Biodiversity Action Plan 2009

Ministry of Agriculture
Royal Government of Bhutan

Acknowledgments

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Biodiversity Action Plan 2009

National Biodiversity Centre

Ministry of Agriculture

Royal Government of Bhutan

Post Box 875, Thimphu

Consulting assistance: Norbu Samyul Consulting for Environment and Development

Design & Layout : Tara Gurung & Singay Dorji

Courtesy cover photographs : N Norbu, Sonam W Wang, Tshering Lhamtshok, Sangay Dorji, Ngawang Gyaltshen, Rinchen Yangzom, Nakul Chettri, Bruce Bunting and WWF Bhutan Programme.

"Throughout the centuries, the Bhutanese have treasured their natural environment and have looked upon it as the source of all life. This traditional reverence for nature has delivered us into the twentieth century with our environment still richly intact. We wish to continue living in harmony with nature and to pass on this rich heritage to our future generations."

His Majesty the King Jigme Singye Wangchuck


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Ministry of Agriculture
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MINISTER

Foreword

Over the past decades, loss of biodiversity has become a major global concern. Various international reports suggest that species are disappearing at 50 to 100 times the natural rate, genetic resources are diminishing, and ecosystems are being severely degraded worldwide largely due to unsustainable human activities. Many countries, both near and far, are suffering from economic and environmental woes brought on to them by the destruction of their ecosystems, species and genetic resources.

Fortunately for us in Bhutan, we have entered the new millennium with much of our natural environment and biodiversity still in pristine state. As a matter of fact, the country can be dubbed as a conservation centerpiece of the Eastern Himalayas, a region known to be one of the global biodiversity hotspots. Despite being a small country, it is home to 5,603 species of vascular plants, 678 species of birds and nearly 200 species of mammals. In terms of domestic biodiversity, there are more than 80 species of agricultural crops and 15 species of livestock. Some of these have adapted in the country's rugged mountain and harsh climatic conditions and, therefore, bear distinctive features.

Ever since the advent of modern development in the country, with the inception of five-year development plans in the beginning of the 1960s, the Royal Government of Bhutan has ensured that all aspects of development take place within the premise of environmental sustainability. Our late entrance into modern development gave us the opportunity to avoid many of the pitfalls of rampant development. At the same time, low population size and rugged topography have helped in moderating our use of the natural environment and biological resources. Most significantly, we were blessed with the enlightened leadership of our monarchs. The noble concept of Gross National Happiness – propounded by His Majesty the Fourth King Jigme Singye Wangchuck – has been our guiding development philosophy since the 1970s. The Gross National Happiness philosophy stresses that development cannot be pursued on the premise of economic growth alone but has to take place in combination with the emotional and environmental well-being of the people.

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Recognizing the enormous importance of biodiversity to humankind and to its own goal of environmentally sustainable development, Bhutan became a party to the Convention on Biological Diversity – a multilateral environmental treaty under the aegis of the United Nations to address the concerns of loss of biodiversity through international cooperation and collective actions – in 1995, three years after the Convention was conceived at the Earth Summit.

Subsequently, Bhutan has taken several initiatives that have augmented its efforts to conserve its rich biodiversity. These include the operationalization of a network of protected areas, establishment of biological corridors linking the protected areas, creation of conservation areas outside the protected areas system, targeted programs to protect globally threatened keystone species such as the tiger, snow leopard, white-bellied heron, and black-necked crane, the establishment of the National Biodiversity Centre including facilities such as the Royal Bhutan Gene Bank and Royal Botanic Garden, and strengthening of programmes to conserve indigenous varieties of plant and animal genetic resources.

It gives me immense gratification to note that we have already prepared and implemented two Biodiversity Action Plans – the first produced in 1998 and the other in 2002. I am also pleased to note that this Biodiversity Action Plan, which is the third, builds on the past Biodiversity Action Plans and places greater emphasis on sustainable use of biodiversity to reduce poverty and enhance economic growth. According to the Poverty Analysis Report 2007 produced by the National Statistics Bureau, 23.2 percent of our population live below the poverty line. It will be unjust and injudicious on our part if we do not use our biological resources, of course within sustainable limits, to help the poor and bring them out of the poverty cycle. There are many possibilities of sustainable use of biological resources to reduce poverty and enhance economic growth. I see great potential in activities that feature in this document such as integrated conservation and development programme, sustainable nature tourism, community forest management, and community-based management of non-wood forest products to contribute enormously to the objectives of poverty reduction and economic growth. Human-wildlife conflicts, especially incursions on field crops by wildlife such as wild pig and elephant, have persisted for long and are

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indeed a cause of great concern to us. These not only impoverish local communities and impinge on food security but also create resentment among the people for anything to do with conservation. I trust that the various actions outlined in this document to reduce human-wildlife conflicts will be successful for both economic and environmental reasons but more especially for the emotional well-being of our farmers, who make up 69 percent of the country's population.

Even though we do not yet know the full identity and value of our biological diversity, we do know that our unspoiled ecosystems are reservoirs of invaluable genetic materials. The potential for bioprospecting is, therefore, considerable. It fits in with the government policy of integrating conservation and economic development as it represents economic opportunities that are not resource use intensive and at the same time helps attach more precise economic values to biodiversity and enhances the rationale for their conservation. I am happy to note that this Action Plan has outlined a comprehensive set of actions to develop bioprospecting mechanisms.

As we endeavor for socio-economic development in a way that is environmentally responsible, we must also realize that environmental conservation is becoming increasingly challenging as a result of a growing population and changing values and ways of life. Let us not take our biological wealth for granted but use it with considerable foresight for the benefit of both present and future generations.

I must commend the National Biodiversity Centre and all the people from various agencies who have collaborated in the development of Bhutan-Biodiversity Action Plan 2009 and request all the people, within and outside the Ministry of Agriculture, to whole-heartedly support its implementation.

Tashi Delek!

Lyonpo (Dr) Pema Gyamtsho
Minister of Agriculture

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Acronyms

BAFRA	Bhutan Agriculture and Food Regulatory Authority
BAP I	Biodiversity Action Plan for Bhutan 1998
BAP II	Biodiversity Action Plan for Bhutan 2002
BAP III	Bhutan Biodiversity Action Plan 2009
BTF	Bhutan Trust Fund for Environmental Conservation
B2C2	Bhutan Biological Conservation Complex
BUCAP	Biodiversity Use and Conservation in Asia Programme
CBD	United Nations Convention on Biological Diversity
CBNRM	Community-based Natural Resource Management
CBS	Centre for Bhutan Studies
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNR	College of Natural Resources, formerly Natural Resources Training Institute
CoRRB	Council for RNR Research of Bhutan (Ministry of Agriculture)
DANIDA	Danish International Development Assistance
DDM	Department of Disaster Management (Ministry of Home & Cultural Affairs)
DEC	*Dzongkhag* Environmental Committee
DGM	Department of Geology and Mines (Ministry of Economic Affairs)
DoA	Department of Agriculture
DoE	Department of Energy
DoF	Department of Forests
DoL	Department of Livestock
DRA	Drug Regulatory Authority (Ministry of Health)
DYT	*Dzongkhag Yargye Tshogdu*
EA	Environmental Assessment
EC	Environmental Clearance
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmers' Field School
FMU	Forest Management Unit
FPUD	Forest Protection and Utilization Division (Department of Forests)
FRDD	Forest Resources Development Division (Department of Forests)
FRPA	Forest Resources Potential Assessment
GBIS	Gene Bank Information System
GMO	Genetically Modified Organism

GNH	Gross National Happiness
GYT	*Gewog Yargye Tshogchung*
ICDP	Integrated Conservation and Development Programme
ICIMOD	International Centre for Integrated Mountain Development
ITMS	Institute of Traditional Medicine Services (Ministry of Health)
IUCN	World Conservation Union, formerly known as the International Union for Conservation of Nature and Natural Resources
MoA	Ministry of Agriculture
MoEA	Ministry of Economic Affairs
NBC	National Biodiversity Centre
NBF	National Biosafety Framework
NCD	Nature Conservation Division (Department of Forests)
NEC	National Environment Commission
NECS	National Environment Commission Secretariat
NLC	National Land Commission
NLMC	National Land Management Campaign
NP	National Park
NRDCL	Natural Resources Development Corporation Limited
NWFP	Non-wood Forest Product
PGR	Plant Genetic Resources
PHCB	Population and Housing Census of Bhutan
PVS	Participatory Varietal Selection
RBR	Royal Botanic Garden
RBRPD	Royal Botanical and Recreational Parks Division (Department of Forests)
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources
RNR-RC	Renewable Natural Resources Research Centre
RSPN	Royal Society for the Protection of Nature
SFD	Social Forestry Division (Department of Forests)
SLIMS	Snow Leopard Information Management System
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WS	Wildlife Sanctuary
WWF	World Wildlife Fund in the United States and Canada, and World Wide Fund for Nature elsewhere

Glossary of Bhutanese Terms

Chathrim	Act, statute
Chhuzhing	Wetland cultivation
Dzong	Fortress-like structure which serves as a center for public administration and religious affairs
Dungkhag	Sub-district
Dungpa	Sub-district Administrator
Dzongdag	District Administrator
Dzongkhag	District
Dzongkhag Yargye Tshogdu	District Development Committee
Gaydrung	*Gewog* Clerk
Gewog	Smallest public administration unit made up of a block of villages
Gewog Yargye Tshogchung	Block Development Committee
Gup	Head of a *gewog*, elected by the local community
Gyalpoi Zimpon	Royal Chamberlain
Kamzhing	Dryland cultivation
Mangmi	Member of the GYT, who also serves as a deputy to the *Gup*
Sokshing	Government reserved forest land leased out for leaf litter production and collection for use in farm yard manure
Thromde Tshogdu	Municipal Committee
Thrimzhung Chenmo	Mother Act
Tsamdro	Government reserved forest land leased out for grazing and improved pasture management
Tshachu	Hot spring
Tshogpa	Village representative in the GYT


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Chapter 1

INTRODUCTION

1.1 The Importance of Biodiversity Conservation

Biological diversity, or biodiversity in short, refers to "the variation of life at all levels of biological organization." The United Nations Convention on Biological Diversity (CBD) has defined biodiversity as "the variability among living organisms from all sources, including *inter alia* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part." It is commonly measured in terms of the totality of genes, species and ecosystems of a region.

The essential goods and services for sustenance and welfare of the planet as well as humankind depend on the integrity and ecodynamics of biodiversity. The Earth's wide range of biological resources feed, clothe and shelter humanity. They provide us with medicines, spiritual nourishment and recreation. Ecologically, they play a crucial part in regulating the chemistry of our atmosphere, the hydrological cycle and climate, and in maintaining soil fertility and land productivity. Biodiversity also helps dispersal and breakdown of wastes, pollination of several crops, and absorption of pollutants. In sum, the conservation and sustainable use of biodiversity is extremely critical to meet the ecological, social, economic, health, spiritual and recreational needs of humankind[1].

In Bhutan, the importance of biodiversity is accentuated by the country's unique social, cultural, economic and physiographic conditions. Reverence for nature and all living things is fundamental to Buddhism, which plays a predominant role in the lives and culture of the Bhutanese people. Local communities revere nature such as wild animals, forests, ridges, mountains, and lakes as these are considered critical for spiritual well-being. Animals such as the tiger, elephant, takin, deer, crane and raven hold iconic significance in Buddhist religion and mythology. Economically, the country is heavily nature-dependent. Agricultural production, hydropower development and tourism, which are the economic mainstays of the country, can only be sustained if the natural resources are managed and used with prudence. Rural communities, which make up 69 percent[2] of the country's population, basically subsist on an integrated farming system of crop production, livestock rearing and use of a wide array of forest-based goods and services. From the ecological standpoint, the country's inherently fragile geologic conditions, rugged mountain terrain and high precipitation levels necessitate conservation and sustainable use of natural resources to mitigate natural disasters such as landslides and flash floods. In today's world of greenhouse gas emissions, global warming and climate change, the forests have an immensely important role in carbon sequestration and alleviating the impacts of climate change. As a result of extensive tracts of forests, the country stands out as one of the very few countries in the world which is a net sequester of carbon, and natural disasters

1 Conservation literatures generally describe the term "conservation" as encompassing protection, management and sustainable use of natural resources. However, in this report the terms "conservation" and "sustainable use" are being used consecutively as there is the general tendency to associate the term "conservation" more with preservation and protection and less with sustainable use of natural resources.

2 RGoB, 2005.

have been relatively less recurrent and widespread compared to many other places in the Himalayan region and elsewhere in the world.

The country carries enormous regional and global conservation significance. Well-preserved watersheds in the country benefit not only the Bhutanese but also the many downstream communities in neighboring India and Bangladesh who subsist on agriculture, fisheries and other water resource-based economic activities. Furthermore, the country is a conservation bastion of the Eastern Himalaya, a region recognized as one of the global biodiversity hotspots[3]. The country's vast and contiguous tracts of sub-tropical and temperate forests, the alpine scrub, meadows and scree in the northern mountains, and the many rivers, lakes and marshlands harbor several species of wild fauna and flora which are known to be globally threatened. Species such as the Bengal tiger *Panthera tigris tigris*, red panda *Ailurus fulgens*, Bhutan takin *Budorcas taxicolor whitei*, golden langur *Trachypithecus geei*, and black-necked crane *Grus nigricollis*, which are threatened elsewhere in the world, are found in substantial numbers in Bhutan.

