental friendly technologies, there is still an overall gap in the transfer, dissemination and adoption of useful technologies, which needs to be addressed.

Therefore, the focus of this target is to strengthen biodiversity information and research to promote evidence-based policy and decision-making and adoption of technologies related to biodiversity.

**Strategies and Actions**

***Strategy 1: Strengthen evidence-based policy and decision-making.***

Action 1.1: Analysis of existing biodiversity data and information gap.

Action 1.2: Strengthen research to generate biodiversity information and expand knowledge base.

Action 1.3: Promote accessibility and sharing of biodiversity information and knowledge.

Action 1.4: Promote evidence-based decision-making on policies affecting biodiversity.

***Strategy 2: Promote transfer and adoption of technologies related to biodiversity management.***

Action 2.1: Support and promote inter and intra-disciplinary research on biodiversity and related technologies.

Action 2.2: Strengthen national mechanism to coordinate and promote transfer and adoption of appropriate technologies.

Action 2.3: Strengthen national mechanism to review adopted technologies for appropriate interventions.

**Indicators:**

* Existence of an accessible central repository on biodiversity data and information.
* Trends in evidence-based decision-making.
* Trends in adoption of technologies related to biodiversity management.

## National Target 20: By 2016, funding requirement for implementation of NBSAP identified and funds mobilized.

**Rationale:**

The fund mobilization for the implementation of NBSAP will cut across three areas, specifically, i) Systemic, ii) institutional and iii) the prioritized targets.

*Systemic:*

In order to ensure successful implementation of NBSAP, it will require effective governance to be in place that provides appropriate and timely interventions. Additionally, it is critical to ensure that the Royal Government of Bhutan (RGoB) adopts NBSAP as the guiding document for implementation of all biodiversity-related interventions. Further, the RGoB should play a key role in mobilizing financial resources through, international, domestic and private sources to support the implementation of key/priority actions identified in the NBSAP.

*Institutional:*

Since the implementation of the NBSAP cuts across several institutions, it is crucial to identify an appropriate organization for effective coordination. The National Biodiversity Center (NBC) is the most appropriate organization to coordinate the implementation of the NBSAP, supported by the National Environment Commission, Department of Forests and Park Services and other relevant agencies. This is based on the fact that the overall mandate and technical competencies of NBC is aligned to the principles of CBD and it is the overall coordinating agency for conservation and sustainable utilization programs in the country.

*Prioritized Targets:*

The prioritization of the Targets was done through a participatory and inclusive approach involving all relevant stakeholders in the country. Through this consultative process, around five Targets (1, 7, 12, 17 and 20) were ranked as extremely important and six Targets (5, 6, 13, 14, 18, and 19) as very important.

In order to address the twenty national targets, a five year phased approach will be adopted in line with the national development planning cycle. Based on such a framework, the existing funds will be utilized and additional funds mobilized to address the targets in terms of national priority.

A brief insight into the history of donor funding in the country shows that Official Development Assistance (ODA) provided from 2005 to 2010 amounted to about 15.5 percent of the GDP and averaged US$ 175 million per year. The Government of India (GoI) is the major donor and other important donors include the Asian Development Bank (ADB), Austria, Denmark, EU, Japan, the Netherlands, Switzerland, the UN Systems and the World Bank. During the period of 1999 to 2009, 11 percent of the total grant was allocated for the Renewable Natural Resources (RNR) Sector (Eleventh Round Table Meeting 2011, GNHC).

The fund allocated for the RNR sector in the 11th Five Year Plan (2012-2017) is about US$ 65 million out of which, around US$ 5 million/year[[13]](#footnote-14) is for biodiversity related activities (Eleventh Five Year Plan, Volume II). Opportunities for Innovative financing such as Payment for Ecosystem Services (PES), eco-tourism, REDD+ and Climate financing are also being tapped. Currently Bhutan is in the process of becoming REDD ready through the financial support of US$ 3.8 million from the Forest Carbon Partnership Facility (FCPF). Further, Bhutan has also initiated projects on integrating PES and REDD-plus, and eco-tourism. However, all of these financial schemes are in their infancy and will require strong support from the government as well as international donors.

A tentative estimate of the total funds required for NBSAP implementation is USD \_\_\_ million (Annexure 10) indicating a gap of USD \_\_ million, which will have to be further sourced. In order to ensure the successful implementation of the NBSAP and achievement of national targets in the given timeline, the following strategies and actions will be implemented.