Decades of self-isolation, sparse population, strong conservation leadership by the monarchs of the country, nature-reverent traditional beliefs of the Bhutanese communities, rugged topography, and belated modernization have all helped Bhutan enter into the new millennium with much of its biodiversity in a robust state. As a consequence, the country presents a unique opportunity for proactive conservation and sustainable use of biodiversity rather than post-damage restoration which many countries around the world are currently struggling with. However, at the same time, the socio-economic development needs of the country are becoming increasingly ambitious as a result of a growing and modernizing population. Furthermore, the country has transited to democracy after a century of monarchy. In the new political scenario, there is the risk of short-term economic development needs of the public taking precedence over the long-term benefits of biodiversity conservation. Given the changing social, economic and political scenario, proactive and concerted actions for conservation and sustainable use of our biodiversity have today become more crucial and challenging than ever before.

1.2 Biodiversity Conservation and Gross National Happiness

Environmental conservation has always occupied a pivotal place in the country's development policies and strategies. Concern for natural environment is embedded in Bhutanese traditional beliefs, socio-cultural outlook and development philosophy. The overarching Bhutanese development philosophy of "Gross National Happiness" (GNH), first propounded by our Fourth King Jigme Singye Wangchuck in the 1970s, underscores that development cannot be pursued on the premise of economic growth alone but has to take place in combination with the emotional and spiritual well-being of the people. It basically stems from the Buddhist notion that the ultimate purpose of life is inner happiness.

3 The concept of biodiversity hotspot was first authored by Dr. Norman Myers. A biodiversity hotspot is a terrestrial region with a significant reservoir of biodiversity that is threatened with destruction. Specifically, a hotspot contains at least 1,500 endemic vascular plants found nowhere else, and at least 70 percent of the hotspot habitat will have already been lost (Mittermeier et al, 2004).

The Bhutanese decision-makers have characterized environmental sustainability as one of the four pillars of the GNH development philosophy (see Box). *Bhutan 2020*, the country's vision document to maximize GNH emphasizes that "development must be pursued within the limits of environmental sustainability and carried out without impairing the biological productivity and diversity of the natural environment."

Bhutan's GNH development philosophy has inspired the conception of the Gross International Happiness Project, a global initiative coordinated from the Netherlands, focusing on dialogue and research to develop indicators and programmes for true value, sustainable development and well being for nations and organizations. The project has held three international conferences and produced numerous publications on GNH, involving institutions and individual development thinkers from around the world, to operationalize GNH in globally-adaptable measurable terms.

At the national level, the Centre for Bhutan Studies (CBS) is developing a whole set of indicators that will help assess our progress in the pursuit of GNH. The standard of living, health of the population, education, ecosystem vitality and diversity, cultural vitality and diversity, time use and balance, good governance, community vitality, and emotional well being are the nine provisional GNH indicators identified by the CBS.

The Four Pillars of Gross National Happiness

Gross National Happiness (GNH) is a development philosophy which defines quality of life in more holistic and psychological terms than Gross National Product. The term serves as a unifying philosophy for development planning and management. While conventional development models stress economic growth as the ultimate objective, the concept of GNH is based on the premise that true development of human society takes place when material, spiritual and emotional well-being occur side by side to complement and reinforce each other. In the sphere of Bhutan's public policy, the GNH philosophy is to operate on the following four main pillars:

- Equitable socio-economic development, ensuring equity between individuals and communities as well as regions to promote social harmony, stability and unity and to contribute to the development of a just and compassionate society.
- Conservation of the environment, ensuring development pursuits are within the limits of environmental sustainability and are carried out without impairing the biological productivity and diversity of the natural environment.
- Preservation and promotion of culture, instilling appreciation of the cultural heritage and preserving spiritual and emotional values that contribute to happiness and cushion the people from the negative impacts of modernization.
- Promotion of good governance, developing the country's institutions, human resources and systems of governance and enlarging opportunities for people at all levels to fully participate and effectively make development choices that are true to the circumstances and needs of their families, communities and the nation as a whole.

To take forward the philosophy of GNH, Bhutan has designed its vision document *Bhutan 2020*, providing development goals, objectives and priorities with a twenty-year perspective and outlining key principles to guide the development process.

1.3 Environmental Conservation – A Constitutional Mandate

Bhutan is one of the very few countries in the world to feature environmental conservation explicitly in its Constitution. Consistent with its longstanding pursuit of environmentally sustainable development and recognition of environmental conservation as one of the pillars of the GNH development philosophy, Article 5 of the Constitution of the Kingdom of Bhutan provides for environmental conservation. It states that:

- Every Bhutanese is a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations and it is the fundamental duty of every citizen to contribute to the protection of the natural environment, conservation of the rich biodiversity of Bhutan and prevention of all forms of ecological degradation including noise, visual and physical pollution through the adoption and support of environment friendly practices and policies;
- The Royal Government shall: (a) protect, conserve and improve the pristine environment and safeguard the biodiversity of the country; (b) prevent pollution and ecological degradation; (c) secure ecologically balanced sustainable development while promoting justifiable economic and social development; and (d) ensure a safe and healthy environment;
- The Government shall ensure that, in order to conserve the country's natural resources and to prevent degradation of the ecosystem, a minimum of sixty percent of Bhutan's total land shall be maintained under forest cover for all time;
- Parliament may enact environmental legislation to ensure sustainable use of natural resources and maintain intergenerational equity, and reaffirm the sovereign rights of the State over its own biological resources; and
- Parliament may, by law, declare any part of the country to be a National Park, Wildlife Reserve, Nature Reserve, Protected Forest, Biosphere Reserve, Critical Watershed and such other categories meriting protection.

1.4 United Nations Convention on Biological Diversity

The United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, at Rio de Janeiro in 1992 brought together governments of 179 countries from around the world to discuss the wide range of environmental concerns and to come to an understanding of "development" that would support socio-economic development and prevent the continued deterioration of the environment. It also laid the foundation for global partnerships between the developing and developed nations, based on mutual needs and common interests that would ensure environmentally sustainable development.

The Summit resulted in Agenda 21, the Rio Declaration on Environment and Development, and the Statement of Forest Principles. Also emanating from the Summit were two legally binding Conventions, namely the United Nations Convention on Biological Diversity (CBD) and United Nations Framework Convention on Climate Change (UNFCCC).

Bhutan was committed to the CBD right from the advent of the convention. Along with 154 other countries, Bhutan signed the CBD at the Earth Summit. Recognizing the growing need to address biodiversity conservation concerns through global cooperation and actions and the relevance of the convention to the country, Bhutan ratified the CBD in August 1995. As of June 2008, 191 countries had become party to the CBD.

The CBD for the first time in international law recognized that the conservation of biodiversity is "a common concern of humankind" and is an integral part of the development process. It links traditional conservation efforts to the economic goal of using biological resources carefully. While past conservation efforts were aimed at protecting particular species and habitats, the convention recognizes that ecosystems, species and genes must be used for the benefit of humans. However, this should be done in a way and at a rate that does not lead to the long-term decline of biological diversity.

The convention establishes three main goals: the conservation of biodiversity; the sustainable use of its components; and the fair and equitable sharing of the benefits from the use of genetic resources. A key obligation under the CBD is the development of national strategies, plans or programmes for the conservation and sustainable use of biodiversity, and integration of, as far as possible and as appropriate, the conservation and sustainable use of biodiversity into relevant sectoral or cross-sectoral plans, programmes and policies. This calls for three sequential processes: country studies (biodiversity assessment); national strategies (developing goals and operational objectives); and action plans (identifying actions and implementation measures).

Subsequently, Bhutan in September 2002 acceded to the Cartageña Protocol on Biosafety, which has been conceived as a component of the CBD to protect biodiversity from the potential risks posed by living modified organisms resulting from modern biotechnology. The objective of the Biosafety Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of 'living modified organisms resulting from modern biotechnology' that may have adverse effects on the conservation and sustainable use of biodiversity, taking also into account risks to human health, and specifically focusing on trans-boundary movements.

1.5 An Overview of Past Biodiversity Action Plans

One of the foremost obligations for countries that have become party to the CBD is the reparation of the National Biodiversity Action Plan, which primarily outlines the status of biodiversity and describes the actions that the country needs to take for conservation and sustainable use of its biological resources.

Bhutan first prepared its Biodiversity Action Plan in 1997 under the coordination of the Nature Conservation Section[4]. A core multi-disciplinary team of six officials from what was then known as the Crop and Livestock Services Division[5], Research, Extension and Irrigation Division[6], and Forestry Services Division[7] prepared the document under the guidance of an international biodiversity expert. The core team was assisted in terms of informational and advisory support by a larger task force of 11 representatives from various government agencies, private sector, non-governmental organizations and the United Nations Development Programme (UNDP). The first Biodiversity Action Plan for Bhutan (BAP I) was released in 1998 and was prepared over a period of six months primarily involving broad-based consultations through a series of workshops and in-depth analyses of the results of the consultations. BAP I was organized into five chapters with the first two chapters providing an assessment of the country's biodiversity resources and the subsequent chapters focusing on direct conservation actions, essential supporting measures, and additional strategic recommendations to enhance benefits from biodiversity conservation.

Preparation of the second Biodiversity Action Plan for Bhutan (BAP II) commenced in November 2001. A format similar to the preparation of BAP I was followed for preparation of BAP II under the coordination of the Nature Conservation Division. A core multi-disciplinary team of six officials from the Department of Forestry Services, Department of Agriculture and Livestock Support Services, and National Biodiversity Center prepared the document. As was in the case of BAP I, an international biodiversity expert guided the preparation of the document. The core group received informational and advisory support from a larger group of 18 focal persons representing various government agencies, private sector, non-governmental organizations and the UNDP. Essentially, BAP II focused on three key elements: one, incorporation of all key developments in the field of biodiversity conservation since BAP I; two, assessment of biodiversity conservation efforts in terms of direct conservation actions, institutional development, policy and legislation, biodiversity information, public education and awareness, and international cooperation; and, three, updating the action plan to more meaningfully address evolving conservation circumstances and needs.

Right from the conception of BAP I, it was recognized that Biodiversity Action Plans would be "living documents" that will need to evolve to be relevant to changing circumstances and needs related to biodiversity conservation. Bhutan is a developing nation and indeed development changes have been rapid especially since the country produced BAP I. Over the past decade, several new policies and laws have been enacted, quality of data has improved, new institutions and programmes have come into being, new development

4 Currently known as Nature Conservation Division under the Department of Forests.

5 The Division was subsequently renamed as the Department of Agriculture and Livestock Support Services, and recently reconstituted into two Departments, namely the Department of Agriculture and Department of Livestock.

6 The Division has been disbanded. The extension and irrigation functions have been directly brought under the De partment of Agriculture and the Council of Renewable Natural Resources Research of Bhutan (CoRRB) has been created to address research needs pertaining to crop agriculture, livestock development and forestry.

7 The Division was subsequently renamed as the Department of Forestry Services and recently as the Department of Forests.

trends have emerged, while the very system of governance has rapidly evolved. The preparation of BAP II and now the preparation of BAP III is a strong indicator that Biodiversity Action Plans are an ongoing process with each successive edition building upon the previous one whilst reflecting changes in conservation circumstances and needs in the context of the country's overall development scenario.

1.6 BAP III Development Process

As recommended in BAP II, the preparation of Bhutan-Biodiversity Action Plan 2009 (BAP III) has been coordinated by the National Biodiversity Centre (NBC). A Bhutanese consultant, with national and international conservation experience, prepared the BAP III in consultation with various stakeholders. The NBC formed a technical group composed of representatives from key conservation and related agencies to provide information and foresight to the BAP III consultant, review the preparation of BAP III and ensure that BAP III adequately and accurately reflects the circumstances and needs of the various stakeholders involved in biodiversity conservation. The consultation process basically involved a series of workshops as described below:

- BAP III Framework Formulation Workshop to discuss the outline, conceptual features and process framework for preparation of BAP III;
- BAP III Action Planning Workshop to review the information on the current status of biodiversity and analysis of the current trends affecting biodiversity in Bhutan, and to discuss and develop actions for the conservation and sustainable use of biodiversity;
- BAP III Review Workshop to enlist broad-based views and consensus on BAP III before its finalization.

The aforesaid workshops were interspersed with individual meetings with relevant people in various organizations to elicit additional information and clarifications. All people who were involved/ consulted in the preparation of BAP III are listed in Annexes 1 and 2.

Chapter 2

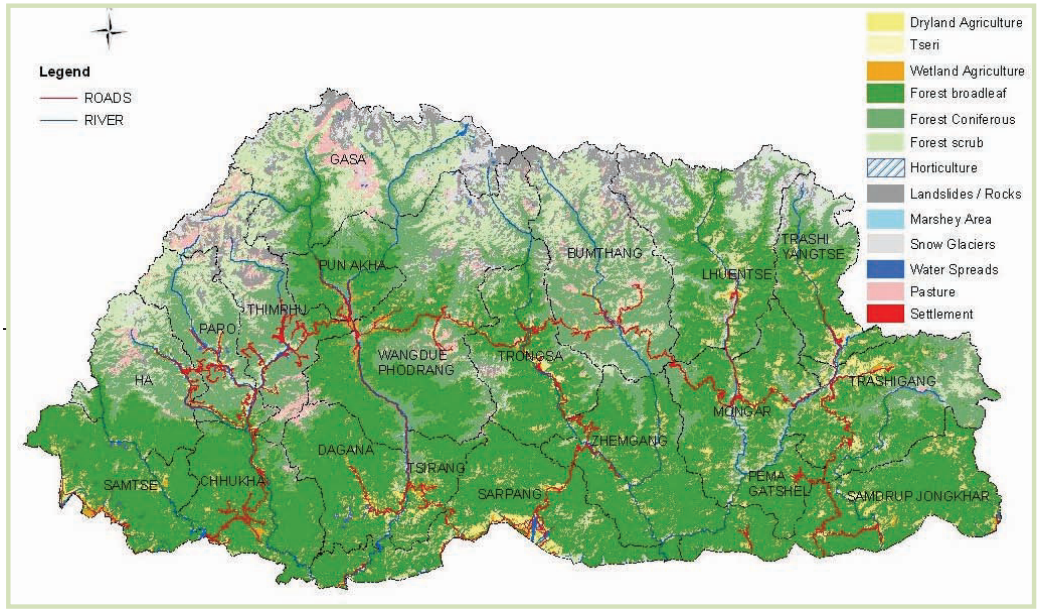
CURRENT STATUS OF BIODIVERSITY IN BHUTAN

2.1 Biogeography

With an area of 38,394 km^2, Bhutan is situated in the Eastern Himalaya, flanked by the Tibetan Autonomous Region of China to its north and northwest, and by the Indian states of Sikkim, West Bengal and Assam, and Arunachal Pradesh to its southwest, south, and east[8]. The country is almost entirely mountainous with nearly 95 percent of the country being above 600 meters (m)[9]. The terrain is rugged and steep, with altitudes declining from above 7,500 m to under 200 m within a short north-south distance of 170 kilometers (km). The country can be divided into three broad physiographic zones. The southern belt is made up of the Himalayan foothills adjacent to a narrow belt of flatland (Duars) along the Indian border with altitude ranging from under 200 m to about 2,000 m. The inner Himalayas consist of the main river valleys and steep mountains with altitude ranging from about 2,000 m to 4,000 m. The great Himalayas in the north along the Tibetan border encompass snow-capped peaks and alpine meadows above 4,000 m.

Lying between the cold and dry Tibetan plateau in the north and the hot and humid Indian plains in the south, Bhutan straddles two major biogeographic realms. These are the Indo-Malayan region consisting of the lowland rain forests of South and Southeast Asia and the Palearctic region consisting of conifer forests and alpine meadows of northern Asia and Europe.

Figure 1: Land Cover Map of Bhutan



8 The area of the country is cited from Bhutan at a Glance 2006 brochure produced by the National Statistics Bureau, Royal Government of Bhutan.

9 Atlas of Bhutan 1997, MoA.

Temperate broadleaf forest in Gasa dzongkhag, Jigme Dorji National Park. ***Forests account for 72.5% of Bhutan's land cover, making the country with one of the highest forest cover in Asia.***

2.2 Ecosystem Diversity

2.2.1 Forest Ecosystems

Forests[10] are the most dominant land cover, making up 72.5 percent of the country's territory. Mixed conifers and broadleaf forests are the most dominant forest types and virtually all forests are natural with plantation forests accounting for a mere 0.2 percent of the country's area[11]. As a result of great altitudinal range, with corresponding variation in climatic conditions ranging from hot and humid sub-tropical conditions in the southern foothills to cold and dry tundric conditions in the northern mountains, the country supports a wide range of forest ecosystems and vegetation zones. Broadly speaking, the country can be divided into three distinct ecofloristic zones. The alpine zone comprises areas above 4,000 m with no tree cover but scrub vegetation and meadows. The temperate zone, lying between 2,000 m and 4,000 m, contains temperate conifer and broadleaf forests. The subtropical zone, which lies between 150 m and 2,000 m, contains tropical and subtropical vegetation.

Several forest types occur within the spectrum of the above three broad ecofloristic zones. These vegetation types are briefly described below:

10 Forests are defined as "areas where tree crowns cover over 10 percent of the ground, and cover areas greater than 0.5 hectares" according to the *Global Forest Resources Assessment Report 2000 Main Report* by the UN's Food and Agriculture Organization.

11 Total forest cover includes scrub forest which constitutes 8.1 percent of the total land cover. So, effectively, true forest cover is 64.4 percent. All land cover figures cited in this document are derived from the Atlas of Bhutan: Land Cover and Area Statistics produced by the Ministry of Agriculture in 1997. No land cover figures have been officially released since the publication of the aforesaid document.

Alpine Meadows and Scrub: Above the tree line, the vegetation basically consists of alpine grasses, and an assortment of herbs, shrubs and flowering plants. In many of the meadows various medicinal plants can be found, such as Chinese caterpillar fungus *Cordyceps sinensis*, Puteyshing *Picrorhiza kurooa*, and Tsika *Fritillaria delavaye*.

Fir Forest: This forest type occurs at very high altitudes, between 2,700 m and 3,800m. Hemlock and birch may also be present. Towards the timber line, fir stands become stunted and juniper and rhododendron scrubs become more prominent.

Mixed Conifer Forest: Prevalent between 2,000 m and 2,700 m, this forest type is dominated by spruce, hemlock and larch, or a mixture of these species. Hemlock tends to be found on wetter slopes than spruce and is generally covered with lichens and mosses.

Blue Pine Forest: Most common in the western and central valleys of the country, between 1,800 m and 3,000 m. It is sometime found mixed with oak and rhododendron.

Chir Pine Forest: A xerophytic forest type occurring in deep dry valleys under subtropical conditions, between 900 m and 1,800 m.

Broadleaf mixed with Conifer Forest: In some parts of the country, the succession between broadleaf and conifer forests is gradual and, as a result, there are extensive areas of a mixture of these two forest types. These mixed forests are generally oak mixed with blue pine or higher altitude broadleaf species mixed with spruce or hemlock, and generally occur between 2,400 m and 3,000 m.

Upland Hardwood Forest: Occurring in the temperate hillsides between 2,000 m and 2,900 m, this forest type is predominantly evergreen oak forest in the drier areas and cool broadleaf forest in wetter areas.

Lowland Hardwood Forest: This forest type occurs in the subtropical hills, between 1,000 m and 2,000 m, and is rich in a mix of subtropical and temperate genera.

Tropical Lowland Forest: This forest type occupies the foothills below 700 m. The forests are multistoried and vary from almost deciduous on exposed dry slopes to almost evergreen on the moist valleys.

2.2.2 Aquatic Ecosystems

Rivers

The country is endowed with tremendous inland water resources as a result of an extensive network of rivers, rivulets and streams arising from high level of precipitation, presence of huge number of glaciers and glacial lakes, and relatively well-preserved forests. The country's river system can be divided into four major river basins, namely Amo Chhu (Torsa), Wang Chhu, Puna Tsang Chhu (Sunkosh), and Drangme Chhu (Manas)[12]. Drangme Chhu, which is the largest river basin, drains more than one-third of the country.

12 The names within the parenthesis are the ones used in southern parts of the country and the adjoining states of India.

In addition, there are several small river basins occupying largely the southern part of the country. These include Samtse Area multi-river, Gelegphu Area multi-river, Samdrup Jongkhar Area multi-river, and Shingkhar-Lauri multi-river.

Table 1: River Systems of Bhutan

River Basin	Major Tributaries	Basin Area (km^2)
Amo Chhu (Torsa)	-	2,400
Wang Chhu	Thim Chhu, Pa Chhu, Haa Chhu	4,689
Puna Tsang Chhu (Sunkosh)	Mo Chhu, Pho Chhu, Dang Chhu, Daga Chhu	10,355
Drangme Chhu (Manas)	Mangde Chhu, Chume Chhu, Chamkhar Chhu, Kuri Chhu, Kholong Chhu, Gongri Chhu	16,599
Samtse Area multi-river	-	962
Gelegphu Area multi-river	-	1,956
Samdrup Jongkhar multi-river	-	2,279
Shingkhar-Lauri multi-river	-	779

Source: Water Resources Management Plan, Department of Energy, 2003

Lakes

Glacial lake at Lunana area, Jigme Dorji National Park. ***There are 2,674 glacial lakes in Bhutan, feeding into the many rivers and rivulets that make the country's watersheds.***

There is a large number of small and medium-sized lakes spread across the country. At the present, except for glacial lakes, there is no adequate assessment of the area and location of various lakes in the country. As for glacial lakes, the Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods in Bhutan produced in 2001 by the Department of Geology and Mines reports a total of 2,674 lakes in the country[13]. However, most of the glacial lakes are extremely small. The largest of all the lakes is the Raphstreng Tsho at an altitude of 4,360 m in the eastern part of Lunana[14].

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 ecosystems in the country although no proper survey of marshlands have been carried out so far. Marshlands are generally known to be rich in biota and good habitat for resident as well as migratory birds, reptiles, amphibians and fishes. The best known marshland in the country is the Phobjikha valley, where the globally threatened black-necked cranes *Grus nigrocollis* roost in large numbers during winter[15]. The valley is also highly valued for its outstanding scenery and cultural ethnicity.

Hot Springs

Hot springs, known as *Tshachu* in Dzongkha, are very popular in Bhutan. People in Bhutan mainly use hot spring 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. These are gNyes *tshachu* and Yonten Kuenjong *tshachu* in Lhuentshe *dzongkhag*, Dur *tshachu* in Bumthang *dzongkhag*, Gaylegphug *tshachu* in Sarpang *dzongkhag*, Dungmang *tshachu* in Zhemgang *dzongkhag*, Koma *tshachu* and Chu Phug *tshachu* in Punakha *dzongkhag*, and Gasa *tshachu*, Laya *tshachu* and Wachi *tshachu* in Gasa *dzongkhag*[16].

Hot springs are associated with microbial biodiversity, which lie at the base of food chain and consequently supports hundreds of higher species, but globally at the present there is very limited scientific understanding of microbial biodiversity in hot springs.

13 The Inventory was produced with support from the International Center for Integrated Mountain Development and the United Nations Environment Programme.

14 The lake measured 1.94 km long, 1.13 km wide, and 107 m deep (WAPCOS, 1997).

15 Annual crane counts by the Royal Society for the Protection of Nature since 1986/87 winter season show that on average around 225 black-necked cranes have been spending their winter in Phobjikha over the last 21 years. Since the winter of 2005/06, the annual number of cranes roosting in Phobjikha valley have exceeded 300 (www.rspnbhutan.org).

16 Wangchuk P and Dorji Y (2007).

Paddy fields in Western Bhutan. ***Rural communities which make up 69% of the country's population depend primarily on agriculture for their livelihood.***

2.2.3 Agricultural Ecosystems

The country is known to have six major agro-ecological zones corresponding with altitudinal range and climatic conditions.

Table 2: Major Agro-ecological Zones of Bhutan

Agro-ecological Zone	Altitude (meter)	Temperature (degree Celsius)			Rainfall (mm per year)
		Monthly (maximum)	Monthly (mean)	Annual (mean)	
Alpine	3,600-4,600	12.0	-0.9	5.5	<650
Cool Temperate	2,600-3,600	22.3	0.1	9.9	650-850
Warm Temperate	1,800-2,600	26.3	0.1	12.5	650-850
Dry Subtropical	1,200-1,800	28.7	3.0	17.2	850-1,200
Humid Subtropical	600-1,200	33	4.6	19.5	1,200-2,500
Wet Subtropical	150-600	34.6	11.6	23.6	2,500-5,500

Source: RNR Research Strategy and Plan Document, MoA, 1992

Alpine zone: This zone, which lies between 3,600 – 4,600 m, is characterized by alpine meadows and is basically too high to grow any food crops. The meadows are used as summer pastures for yaks by the nomadic yak-herding communities.

Cool Temperate Zone: This zone covers cultivated areas between 2,600 – 3,600 m. Rainfall is low, so dryland farming is common. Livestock farming is a predominant feature and, in particular, a small but distinct population of pastoralists maintain herds of yak and sheep in a nomadic manner. Horses, mules and dogs are the other livestock found in this zone. Key crops that are grown include wheat, potato, buckwheat, mustard and barley.

Warm Temperate Zone: This zone occurs between 1,800 – 2,500 m where rainfall is still low but temperature is moderately warm, except during winter when frost occurs. Migratory cattle herding is common and the herders have family links with the agricultural communities in the lower altitudes. People in this zone also keep pigs, poultry, dogs, cats, horses and small ruminants. In the wetland agricultural areas, rice is most commonly grown followed by wheat, potato, and several kinds of vegetables.

Dry Subtropical Zone: Occurring between 1,200 – 1,800 m, this zone is warm with moderate rainfall averaging 850 – 1,200 mm in a year. Rice and maize are the major crops grown in this zone, in addition to wheat and mustard.

Humid Subtropical Zone: This zone lies between 600 – 1,200 m with relatively higher rainfall and temperature. Cattle rearing is common but is not done in a migratory fashion as in the temperate zones. The main cropping pattern in the wetland agricultural areas is rice followed by wheat and mustard. Citrus (mandarin types, locally called “oranges”) are grown as cash crops. In the dryland agricultural areas, maize is the main crop followed by mustard, millet and buckwheat.

Wet Subtropical Zone: This zone has excellent areas for crop cultivation. Fodder is scarce, so the cattle are tethered in the cropping areas prior to preparation. As in the humid subtropical zone, cattle rearing is normally sedentary in this zone. Rice is the main crop grown in summer while maize or wheat are grown in winter depending on irrigation. Rainfall is very high, ranging between 2,500 – 5,500 mm in a year. Irrigation sources are mostly rain-fed and dry up in the winter when rainfall becomes very low. As a result, large-scale winter cropping normally does not take place. In the dryland agricultural areas, maize is the main crop. Other crops include cowpea, mustard, niger, millet and sorghum.