**Strategies and Actions**

***Strategy 1: Strengthen good governance to coordinate fund mobilization for NBSAP implementation.***

Action 1.1: Adopt NBSAP as a guiding document for biodiversity for implementation of all biodiversity-related interventions.

Action 1.2: Establish NBC as the coordination agency for NBSAP implementation.

Action 1.3: Establish a funding window for NBSAP implementation within BTFEC

***Strategy 2: Mobilize financial resources to support implementation of the NBSAP.***

Action 2.1: Review the financial gap for implementation of the NBSAP.

Action 2.2: Develop and implement resource mobilization plan.

Action 1.4: Ensure effective utilization of available funds.

**Indicators**:

* Trends in funds sourced to implement NBSAP.

# Chapter 5: NBSAP Implementation Plan

## 5.1: National Coordination Structure

The key gaps identified in the implementation of the past BAPs are the lack of ownership at the national, sectoral and local levels, coupled with poor coordination mechanism for fund mobilization and subsequent implementation.

Currently, there are more than eight governmental agencies and civil society organization involved in biodiversity management, implementing programs often in isolation. This is largely due to the lack of a national mechanism to coordinate and oversee biodiversity management amongst different stakeholders. The current business-as-usual approach to managing biodiversity needs to change and be focused, strategic, strengthened and streamlined by adopting the NBSAP as the national guiding document and accordingly instituting effective governance and institutional arrangements for successful delivery of the biodiversity targets.

With the adoption of the NBSAP as the guiding document on biodiversity management in the country, a National Committee on Biodiversity with high-level representation from the key sectors will be instituted. The national level committee will constitute of the head or representatives of the head of but not necessarily limited to, i) Department of Forests and Park Services, ii) Department of Livestock, iii) Bhutan Agriculture and Food Regulatory Authority, iii) National Environment Commission, iv) Department of Agriculture v) Bhutan Trust Fund for Environmental Conservation, vi) Royal Society for Protection of Nature. This Committee will guide the implementation of the NBSAP, in line with the obligations of CBD and other biodiversity-related regional and international conventions and treaties. The Head of the National Biodiversity Centre will act as a Member Secretary to the Committee to coordinate implementation, monitoring and reporting of the NBSAP.

For the implementation of NBSAP, NBC as lead coordinating agency will institute four thematic groups (Fig. XX) composed of representatives from implementing agencies to address relevant Aichi Targets, namely: 1) Forestry/Ecology/Biodiversity, 2) Agro-Biodiversity, 3) Resource Mobilization, 4) Resources Management and Utilization. The implementation of the targets will be based on the implementation framework (Annexure 11) which is guided by the results of the prioritization done through regional and national consultation processes. Further, in order to give more administrative leverage to NBC to coordinate Biodiversity management programs at the national level as well as to liaise with international partners for technical and financial support for NBSAP implementation, it is recommended that NBC is upgraded to a departmental level.



**Fig: XX**

## 5.2: Capacity development approach for NBSAP implementation

Review of the past BAPs has indicated the lack of capacity as one of the main challenges in the successful implementation of NBSAP. The current revision addresses key capacity needs identified under different Aichi Targets. This will however be subject to rigorous appraisal based on comprehensive systematic stocktaking and needs assessment. In order to ensure that the capacity building approach is realistic and holistic; it will target strengthening at the i) individual level (knowledge, skills and competencies), ii) organizational level (structure, processes and procedures, facilities, equipment and materials, and inter-institutional coordination/partnership) and iii) systemic level (enabling legislation, policy, governance and support). Capacity development plan will be developed subsequent to which resource will be mobilized for implementation of the capacity development plan in a coordinated and holistic approach.

## 5.3: Communication and outreach plan for the NBSAP

The need to create awareness on national biodiversity targets prioritized in the NBSAP amongst key biodiversity stakeholders is important since lack of awareness on the existence of the document was identified as one of main gaps in implementing the past BAPs. As a first plan of action, it will be important to adopt the NBSAP as a national guiding document for biodiversity management. Subsequent to that, a strategic communication and outreach plan will be developed by NBC in consultation with the key partners, which will be endorsed by the National Biodiversity Committee for implementation. The key features of the strategic communication and outreach plan will include translation of the NBSAP document into the national language; awareness campaigns through public forum and media targeting legislators, administrators, relevant implementing agencies, Civil Society organizations, communities and local governance leaders and key donors of Biodiversity. The plan is targeted for implementation within the first two years of adoption of the NBSAP.