2.3 Wild Species Diversity

2.3.1 Wild Flora

Vascular Plants

***Paphiopedilum fairrieanum*, Royal Botanical Garden, Serbithang. Bhutan's biodiversity includes 369 recorded species of orchids**

The country's diverse ecosystems harbor a spectacular assortment of wild flora. The Royal Botanic Garden of Edinburgh, which published the Flora of Bhutan, has recorded 5,603 species of angiosperms and gymnosperms. These include 369 species of orchids and 46 species of rhododendrons[17]. Of the recorded plant species, 105 are said to be endemic to Bhutan, found nowhere else in the world[18]. These include species such as *Rhododendron bhutanense, R. kesangiae*, *Meconopsis superba*, *Pedicularis inconspicua*, *Bhutanthera himalaica,* and *Vanda chlorosantha*. The wild flora includes several plant species of enormous commercial and scientific values. The Institute of Traditional Medicine Services (ITMS) uses more than 200 species for the formulation of various traditional medicines. The Himalayan yew *Taxus baccata* (subspecies *wallichiana*) is known to have cancer-curing properties. Other examples include: *Podophyllum hexandrum, Aconitum orochryseum, Delphinium glaciale, Pleurospermum amabile, Gentiana urnula, Corydalis crispa, Parnassia ovata,* and *Polygonatum verticilliatum* for their valuable alkaloids and various medicinal properties; *Allium* spp*, Fritillaria* spp, and *Lilium* spp as wild gene pools for future crop research; and *Rheum nobile, Pterocephalus hookeri, Aster* spp*, Senecio* spp*, Saussurea* spp*, Rhododendron* spp*, Geranium* spp*,*

17 Some plant taxonomists reckon that there will be more than 7,000 species of vascular plant in the country. NJ Pearce and PJ Cribb, who authored *The Orchids of Bhutan* published by the Royal Botanic Garden Edinburgh and the Royal Government of Bhutan in 2002, have estimated that an additional 200 or more species of orchids alone are likely to be discovered in the country in future.

18 These include 14 orchid species and 91 other plant species. The 14 endemic orchid species have been named in The Orchids of Bhutan by Pearce and Cribb while the information on other endemic plant species is based on personal communication with Tandin Wangdi, curator of the National Herbarium at the National Biodiversity Center, Serbithang.

Meconopsis spp*, Epilobium* spp*, Anemone* spp*, Potentilla pedicularis*, and *Talauma hodgsoni* as potential horticultural crops for ornamental purpose.

The Flora of Bhutan, which consists of three volumes of three parts each, provides a comprehensive description of the country's flora. The species described belong to eight families of Gymnosperms, 180 families of Dycotyledons, and 66 families of Monocotyledons. The Bhutanese flora is considered to be of immense scientific value not only due to the high level of diversity but also because of the relatively good state of preservation compared to other Himalayan regions.

In addition, the National Biodiversity Centre has recorded 410 species of pteridophytes (ferns and fern allies) through ongoing inventories in various regions of the country[19].

Insect-fungi

Bhutan, given its wide-ranging geo-climatic conditions, is also expected to be very rich in insect-fungi although records are currently very limited. Chinese caterpillar fungus *Cordyceps sinensis*, found in the alpine meadows of the country, is highly valued for its medicinal properties as an aphrodisiac and cure of lung and kidney ailments. A kilogram of this insect-fungi species known as Yartsa Guenbub in Bhutanese, can fetch more than US$ 2,400 within the domestic market itself. Although listed as a totally protected species in the Forest and Nature Conservation Act 1995, collection and trade of Yartsa Guenbub have been legalized since 2006 to provide local communities with additional income-earning opportunities. The collection and trade of the species are regulated by the Ministry of Agriculture (MoA). Field studies have been initiated in 2007 to study the occurrence and ecology of insect-fungi in the country, starting with the subtropical region of the country.

About 50 species of insect-fungi have been recorded in Gedu forest area alone by a survey team comprising Bhutanese foresters, a phytochemist from the ITMS, and an international insect-fungi scientist. The preliminary record includes a highly possible new species of insect-fungi, which has been provisionally named *Cordyceps bhutanensis*[20].

Mushrooms

The National Mushroom Centre has recorded more than 90 species of forest mushrooms in the country. Several species such as *Cantherellus cibarius* (Sissi shamu in Dzongkha, *Clavaria botrytis* (Bjichu kangro in Dzongkha) and *Auricularia auricula* (Jilli namchu in Dzongkha) are popular in Bhutanese cuisine. *Tricholoma matsutake* (Sangay shamu in Dzongkha) is much sought in European and Japanese culinary markets.

19 The figure may change once the National Biodiversity Centre has completed field verification and literature research of the recorded species of pteridophytes.

20 Kuensel, 3rd December, 2007.

2.3.2 Wild Fauna

Mammals

Close to 200 species of mammals are known to occur in the country[21]. This is extraordinary for a country which is one of the smallest in Asia. Although there are relatively few endemic mammal species, the high species richness combined with the availability of well-preserved habitats across various altitudinal and climatic zones together make for what is probably the only example of an intact faunal assemblage in the Eastern Himalaya. This ecological integrity provides preconditions in Bhutan for a prime sanctuary for numerous Palearctic and Indo-Malayan mammal species. These species include a number of globally threatened mammals such as the Bengal tiger *Panthera tigris tigris*, snow leopard *Uncia uncia*, clouded leopard *Neofelis nebulosa*, red panda *Ailurus fulgens*, Bhutan takin *Budorcas taxicolor whitei*, golden langur *Trachypithecus geei*, capped langur *Trachypithecus pileatus*, Asian elephant *Elephas maximus*, and Himalayan musk deer *Moschus chrysogaster leucogaster*. Altogether, there are 27 globally threatened species of mammals in the country (Table 3).

There are 27 globally threatened species of mammals in the country including the capped langur, Trachypithecus pileatus (pictured above).

21 Wangchuk T et al, 2004.

Table 3: Globally Threatened Mammal Species found in Bhutan

Species	Threat Category
Pygmy Hog *Sus salvanius*	Critically Endangered
Golden Langur *Trachypithecus geei*	Endangered
Capped Langur *Trachypithecus pileatus*	Endangered
Dhole/ Wild Dog *Cuon alpinus*	Endangered
Red Panda *Ailurus fulgens*	Endangered
Bengal Tiger *Panthera tigris tigris*	Endangered
Snow Leopard *Uncia uncia*	Endangered
Asian Elephant *Elephas maximus*	Endangered
One-horned Rhinoceros *Rhinoceros unicornis*	Endangered
Asiatic Water Buffalo *Bubalus bubalis*	Endangered
Hispid Hare *Caprolagus hispidus*	Endangered
Ganges River Dolphin *Platanista gangetica*	Endangered
Assamese Macaque *Macaca assamensis*	Vulnerable
Sloth Bear *Melursus ursinus*	Vulnerable
Himalayan Black Bear *Ursus thibetanus laniger*	Vulnerable
Himalayan Musk Deer *Moschus chrysogaster*	Vulnerable
Smooth-coated Otter *Lutrogale perspicillata*	Vulnerable
Fishing Cat *Prionailurus viverrinus*	Vulnerable
Marbled Cat *Pardofelis marmorata*	Vulnerable
Clouded Leopard *Neofelis nebulosa*	Vulnerable
Asiatic Golden Cat *Catopuma temmincki*	Vulnerable
Swamp Deer *Cervus duvauceli*	Vulnerable
Gaur *Bos gaurus*	Vulnerable
Serow *Capricornis sumatraensis*	Vulnerable
Takin *Budorcas taxicolor*	Vulnerable
Mouse-eared Bat *Myotis sicarius*	Vulnerable
Sikkim Rat *Rattus sikkimensis*	Vulnerable

Source: Red List of Threatened Species, IUCN, 2008

High species richness, availability of unspoiled natural habitats in large parts and relatively small demographic pressure have made the country a haven for wildlife. Many species that are striving for survival elsewhere exist in healthy numbers in Bhutan. For instance, country-wide tiger status surveys between 1996 – 1998 revealed a conservative estimate of 115 to 150 tigers, including 67 to 81 breeding adults, occurring in contiguous distribution spread over an area of 10,714 km^2 [22]. This means that the country has a potentially viable population of tigers that can serve as a vital gene pool for future tiger conservation efforts.

22 McDougal C and Tshering K, 1998

The golden langur is another example of a species which is on the verge of extinction elsewhere in its range but occurs abundantly in Bhutan[23]. Golden langur habitat and population surveys conducted in the mid-1990s had revealed available habitat of over 3,400 km^2 and a population of more than 4,000 golden langurs across the country[24].

Several mammal species are habitat specialists and consequently have restricted range. For instance, blue sheep use alpine meadows for grazing and venture into alpine scree in the ridge tops above the meadows. During winter, blue sheep migrate down into the alpine scrub habitat. Takin follow the blue sheep migratory pattern but remain in one habitat category below by migrating into alpine scrub in summer and down to sub-alpine and cool temperate broadleaf forests in the winter. The distribution of snow leopard is restricted to the higher elevations such as alpine scree and meadows. Musk deer, usually found in moist sub-alpine forests, overlap with the red panda, which inhabit old growth mixed conifer and temperate forests with heavy moss cover on trees and bamboo undergrowth. Intriguingly in Bhutan, tiger, which is generally associated with sub-tropical and tropical habitats, has been found at elevations up to 4,000 m.

Avifauna

Bhutan has an outstanding birdlife: 678 species have been recorded and many more are likely to be found in the future[25]. On a global scale, the country is recognized as forming a part of several globally important bird regions. It is a part of the Sino-Himalayan mountain forests, Indo-Burmese forests, Indo-Gangetic grasslands, South Asian arid habitats, and Tibetan plateau wetlands – all categorized as globally important bird regions by BirdLife International.

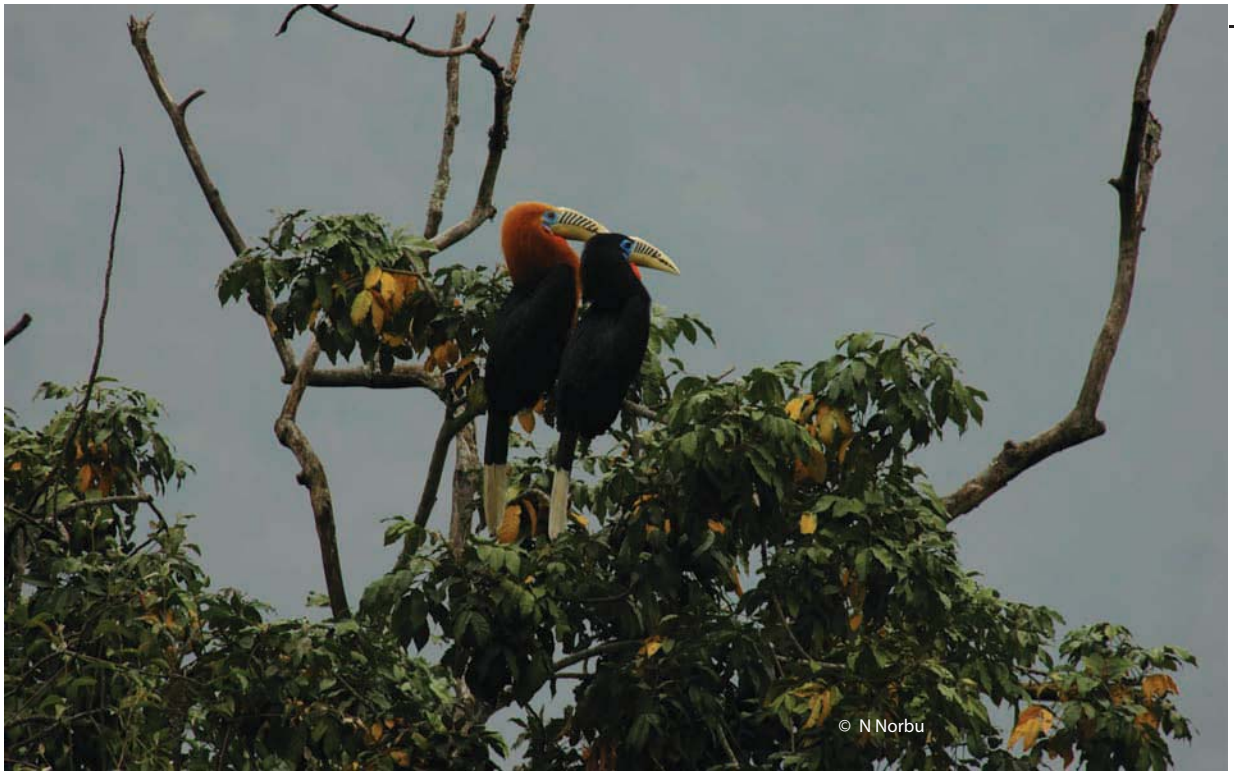
There are 14 globally threatened bird species and ten restricted range bird species in the country. Of the 14 that are globally threatened, one species i.e. white-bellied heron *Ardea insignis* is considered critically endangered according to the Red List of Threatened Species maintained by the World Conservation Union (IUCN)[26]. The others are categorized as vulnerable and they include black-necked crane *Grus nigricollis,* rufous-necked hornbill *Aceros nipalensis,* chestnut-breasted partridge *Arborophila mandellii,* Pallas's fish eagle *Haliaeetus leucoryphus,* beautiful nuthatch *Sitta Formosa,* wood snipe *Gallinago nemoricola,* Blyth's tragopan *Tragopan blythii,* greater spotted eagle *Aquila clanga,*

23 Outside Bhutan, the golden langur is reportedly found in small numbers in a few pockets of forests in the neighboring Indian state of Assam.

24 Wangchuk T, 1996.

25 Inskipp C et al (1999) recorded 616 species. Subsequent field surveys by the staff of the Department of Forests and the Royal Society for the Protection of the Nature have recorded additional species, expanding the list of recorded bird species to 678 as of November, 2008. The latest records are that of Hodgson's Frogmouth *Batrachostomus hodgsoni* reported by Chris G Bradshaw and Peter Lobo from their trip to Bhutan in Spring 2008, and that of Brandt's Mountain Finch *Leucosticte brandtii* and the Tibetan Blackbird *Turdus maximus reported by WWF Bhutan in November 2008.*

26 White-bellied heron has been uplisted from "endangered" to "critically endangered" status in the IUCN Red List of Threatened Species 2007 because new information indicates that it has an extremely small and rapidly declining population. Current estimate suggests there may be fewer than 250 individuals of this species in the world.



Rufous-necked hornbill, *Aceros nipalensis*. *There are 14 globally threatened bird species and 10 restricted range bird species in Bhutan*

Imperial eagle *Aquila heliaca,* Baer's pochard *Aythya baeri,* Hodgson's bushcat *Saxicola insignis,* dark-rumped swift *Apus acuticauda,* and grey-crowned prinia *Prinia cinereocapilla.* The ten restricted range bird species are Blyth's tragopan *Tragopan blythii*, chestnut-breasted partridge *Arborophila mandellii*, dark-rumped swift *Apus acuticauda*, ward's trogon *Harpactes wardi*, rufous-throated wren babbler *Spelaeornis caudatus*, hoary-throated barwing *Actinodura nipalensis*, brown-throated fulvetta *Alcippe ludlowi*, white-naped yuhina *Yuhina bakeri*, yellow-vented warbler *Phylloscopus cantator*, and broad-billed warbler *Tickellia hodgsoni*.

Herpetofauna

In terms of herpetofauna, there has been very little survey and documentation done although the country is considered to be rich in reptiles and amphibians particularly in the tropical/ sub-tropical areas. Preliminary wildlife surveys in the early 1990s recorded 15 reptiles and three amphibians in Royal Manas National Park[27]. Subsequently, in 1999, 23 species of reptiles and amphibians were recorded in the same park during a week-long herpetological survey training for the park staff of Royal Manas National Park[28]. The recorded list includes globally threatened species such as the Gharial *Gavialis gangeticus*, Indian Python *Python molurus molurus* and Yellow Monitor Lizard *Varanus flavescens*.

27 MacKinnon J, 1991 and 1994.
28 WWF, 1999

Invertebrates

Documentation of invertebrates is currently very limited. Some documentation of the butterflies of Bhutan has been carried out only in the recent years. The country is reportedly expected to have 800 to 900 species of butterfly[29]. Of these, 140 species have been catalogued with photographs in the *Butterflies of Bhutan* booklet published by the Royal Society for the Protection of Nature in 2007[30]. These include some rare species such as the Blue Dake *Euthalia durga* and Blue Forester *Lethe scandal*. Internationally protected species such as the Bhutan Glory *Bhutanitis lidderalii* and Kaiser-i-Hind *Teinopalpus imperialis* are also known to occur in the country although they have not yet been photographically catalogued since they are rarely seen.

At the present, four indigenous species of bees are known to be found in the country. These species are *Apis cerena, Apis dorsata, Apis laboriosa,* and *Apis florae*. However, the beekeeping industry in the country is currently promoting an introduced European species *Apis melifera*. Observations made by beekeeping veterans in the country suggest changes taking place in the population dynamics of the wild bees. Information on their distribution, trends and characteristics are limited. Their contribution to agricultural productivity through pollination is also not widely recognized in the country. *Apis laboriosa*, which is considered a rare species, is still less understood and not many references are available.

Fish fauna

The fish fauna of the country has not yet been properly assessed. Existing records list 50 freshwater fish species, including eight introduced species[31]. The main indigenous fish species include Himalayan trout *Barilius spp* and mahseer *Tor tor*, which is listed as a totally protected species in the Forest and Nature Conservation Act 1995. Amongst introduced species, brown trout *Salmo trutta trutta* is the most common.

29 van der Poel P and Wangchuk T, 2007.
30 The booklet catalogues butterflies sighted in habitats ranging from 800 to 3,000 m.
31 www.fishbase.org

Table 4: Comparative Wild Species Diversity of Selected Countries from Various Regions

Countries (Region)	Area (km²)	Birds	Mammals	Vascular Plants
Australia (Oceania)	7,741,220	851	376	15,638
Armenia (Central Asia)	29,800	302	78	3,553
Bangladesh (South Asia)	144,000	604	131	5,000
Benin (West Africa)	113,000	485	159	2,500
Bhutan (South Asia)	38,394	678	198	5,603
Brazil (South America)	8,512,000	1,712	578	56,215
China (East Asia)	9,597,054	1,221	502	32,200
Colombia (South America)	1,139,000	1,821	467	51,220
Costa Rica (Central America)	51,100	838	232	12,119
India (South Asia)	3,287,263	1,180	422	18,664
Indonesia (Southeast Asia)	1,750,669	1,604	667	29,735
Japan (East Asia)	378,000	592	171	5,565
Kenya (East Africa)	580,367	1,103	407	6,506
Kuwait (West Asia)	17,818	358	23	234
Nepal (South Asia)	147,181	864	203	6,973
Netherlands (West Europe)	37,000	444	95	1,221
Pakistan (South Asia)	796,000	625	195	4,950
Papua New Guinea (Oceania)	462,840	720	260	11,544
Peru (South America)	1,285,000	1,781	441	17,144
Russia (Europe/Asia)	17,075,000	645	296	11,400
Slovakia (East Europe)	49,012	332	87	3,124
South Africa (Southern Africa)	1,221,000	829	320	23,420
Switzerland (Central Europe)	41,284	382	93	3,030
Sri Lanka (South Asia)	65,610	381	123	3,314
Thailand (Southeast Asia)	513,115	971	300	11,625
United Kingdom (West Europe)	242,900	557	103	1,623
United States (North America)	9,363,520	888	468	19,473
Uzbekistan (Central Asia)	447,400	343	91	4,800
Venezuela (South America)	912,050	1,392	353	21,073
Yemen (West Asia)	528,000	385	74	1,650

Sources :

1. *Number of species for Bhutan are derived from national sources (Birds of Bhutan book by Inskipp et al, 1999, Field Guide to the Mammals of Bhutan by Wangchuk et al, 2004, and Flora of Bhutan)*
2. *Number of species for other countries are from the environmental information portal maintained by the World Resources Institute (earthtrends.wri.org)*
3. *Country area figures are from Oxford Atlas, 2002.*

2.4 Domestic Biodiversity

2.4.1 Agricultural Crops

Bhutan's diversity of agricultural crop species is quite impressive. About 80 species of agricultural crops are expected to occur in the country. The main crops include: cereals such as rice, maize, barley, millet, wheat, and buckwheat (pseudo cereal); fruits such as apple, orange, and pear; vegetables such as potato, bean, and cabbage; and spices such as chili, cardamom, garlic, and ginger. The crop species diversity can be further broken down into numerous landraces that occur as a consequence of adaptation to micro-environments created by altitudinal and climatic variations. For instance, there are some 350 landraces of rice, 47 of maize, 24 of wheat, and 30 of barley.

Phobjikha valley, Wangduephodrang. ***Rural landscapes in the temperate region typically comprise agricultural fields against the backdrop of pastures and forests.***

Table 5: Major Food Crops of Bhutan

Crop	Harvested Area in acre (2006)	Production MT (2006)
Paddy	67,566	74,380
Maize	75,413	71,062
Wheat	17,515	9,586
Barley	7,494	4,003
Foxtail millet	4,420	1,801
Finger millet	16,558	6,984
Sweet buckwheat	12,325	4,902
Bitter buckwheat	9,088	4,451
Mustard	13,123	3,706
Rajma bean	2,908	1,279
Soy bean	3,196	1,419
Bean	4,501	4,632
Potato	17,628	68,048
Chili	5,971	11,606
Radish	4,016	10,218
Turnip	2,111	12,914
Cabbage	2,026	4,298
Green leaves	2,803	4,385
Ginger	4,425	7,571
Cardamom	9,991	3,477

Source: Agriculture Statistics 2006, Department of Agriculture, Ministry of Agriculture

Several of the crop varieties represent adaptations to some of the highest agricultural lands in the world, with cultivation in the alpine agro-ecological zone extending up to 4,600 m. For example, while wheat is not an indigenous crop, varieties grown around Laya 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. A few other crop species have been domesticated; for example, buckwheat is indigenous and at least one putative wild relative, *Fagopyrum debotrys*, is found in the wild in Bhutan. Foxtail millet is another indigenous crop species with a wild relative, *Setaria viridis*. Two wild relatives of oats, *Avena fatua and A. sativa,* are found in the country. There are also numerous wild relatives of horticultural crops such as apple, pear and citrus in the temperate and subtropical forests of the country.

Bhutanese rice is unique in that it represents an intermediate type between the two major groups of *Oryza sativa*, "indica" and "japonica" ("javanica" is a less significant third group)[32]. There are an estimated 350 varieties of rice in the country, many adapted to micro-environments, and thus creating a very valuable and unique gene pool. At least two wild relatives of rice, *O. minuta* and *O. rufipogon*, are known to be found in the country.

In addition, four wild relatives of lentil, *Vigna radiate var sub-lobata*, *V. vexillata*, *V. pilosa*, and *V. trilobata*, and three wild relatives of pigeon pea, *Cajanus grandiflorus*, *C. mollis*, *C. elangatus*, are known to occur in the country.

2.4.2 Livestock

Livestock diversity in Bhutan basically consists of bovines, caprines, ovines, equines, avians, swines, canines and felines. Among cattle, Nublang is a *Bos indicus* breed believed to have originated in Sombe *gewog* of Haa. Its key characteristics are disease resistance, strength and high butterfat content in milk. Mithun *Bos frontalis* is a descendant of Gaur, which originated in Northeast India but has been bred in Bhutan since at least the 17th century. Mithun (male) are often crossbred with Thrabam (female of Nublang) to reproduce Jatsa and Jatsham, which are productively superior compared to either of the parent breeds. Then there is Goleng, a *Bos taurus* cattle species probably originating in Tibet, which is commonly used for cross-breeding with yak.

A Lunap lady milking yak, Lunana. *Yak herding is a major economic activity in the sub-alpine region*

32 Chettri GB, 1992

The yaks in Bhutan are similar to those which occur commonly elsewhere in the Himalayas and Tibetan plateau. There appears to be distinct genetic differences between yaks in eastern and western Bhutan, with higher level of genetic diversity in the east. Yak and cattle hybridization is commonly practiced in central and eastern Bhutan, producing several sub-breeds such as Zo and Zom.

Horse breeds found in the country are also considered to be unique. These breeds are known as Yuta, Boeta, Mera-Saktenpa, and Jata. Ass breeds are imported from Tibet or India for crossbreeding with horses to produce mules.

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. It is highly threatened as farmers are giving up sheep husbandry practices because they are no more economically viable.

Table 6 : Population Overview of Various Livestock Breeds in Bhutan

Breed/ Type	Population Status (2007)
Nublang cattle	208,783
Mithun cattle (pure)	1,643
Mithun cattle (cross)	48,755
Jersey cattle (pure)	1,140
Jersey cattle (cross)	53,716
Brown Swiss cattle (pure)	79
Brown Swiss cattle (cross)	5,192
Yak	51,500
Buffalo	1,551
Horse (local breed)	19,617
Horse (improved breed)	1,309
Mule	5,183
Donkey	153
Sheep	12,202
Goat	28,300
Pig (local breed)	17,742
Pig (improved breed)	7,814
Chicken (local breed)	147,738
Chicken (improved breed)	41,408
Dog	31,729
Cat	30,192

Source: Livestock Population Statistics 2007, Department of Livestock, Ministry of Agriculture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Chapter 3

BIODIVERSITY CONSERVATION EFFORTS

3.1 Conservation of Wild Biodiversity

3.1.1 *In situ* Conservation

Establishment and Management of Protected Areas

Bhutan has set aside a sizeable portion of the country as protected areas. With the inauguration of the Wangchuck Centennial Park[33] in December 2008, the country's protected areas system is now made up of five national parks, four wildlife sanctuaries, and a strict nature reserve, covering altogether an area of 16,398 km^2 or 42.7 percent of the country's total area (see Figure 2 and Table 7)[34]. This puts Bhutan well at the top of the list of countries in the world with the highest proportion of area under protected status[35] (Figure 3).

Rheum nobile, Jigme Dorji National Park. ***Bhutan's natural ecosystems are rich in medicinal plants with more than 300 recorded plant species of medicinal value.***

33 Wangchuck Centennial Park is dedicated to the Bhutanese monarchs for hundred years of peace, prosperity and happiness. The protected area is now the largest in the country with an area of 4,914 km^2.

34 Some official figures include biological corridors in the calculation of the total area under protected areas system. This report has left out biological corridors in the calculation of the total area under protected areas system as they do not fall under IUCN classification, which is internationally used to define protected areas.

35 The ranking excludes very small countries that have a total area of less than 5,000 km^2. Nor does it account for those few remaining countries or regions, like Suriname and Alaska, where the system of protected areas may take in a smaller overall percentage of land area than indicated for those countries listed in Figure 2, but, in actual effect, harbors enormous contiguous pristine territory. In the case of Suriname, more than 90 percent of the country remains as scarcely-populated, intact tropical rain forest, with low threat of deforestation.