## 5.3: Monitoring, Evaluation and reporting.

The monitoring and evaluation unit will be established within NBC to monitor the progress and for effective coordination in implementation of the NBSAP. This unit will supported by the thematic groups. The progress of implementation of the thematic areas and targets will be assessed on an annual basis, using currently identified indicators and additional ones if required. This mechanism will also be used to identify implementation issues. The evaluation report in turn will be presented to the National Biodiversity Committee for necessary interventions for the successful achievement of the targets. It will also form a basis for national and international reporting obligations as well as national planning process. The Monitoring and evaluation mechanism will be established within the first year of the adoption of the NBSAP.

## 5.3.1 Clearing House Mechanism

The Clearing House Mechanism (CHM) is housed within the National Environment Commission Secretariat. The CHM will be used as platform to update and report on the status of NBSAP implementation. It will also provide information on the global processes and program of works and other national obligations under CBD.

# Reference

1. Internal Centre for Integrated Mountain Development (ICIMOD), 2010. Frequently Asked Question #2.

# Annexure

## Annexure 1: Details of protected areas and biological corridors of Bhutan

## Annexure 2: Annotated checklist of fishes recorded in Bhutan.

## Annexure 3: List of agricultural crops found in Bhutan

## Annexure 4: List of Crop Wild Relatives (CWR) found in Bhutan.

## Annexure 5: List of International Conventions and Treaties Bhutan is party to.

## Annexure 6: List of major Invasive Species found in the country as of 2013.

## Annexure 7: Issues and threats identified through stakeholder consultation workshops.

## Annexure 8: Mapping of the National Targets to Aichi Biodiversity targets

## Annexure 9: How US$ 5 million/per year has been assessed

## Annexure 10: NBSAP Financial Resourced Estimate 2014 - 2020

## Annexure 11: NBSAP Implementation framework

## Annexure 12: Details of Indicator measurement

## Annexure 13: Working group member team

## Annexure 14: Participants of regional SH consultation workshop

## Annexure 15: Participations of National SH consultation workshop.

1. The “Forests” refer to a minimum area of land of 0.05-1.0 hectare with tree cover (or equivalent stocking level) of more than 10-30 percent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ *(LCMP 2010)*. [↑](#footnote-ref-2)
2. The total forest cover for Bhutan including the shrubs is 80.89 % (LCMP 2010). [↑](#footnote-ref-3)
3. High Altitude Wetlands (HAWs): Open water lakes and marshes above 3000 m of elevation (UWICE-WWF Bhutan Program, undated) [↑](#footnote-ref-4)
4. Annual Black-necked Crane counts by the Royal Society for Protection of Nature since 1986/1987-winter period (October-March) show that on an average around 234 individuals arrive in Phobjikha to spend their winter over the past 27 years. Since the 2005/06-winter period, the annual arrival of BNCs in Phobjikha has exceeded 300 individuals (RSPN, Thimphu). [↑](#footnote-ref-5)
5. Mean value for provisioning, regulating and cultural services. [↑](#footnote-ref-6)
6. Revision of the Forest Policy 1974 [↑](#footnote-ref-7)
7. Amendment of the Land Act 1979 [↑](#footnote-ref-8)
8. Real growth rate averaging 8 percent per annum over the five years of the 10th plan, ( 11th FYP doc, RGOB) [↑](#footnote-ref-9)
9. State Forests refers to Government Reserved Forests (GRF) [↑](#footnote-ref-10)
10. About 3.2 % and 0.5 % of the country’s land is identified as bare and degraded area respectively (LCMP 2010). [↑](#footnote-ref-11)
11. Bare areas captured in this figures are those non-agricultural areas with very limited vegetation and rock outcrops (<4 %) either due to natural process (surface erosion) or human interventions (LCMP, 2010) [↑](#footnote-ref-12)
12. Degraded areas constitute areas with landslides, gullies, ravine and moraines (LCMP, 2010) [↑](#footnote-ref-13)
13. See assumptions for budget calculation, annexure 9 [↑](#footnote-ref-14)