Figure 2: Map showing Protected Areas and Connecting Biological Corridors in Bhutan

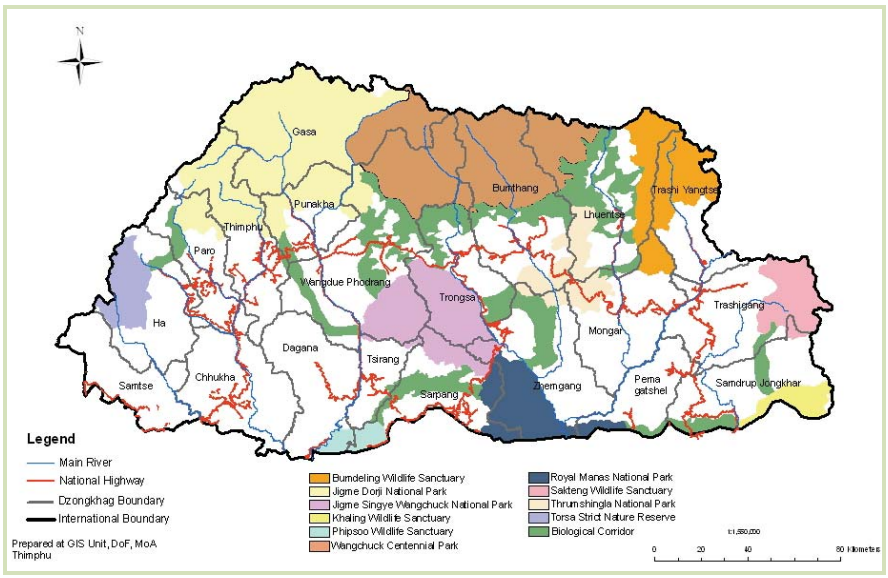
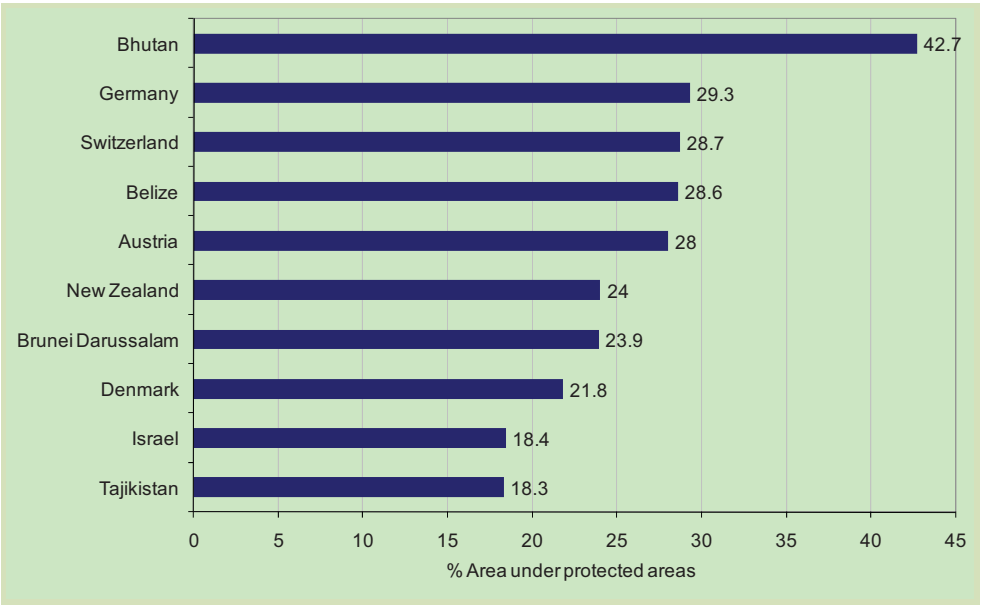


Figure 3: Countries with Highest Proportion of Protected Areas



Source : WRI (2007) excepting the figure for Bhutan

Note : For international comparability, the protected areas taken into account for the ranking fall in IUCN category I to V

The protected areas system in Bhutan is one of the most comprehensive in the world not only in terms of area coverage but also in terms of the balance and contiguity in distribution across the country. The system encompasses a continuum of representational samples of all major ecosystems found in the country ranging from the tropical/ sub-tropical grasslands and forests in the southern foothills through temperate forests in the central mountains and valleys to alpine meadows and scree in the northern mountains (see Annex 3 for brief descriptions of the protected areas).

In 2006, the area of Thrumshingla National Park was increased from 768 km^2 to 905 km^2 and that of Bumdeling Wildlife Sanctuary from 1,400 km^2 to 1,521 km^2 to bring additional areas of potential tiger and snow leopard habitats under the protected areas system. Of the ten protected areas, six are operational at present with conservation management plans, personnel and basic conservation management infrastructure in place (see Table 7). These six protected areas collectively cover an area of 9,234 km^2, constituting 56.3 percent of the total area under protected areas. The remaining protected areas are expected to become operational in the Tenth Five Year Plan period (2008-2013)[36].

Table 7: Operational Status of Protected Areas in Bhutan

Protected Area	Area km^2	Operational Status
Torsa Strict Nature Reserve	610	Not yet operational
Jigme Dorji National Park	4,316	Operational since 1997. Conservation management plan being revised.
Jigme Singye Wangchuck National Park	1,730	Operational since 2002. Conservation management plan being revised.
Royal Manas National Park	1,057	Operational since 1994. Prior to 1994, patrolling and some limited research activities were being implemented as well as basic park infrastructure existed in Manas.
Thrumshingla National Park	905	Operational since 2002. Conservation management plan being revised.
Bumdeling Wildlife Sanctuary	1,521	Operational since 2001. Conservation management plan being revised.
Phibsoo Wildlife Sanctuary	269	Not operational but patrolling and preliminary surveys ongoing under the management of Sarpang Forest Division
Sakten Wildlife Sanctuary	741	Operational with its first conservation management plan in place in 2006.
Khaling Wildlife Sanctuary	335	Not yet operational
Wangchuck Centennial Park	4,914	Declared a protected area in December 2008
All PAs (total)	*16,398*	-

Source: Nature Conservation Division, DoF, 2009

36 Phipsoo Wildlife Sanctuary has some basic infrastructure and staff for regular patrolling and wildlife protection. It is presently managed by Sarpang Forest Division.

The conservation management plans of the operational protected areas essentially include conservation research and monitoring, patrolling and law-enforcement, public awareness and education, integrated conservation and development programmes, and nature tourism. In Bhutan, irrespective of the conservation category (strict nature reserve, national park, wildlife sanctuary) the protected areas are not managed as a homogeneous territory but, rather, as a mosaic of conservation zones permitting varying levels of human intervention and use. For instance, the core zone is fully protected, allowing only for regulated research and scientific monitoring. On the other hand, the multiple-use zone is an area which might well support local communities, their agricultural needs and practices, including grazing and forest use. However, natural resource use and livelihoods in such areas must not compromise the conservation objectives for which the protected area was established. This is in contrast to many other countries which follow exclusionary policies for protected area management, involving relocation of local communities to areas outside the protected areas[37].

Establishment and Management of Biological Corridors

Declared in 1999, the eight biological corridors, collectively encompassing an area of 2,686 km^2, connect all the ten protected areas. The primary purpose of the biological corridors is to maintain gene-flow through uninterrupted wildlife movements and succession of habitats (see Table 8). The width of the corridors ranges from 500 m to 3 km. The corridors were identified based on field assessment of the following criteria: abundance of target wildlife; slope of terrain; occurrence of forest fires; condition of canopy and undergrowth; level of human disturbance; and width of narrowest constriction.

Conservation management interventions have been piloted since 2003 in the biological corridors adjacent to Thrumshingla National Park in order to draw lessons from and establish the basis for defining the conservation management status of and administrative framework for the biological corridors in general. Consequently, the Nature Conservation Division (NCD), under the Department of Forests (DoF), has promulgated Biological Corridor Rules 2007 as an addendum to the Forest and Nature Conservation Rules 2006. The Rules describe the conservation management status of biological corridors as lower than that of a protected area but higher than that of government reserved forests. The field-level implementation of the Biological Corridor Rules 2007 and management of the biological corridors are mandated to the territorial forest divisions with the NCD providing coordination and backstopping.

Socio-economic and biodiversity surveys are ongoing and a strategic plan has been prepared for the biological corridor connecting Torsa Strict Nature Reserve and Jigme Dorji National Park. These initiatives have been undertaken as a part of the tri-border Kanchenjunga Conservation Programme involving Bhutan, India and Nepal[38].

37 Globally speaking, relocation of local communities is particularly prevalent in protected areas belonging to the category of a strict nature (category I), national park (category II) or wildlife sanctuary (category IV).

38 The programme is supported by the International Center for Integrated Mountain Development.

Table 8: Biological Corridors and their Areas

Biological Corridor	Area km^2
North Corridor	934
Thrumshingla NP – Jigme Dorji NP	149
Jigme Dorji NP – Jigme Singye Wangchuck NP	275
Thrumshingla NP – Bumdeling WS	79
Thrumshingla NP – Jigme Singye Wangchuck NP – Royal Manas NP	501
Khaling WS – Sakten WS	160
Jigme Singye Wangchuck NP – Royal Manas NP – Phipsoo WS	376
Royal Manas NP – Khaling WS	212
Total	*2,686*

Source: Nature Conservation Division, DoF, 2009

Establishment and Management of Conservation Areas Outside the Protected Areas System

There are several natural areas which have special conservation value but are not a part of the protected areas system. BAP II named a number of areas outside the protected areas system that are of great conservation value and require special regulations and management interventions to ensure protection from potentially intrusive activities. In addition to the conservation areas that feature in BAP II, the MoA has named a number of forest areas for lease to RSPN for conservation management[39]. These areas, as featured in BAP II and in the MOA notification of August 2003, are all shown in Table 9.

Amongst the conservation areas listed in Table 9, Phobjikha and Dochula have conservation management programmes underway. Phobjikha valley is primarily known as a winter habitat of the globally threatened black-necked crane *Grus nigricollis.* Since 2003, the MoA has leased Phobjikha conservation area to the Royal Society for the Protection of Nature (RSPN) for conservation management[40]. RSPN is active in the conservation area in the fields of research on black-necked cranes and their habitat, public education and awareness, community empowerment for conservation, and integrated conservation and development programmes, including community-based ecotourism. An area of 162 km^2, which includes the *gewogs* of Phobji, Gangte and Bjena in Wangduephodrang *dzongkhag*, has been delineated as Phobjikha conservation area. A conservation management plan for the conservation area is in place with approval from the MoA, and conservation zones

39 The approval of the lease was notified vide Ministry of Agriculture's letter MoA/59/363 dated 4th August, 2003. However, the lease of Chelila, Dochula, Kamechu, and Goenshari was later retracted by MoA vide letter M(1)MoA/MISCE/2003/504 dated 12th October, 2004, in view of overlap with conservation programmes mandated to DoF.

40 RSPN is a non-governmental organization founded in 1987 with the objective to promote nature conservation in the country. It has been working in Phobjikha since its inception. The official lease accorded by MoA in 2003 gives RSPN the legitimacy to plan and implement conservation programmes in a full-fledged manner.

have been identified and are being physically delineated jointly by RSPN and the DoF using a consultative process involving local stakeholders. Regulatory framework for the conservation zones has been developed and is being refined and described in detail by RSPN in consultation with DoF and using available results of ongoing studies on interactions between human land use and crane habitat in Phobjikha.

The Dochula conservation area is a part of the recently-declared "Royal Botanical Park." An area of 47 km^2 around Dochula has been delineated for protection and for development into a locale for ecotourism and nature education. Within this area, MoA is developing a visitor information center, a rhododendron garden, a network of eco-trek trails, and several vista points and camping sites to promote ecotourism and nature education. The Royal Botanical Park falls within the biological corridor connecting Jigme Singye Wangchuck National Park and Jigme Dorji National Park, and forms a crucial part of a long, contiguous hill range that joins Tibet to the north and India to the south. Despite its small size, the park has a very good assortment of wild fauna and flora. Wild fauna that occur in the area include Bengal tiger *Panthera tigris tigris*, red panda *Ailurus fulgens*, musk deer *Moschus chrysogaster*, sambar deer *Cervus unicolor*, leopard *Panthera pardus*, leopard cat *Felis bengalensis*, Himalayan black bear *Ursus thibetanus*, monal pheasant *Lophophorus impejanus*, and Satyr tragopan *Tragopan stayra*. Occasional sightings of Bhutan takin *Budorcas taxicolor* have also been recorded in the area. While on one hand accessibility and proximity to the towns of Thimphu, Punakha and Wangduephodrang make the area vulnerable to environmental degradation, on the other these very same factors lend the area great potential to develop into an outstanding locale for ecotourism and nature education to instill appreciation for nature among the urban Bhutanese as well as foreign tourists.

Table 9: Conservation Areas in Bhutan

Conservation Area	Dzongkhag	Remarks
Dochula	Thimphu	Identified in BAP II
Pelela	Wangduephodrang	Identified in BAP II
Yutongla	Trongsa	Identified in BAP II
Dhur tshachu	Bumthang	Identified in BAP II
Phobjikha	Wangduephodrang	Identified in BAP II
Doga	Paro	Identified in BAP II
Ada	Wangduephodrang	Listed in MoA Notification
Chelila	Haa and Paro	Listed in MoA Notification
Goenshari	Punakha	Listed in MoA Notification
Kamechhu	Wangduephodrang	Listed in MoA Notification
Kangpara	Trashigang	Listed in MoA Notification
Tri-junction area	Chhukha, Haa and Samtse	Listed in MoA Notification

Bhutan Biological Conservation Complex

The NCD has consolidated the protected areas and biological corridors into a macro-level natural landscape called the "Bhutan Biological Conservation Complex", or B2C2 in short. The B2C2 landscape approach has been adopted as a conceptual strategy for holistic and integrated management of protected areas and biological corridors as opposed to the conventional piecemeal approach, attendant with the risk of imbalanced management of the protected areas and biological corridors. The approach, however, does not deride the importance of individual protected area management. Individual protected areas are seen as the main "building blocks" of the overall conservation landscape rather than as independent conservation units. It is also meant to help address critical biodiversity conservation gaps and needs, avoid duplication, develop common ground and synergies for conservation actions, and direct limited resources on priorities.

Forest Management Planning and Implementation

In order to cater to the demand of timber for domestic and commercial use without degrading forest resources and diminishing future forest productivity, the Department of Forests (DoF) has been planning and implementing forest harvesting operations based on the principles of sustainability for the past 30 years. All forest areas identified for harvesting have to first be inventoried to determine growing stock, assess demand-supply situation and identify ecological protection needs. Based on the inventory, management plans are prepared for harvesting of these areas. Forest areas with management plans are called "Forest Management Units" (FMUs)[41]. Each FMU is in principle required to operate within the limits of annual allowable cut and without weakening the ecological productivity of the forest area.

According to the Forest Resources Potential Assessment carried out by the Forest Resources Development Division (FRDD) from 2002 to 2004, 54.4 percent of the country's forest is unsuitable for timber use due to technical, ecological and economic reasons and another 28.8 percent cannot be used by virtue of being inside protected areas. This leaves only 16.8 percent of the country's forests for management to produce timber (see Table 10).

Table 10: Forest Resources Management Potential

Potential Use	Forest area (hectare)	Percentage of total forest area
Strictly protected areas	846,054	28.8
Unsuitable for timber use	1,590,573	54.4
Manageable for timber production	492,458	16.8
Commercially manageable area for timber production	*240,463*	*8.2*
Suitable for local timber use	*251,995*	*8.6*

Source: Forest Resources Potential Assessment 2004, FRDD

41 The duration of the management plan of a FMU is 10 years.

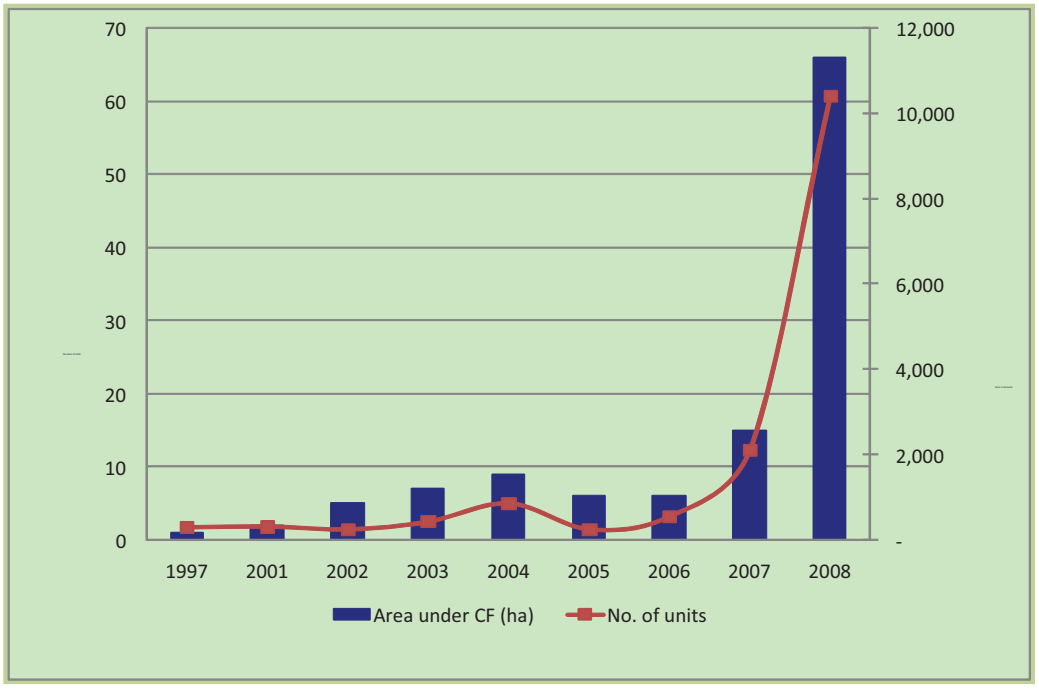
There are a total of 18 FMUs in operation. These FMUs cover altogether 204,312 hectares of forest area. Another three FMUs, with a total forest area of 34,321 hectares, are at various stages of inventory and management plan preparation. The operational and planned FMUs collectively cover a total forest area of 238,633 hectares. This figure translates to roughly eight percent of the total forest area and 48 percent of the total forest area manageable for timber production. The FRDD prepares the management plans for FMUs, the Natural Resources Development Corporation Limited (NRDCL) carries out the logging operations in the FMUs, and the territorial forest divisions oversee and monitor the activities in the FMUs to ensure compliance with the management plan.

Community Forest Management

Community forestry programme was introduced in the country in the 1980s. The primary objective was to improve local forest conditions through community management whilst enhancing socio-economic benefits to the local communities in terms of increased access to timber, fuelwood, fodder and non-wood forest products. It took several years to initiate the community forestry programme on the ground due to lack of appropriate legal framework, trained personnel and extension guidelines. These gaps were subsequently addressed with the promulgation of social forestry rules and regulations as a part of the Forest and Nature Conservation Rules 2000, and development of guidelines for planning, establishment and management of community forests in 2003. Until 2001 there was only one community forest unit, which was established with the community of Dozam village in Drametsi *gewog*, Mongar, in 1997. Since 2001, a total of 117 community forest units collectively covering 15,489 ha of forest land have been established across the country. 2008 was in particular a landmark year for the community forest management programme. In that year, 66 community forest units covering 10,396 ha of forest land were established (see Figure 4).

Joensham Lamdoksa Community forest, Khaling, Trashigang. ***A total of 117 community forest units collectively covering more than 15,000 hectares of forest land have been established in the country since 2001.***

Figure 4: Community Forests in Bhutan (1997-2008)



Source: Social Forestry Division, DoF, 2009

Non-Wood Forest Products Management

The rural Bhutanese use a wide range of non-wood forest products (NWFPs) for food, fiber, shelter, medicine, household implements, handicrafts and several other purposes. The Forest and Nature Conservation Act 1995, supported by the revised Forest and Nature Conservation Rules 2006, provide legal basis for the use and management of forest resources, including NWFPs, by local communities. Since 2006, the DoF has taken up NWFP management as a planned programme. As a first step of this initiative, DoF has prepared a set of guidelines for resource assessment and management for a selected number of NWFP species, which include Chirata *Swertia chirayata*, *Illicium griffithii*, lemon grass *Cymbopogon* spp, Pipla *Piper pedicellatum*, Yula *Neomicrocalamus andropogonifolius*, and *Borinda grossa* (an endemic bamboo species). Using these guidelines and based on the framework of community forest management, the DoF is focusing on working with local communities to develop and implement community-based plans for sustainable management of NWFPs.

Cordyceps sinensis (Yartsha guenbub), Lhingshi.

Display of *Cordyceps sinensis* at an auction site, Dodena, Thimphu.

The harvesting of Cordyceps sinensis has become a very beneficial alternative form of livelihood for the people living in the alpine/subalpine region.

Reforestation

As a national programme, reforestation[42] of degraded and barren forest lands was the earliest conservation initiative in Bhutan. As early as 1947, the first forest plantation was established, five years prior to the DoF coming into being[43]. Since then, reforestation has been carried out on more than 21,500 ha (see Table 11)[44]. Reforestation has been a regular feature in all the Five Year Plans and has been carried out at the rate of about 2,400 ha per Five Year Plan.

Table 11: Reforestation in Bhutan

Period	Plantation Area (hectare)
Before 1st Five Year Plan	822
1st Five Year Plan (1961-66)	932
2nd Five Year Plan (1967-72)	1,278
3rd Five Year Plan (1972-77)	3,525
4th Five Year Plan (1977-82)	1,743
5th Five Year Plan (1982-87)	2,199
6th Five Year Plan (1987-92)	4,498
7th Five Year Plan (1992-97)	2,525
8th Five Year Plan (1997-2002)	1,916
9th Five Year Plan (2002-07)	2,078
Total	21,516

Source: Social Forestry Division, DoF, 2007

42 The term reforestation also refers to afforestation, the process of restoration of forests in barren lands (which may have been forested at some point in the past).

43 The DoF was established in 1952, with its head office then located in Samtse.

44 The figures exclude community forest plantations as they are already included in area figures for community forests.

Forest plantations are carried out usually along the following institutional models[45]:

- Plantations carried out by territorial forest plantations in suitable areas of Government Reserved Forests that cannot be viably re-afforested through other institutional models;
- Plantations carried out by NRDCL in areas within FMUs that have been harvested according to the forest management plan[46];
- Plantations carried out by industries in forest areas that have been leased to them with the objective of extraction of raw materials;
- Community forest plantations by local communities, established in accordance to the requirements of Forest and Nature Conservation Rules 2000;
- Landscape development plantations carried out around *dzongs*, monasteries, schools, townships, institutional premises, and along roads. The objectives may vary but are principally of non-economic nature and usually pertain to beautification, public recreation, wind protection, and soil stabilization.

Anti-Poaching Programme

Protection of wild biodiversity from poaching is carried out by the territorial forest divisions in forest areas outside the protected areas and by the protected area management authorities in the various protected areas. In addition, there is an Anti-Poaching Unit within the NCD. This unit functions as a nodal coordinating and monitoring base for anti-poaching activities throughout the country. It also conducts additional on-site patrolling in high-risk areas, and at those times of the year most likely to have poaching activity. In addition, the anti-poaching programme includes implementation of the requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Keystone/ Flagship Wildlife Species Conservation

Tiger Conservation

While it has been the policy of the Royal Government of Bhutan (RGoB) to take a holistic approach to conservation focusing on ecosystems rather than on individual species, there has been some species-specific conservation work relating to species such as the Bengal tiger *Panthera tigris tigris* and snow leopard *Uncia uncia* in view of the significance they bear as keystone/ flagship species of the ecosystems in which they survive[47]. A national

45 The models are defined in the National Re-afforestation Strategy of Bhutan, 1996.
46 In some places, NRDCL is even involved in reforestation of degraded or barren areas outside FMUs.
47 A keystone species is a species that has a disproportionate effect on its environment relative to its abundance. Such species affect many other organisms in an ecosystem and help to determine the types and numbers of various others species in a community. A flagship species is a species chosen to represent an environmental cause, such as an ecosystem in need of conservation. The concept of a flagship species holds that by giving publicity to a few key species, the support given to those species will successfully leverage conservation of entire ecosystems and all species contained therein.

programme for tiger conservation was initiated in 1996 with the objective to determine the status of tiger population and distribution, assess the conditions of tiger habitats, integrate tiger conservation needs in the overall nature conservation and protected area management strategy, and promote public awareness and education to enlist public appreciation and support for tiger conservation. In response to the longstanding concern of livestock depredation by tigers and other wild cats and the likely ramification of retribution killing of these species by farmers, the MoA established a tiger conservation fund to compensate farmers whose livestock are killed by tigers and leopards.

Royal Bengal Tiger, *Panthera tigris* tigris, Chendebji, Jigme Singye Wangchuck National Park. ***Tigers in Bhutan can be found at very high altitude up to 2800m because of contiguous forest habitats and healthy prey base.***

The NCD has prepared "Tiger Action Plan for the Kingdom of Bhutan, 2006-2015" to continue and enhance tiger conservation work in the country. This Action Plan, which has been prepared with the assistance of World Wildlife Fund (WWF) Bhutan Programme, spells out the following activities:

- Species conservation by means of development of database on tiger and ungulate prey population status and trends, and prevention of killing of tiger and prey species and illegal trade of tiger parts and products;

- Tiger habitat conservation through assessment and monitoring of tiger habitats and land-use conflict management using multi-sectoral consultative approaches and policy interventions;
- Human-wildlife conflict management through detailed studies of livestock depredation by tigers and introduction of preventive and mitigatory measures as well as incentives to reduce retaliatory killing of tigers;
- Development of enabling factors for tiger conservation especially in terms of increased public awareness, regional cooperation, and human resources development.

Snow Leopard Conservation

The advent of snow leopard conservation in Bhutan took place in 1997, when NCD in collaboration with WWF Bhutan Programme and the International Snow Leopard Trust conducted the first Bhutan Snow Leopard Information Management System (SLIMS) training and field survey in Thimphu and Jigme Dorji NP. In 2000, the second SLIMS training and field survey was conducted also in Thimphu and Jigme Dorji NP. Currently, NCD is carrying out surveys to assess the current status of snow leopard population and distribution, including habitat conditions and status of prey species, through out the country. The results of the surveys will be primarily used to formulate a national action plan for snow leopard conservation.

White-bellied Heron Conservation

The RSPN, apart from research and monitoring of black-necked crane *Grus nigricollis* as a part of their conservation management programme in Phobjikha valley, has initiated field studies on white-bellied heron *Ardea insignis* since 2005. The heron, recorded only in Nepal, India, Bangladesh, North Myanmar, and now in Bhutan is reportedly among the 50 rarest bird species according to BirdLife International. Less than 200 individuals of this heron are estimated to occur in the entire world; far rarer than earlier estimated. Consequently, the species has been uplisted to "critically endangered" status in the IUCN Red List of Threatened Species, 2007. The field studies by RSPN have so far recorded 32 white-bellied herons in nesting sites at Rurichhu, Zawa, Kisonachhu and Hararongchhu in Wangduephodrang *dzongkhag* and Bertichhu in Zhemgang *dzongkhag*, and in feeding areas along Phochhu in Punakha *dzongkhag*[48]. Recognizing the conservation importance of the white-bellied heron and the vulnerability of its habitats to activities such as quarrying of river beds, the RGoB has decided to prepare a proposal for submission to the National Assembly for ratification to incorporate the species in the totally protected species list of Forest and Nature Conservation Act 1995[49].

48 The field study information are available in detail in RSPN's White-bellied Heron Project Report, January to June, 2007.

49 Letter No. COM/04/07/887 dated 1st March, 2007, of the Cabinet Secretariat of the Royal Government of Bhutan to the Ministry of Agriculture and the National Environment Commission.

White-bellied heron, Ardea insignis, declared a critically endangered bird species in the IUCN Red List is found along Puna Tsang Chhu in west central Bhutan. Population survey and habitat research is ongoing for the protection of the species and its natural habitat.

High Value Medicinal and Aromatic Plant Species Conservation

This programme focuses on conservation of medicinal and aromatic plant resources through sustainable utilization, streamlining of supply chain with quality medicinal plants' raw materials, and enhancement of livelihood/economic opportunities for the rural poor. It seeks to combine conservation and economic development aspects of medicinal and aromatic plant species. The programme, financially supported by the European Union, is a collaborative initiative between the Renewable Natural Resources Research Centres (RNR-RCs) at Yusipang and Mongar (MoA) and ITMS (Ministry of Health). The medicinal and aromatic plant species conservation program at Yusipang focuses on mid- and high-altitude species and the one at Mongar focuses on low-altitude species.

3.1.2 Ex situ Conservation

Since the establishment of the National Biodiversity Centre (NBC), *ex situ* conservation has been gradually evolving into a noteworthy national programme. The *ex situ* conservation programme for wild biodiversity under NBC currently consists of the Royal Botanical Garden and the National Herbarium, both located at Serbithang.

With funding from the Bhutan Trust Fund for Environmental Conservation (BTF), the Royal Botanical Garden (RBG) was established in 1999, commemorating the Silver Jubilee Coronation Anniversary of the Fourth King His Majesty Jigme Singye Wangchuck. The Garden is designed to explore and exhibit the wide diversity of plants, with focus on species of economic significance such as those useful for food, fibre, cosmetic and industry, including those species that are endangered. It includes thematic gardens, a sub-tropical house, an orchidarium, an information centre, and recreational facilities such as a children's park. In the long term, it will also focus on the ecology and evolutionary biology of plants. At the present, the RBG has a collection of 154 species of orchids, 25 species of rhododendrons, four species of oaks, eight species of conifers, 120 species of broadleaf plants, and 15 species of succulents and creepers.

The National Herbarium at NBC houses some 12,000 plant specimens, the oldest of which dates back to 1914. Most of the specimens were earlier preserved at a temporary storage facility which was subsequently converted into a herbarium at the Forest Research Division in Taba in the late 1980s. With the construction of the National Herbarium building at the NBC, the plant specimens were shifted from the herbarium at Taba to the new facility and subsequently several more specimens were added to the collection. In addition, the National Herbarium holds a library of both indigenous and global botanical literature.

Apart from the above activities managed by NBC, there is a Gharial Conservation Programme[50] at Phuentsholing and a Takin Preserve at Motithang, Thimphu. The Gharial Conservation Programme is managed by the DoF and breeds two species of crocodile – gharial *Gavialis gangeticus,* which is a critically endangered species, and mugger *Crocodylus palustris*. The Takin Preserve, which was earlier managed by the Tourism Council of Bhutan, has been taken over for management by the NCD since August 2008. It serves as a recreational facility and public exhibition of Bhutan's national animal, the takin.

In addition, as a part of the collaborative programme on medicinal and aromatic plant species between RNR-RCs Yusipang and Wengkhar (MoA) and ITMS (Ministry of Health), herb gardens have been established at Lingshi (4,000 m) and at Lingmithang (600 m). A germplasm collection of 53 species has been established and a total of 13 species have been successfully propagated and subsequently distributed to farmers or planted in trial plots.

50 This programme was previously called Crocodile Breeding Centre but was renamed as Gharial Conservation Programme to have greater focus on the conservation of gharial in view of its status as a critically endangered species.

3.2 Conservation of Domestic Biodiversity

3.2.1 Crop Diversity Conservation

Ex situ Conservation of Crop Genetic Resources

The National Gene Bank for Plant Genetic Resources (NGB-PGR) was established in early 2004 with the key objective to conserve crop varieties, especially the traditional varieties, lest they became extinct in their natural environments. The NGB-PGR, which was established with funding support from the Royal Government of Netherlands under the framework of Sustainable Development Agreement, is managed by NBC. Since the establishment of NGB-PGR, one of its priorities among other things has been exploration of traditional crop diversity and collection of germplasm of traditional crop varieties. Germplasm collections from across the country are being carried out every winter by the NBC staff in close collaboration with *dzongkhag* and *gewog* agricultural staff and RNR-RCs. As of 2008, a total of 109 gewogs had been covered and approximately 1,500 samples of traditional varieties/cultivars of various crops have been collected.

The collected samples are cleaned, quality evaluated, processed, and information documented in database called Gene Bank Information System (GBIS). The GBIS holds taxonomic information, accession numbers, storage system, passport data, number of packets under each system, amount of seeds available, germination percentage at entry as well as at established intervals, characterization and evaluation data, and other necessary information.

Seeds conserved at the NGB-PGR, NBC. ***The gene bank houses over 1000 accessions of traditional crop species/varieties collected from 109 gewogs.***

Two types of collections 'Active' and 'Base' are being maintained at NGB-PGR. The 'Active Collections' are used for distribution to the users, researchers, breeders, etc. The 'Base Collections' are maintained for security and will be used only for monitoring of viability of stored seeds or for regeneration or to replenish the active collections. About 1,000 accessions belonging to paddy, maize, millet, wheat, buckwheat, amaranthus, legumes and oil-seeds are currently conserved in the NGB-PGR.

Samples that are conserved in the gene bank are being characterized through morphological/ phenotypic evaluation. Molecular characterization of the collected samples has been planned to be carried out in the 10 FYP.

The NGB-PGR is a pivotal part of NBC's Conservation Programmes and links with on-farm plant genetic resources conservation initiatives of NBC and the Regional Renewable Natural Resources Research Centers (RNR-RCs) in a mutually-reinforcing manner.

In situ Conservation of Crop Genetic Resources

On-farm conservation of crop genetic resources was initiated as a national programme in 2001 by the NBC in collaboration with regional RNR-RCs and *Dzongkhag* Agriculture Sectors through assistance from the Biodiversity Use and Conservation in Asia Programme (BUCAP). In addition to Bhutan, BUCAP is currently active in four other countries, namely Lao People's Democratic Republic, Philippines, Thailand and Vietnam. At the regional level, BUCAP is coordinated and technically supported by South East Asia Regional Initiatives for Community Empowerment (SEARICE) based in the Philippines and funded by Development Fund, Norway; SwedBio, Sweden and Hivos, the Netherlands. In the initial period, the Programme in Bhutan focused on on-farm conservation of maize and rice genetic resources using Farmers' Field School (FFS) approach.

Currently the on-farm conservation programme is being carried out at 13 sites in eight *dzongkhags* (Trashigang, Mongar, Trongsa, Wangdue, Thimphu, Tsirang, Sarpang and Chukha). The activities are aimed at supporting farming communities conserve traditional crops and crop varieties through yield enhancement, income generation, proper seed selection and storage, and capacity development through training, exposure trips (including visits to other BUCAP partner countries). Farming communities select crop varieties using Participatory Varietal Selection (PVS) methodology and organize biodiversity fairs and seed exchange programmes to facilitate farmer-to-farmer awareness of on-farm conservation activities and benefits. The programme also supports income generation activities among farmers through diversification and development of local agricultural produce.

Biodiversity Fair 2009, Tsirang. *In situ conservation of agro-biodiversity is promoted through public awareness and participatory activities such as biodiversity fairs.*

3.2.2 Livestock Diversity Conservation

Livestock, particularly cattle, yak, horse and sheep, has traditionally been an integral part of the agricultural production system and the economy of Bhutan. Traditional farming systems allowed livestock to be managed in harmony with the environment.

With the increase in human population and emerging economic needs, indigenous livestock breeds have come under threat as a result of crossbreeding with exotic breeds to increase productivity. In response to this threat and as a party to the CBD, RGoB accords high priority to the conservation and utilization of domestic animal genetic resources for sustainable livestock development. The Department of Livestock (DoL), Council for RNR Research of Bhutan (CoRRB), College of Natural Resources (CNR), and NBC are involved in both *ex situ* and *in situ* conservation of domestic livestock biodiversity in Bhutan.

Ex situ conservation

The DoL has established a number of livestock breeding farms to maintain and improve native breeds. These farms include the National Nublang Breeding Farm at Tashiyangphu, Regional Mithun Breeding Farms at Arong and Wangdigang, National Horse Breeding Farm and National Sheep Breeding Centre at Bumthang. In collaboration with the CoRRB, these farms focus on the genetic selection and improvement of native breeds. These farms also serve as "nucleus herds" for supplying quality germplasm to the *in situ* conservation areas.

Livestock germplasm conserved at the National Animal Gene Bank, NBC. ***Currently the gene bank has germplasm collections of Nublang, Jakar sheep and local poultry.***

In addition, the National Livestock Breeding Programme has cryo-preserved several hundred doses of semen of Nublang and Mithun. The NBC has also taken up preliminary activities to preserve genetic materials of native breeds of sheep, poultry and pig. 327 semen doses of Jakar sheep, 326 semen doses of seven different types of poultry, and 114 semen doses of Jitu-pha pig have been conserved at the National Gene Bank for Animal Genetic Resources (NGB-AnGR).

In situ conservation

Nublang is genetically distinct from any other cattle breeds in the Himalayas. The breed is adapted to survive and perform optimally under harsh terrain and climatic conditions. Its original habitat is in Sombekha in Haa *dzongkhag*. The National Livestock Breeding Programme, RNR-RC Jakar and NBC have initiated *in situ* conservation programme in Sombekha. An important component of the Programme is the formation of "Nublang

Local pig, Sombekha, Haa. ***In situ conservation of traditional breeds of livestock is promoted through education and participatory approaches.***

Breeders Society" involving the local cattle herders. Bull mothers have been identified, ear-tagged and quality Nublang breeding bulls have been distributed from the breeding farms. Village herd recording has been introduced to facilitate selection and herd improvement.

Bhutanese local horse, Yuta, is a sturdy breed with compact body, small hooves and strong limbs. They perform well in the treacherous and rugged mountain terrain of the country. To conserve and improve the Yuta breed, Yuta Breeders Groups have been formed in potential areas of the country, such as Tandigang, Bumthang and Bumdeling.

Due to decreasing economic returns from sheep farming, farmers are gradually giving up sheep husbandry in Bhutan. This has particularly affected the rearing of Jakar sheep, which is native to central Bhutan. In response, MoA has initiated participatory Jakar sheep breeding programme at Phobjikha in central Bhutan. The programme focuses on encouraging Jakar sheep owners to continue rearing sheep. This is being done by means of provision of good breeding rams, free health care, wool processing technologies, value addition and marketing of sheep products.

3.2.3 Sustainable Land Management to Protect Agricultural Ecosystems

National Land Management Campaign

The National Land Management Campaign (NLMC) was launched in July 2005 by the former Agriculture Minister Lyonpo Sangay Ngedup in response to the need to proactively deal with land degradation problems which had become increasingly visible and profound in terms of impacts on the local people and their livelihoods, especially in many parts of eastern Bhutan. What triggered the NLMC was the heavy monsoon of 2004, which caused several floods and land slides in eastern Bhutan, resulting in the loss of human lives and livestock, destruction of homes, degradation of farm lands, and damage to rural socio-economic infrastructure. During the visit to the affected areas, the former Agriculture Minister observed that one of the key factors leading to land degradation and natural disasters was the lack of proper land management practices.

The NLMC is not a one-off activity but a continuous programme of the MoA to instill in people the awareness and understanding of various land management techniques based on site-specific land degradation problems. It focuses on field demonstrations of sustainable land management practices and techniques using a broad-based participatory approach bringing together local communities, *dzongkhag* staff as well as professionals from various disciplines in the rural sector.

The DoA is responsible for overall coordination and organization of the Campaign. To facilitate inter-agency coordination in planning and implementation, an organizing committee with representation from various departments and agencies has been formed. In addition, a technical team led by the National Soil Services Centre has been formed to provide core technical advisory services and backstopping to the Campaign.

The NLMC took off in 2005, starting with eight sites in Trashigang *dzongkhag*. The technical team selected the eight sites after having conducted an intensive field survey covering 42 locations in 13 *gewogs* in Trashigang. The selection was based on a set of criteria such as impact of land degradation, demonstration value and geographic distribution. Since its inception, the Campaign has spread over to selected *gewogs* in Mongar, Trongsa, Tsirang, Dagana, and Pemagatshel *dzongkhags*.

Landslide, Tshogonpa, Trashigang. ***The Ministry of Agriculture supports local communities to take up land rehabilitation through targeted national land management campaigns.***

Sustainable Land Management Programme

Sustainable land management is a key programme of the MoA. This programme is being implemented through two projects.

With a grant from the GEF through its Operational Programme 15 and co-financing from DANIDA, the Sustainable Land Management Project has been conceived with the development objective to strengthen institutional and community capacity in terms of human resource, policies, incentives, technologies and knowledge for anticipating and managing land degradation in the country. The SLMP, as the project is known in short, is made up of the following four complementary, mutually-reinforcing components:

- Pilot projects to demonstrate effective application of land degradation prevention approaches. For the first three years, the pilot sites are Nangkor in Zhemgang *dzongkhag*, Phuentsholing in Chhukha *dzongkhag* and Radhi in Trashigang *dzongkhag*;
- Mainstreaming of practices for protection against land degradation. This component will support the scaling up of the pilots to additional sites based on the lessons learned from first component. In addition, it will facilitate coordinated and participatory planning at the *dzongkhag* level which integrates the cross-sectoral impacts of development (e.g. infrastructure, roads, irrigation, power, agriculture and industrial development). Under this component, the project will support on-the-ground investments, technical assistance, community cross-site visits, training, research and awareness programmes, new analytical tools, GIS and databases.
- Policy support and guidance for mainstreaming land degradation prevention practices. This component will bring lessons from the first and second components to inform national legislation and policy pertaining to watershed management, upland agriculture and livestock production, forestry, urban planning and infrastructure. It will provide technical assistance to develop guidelines for mainstreaming SLM principles into RGoB's Five Year Plans, and gewog and dzongkhag five-year and annual plans.
- National level support for coordination of implementation of land degradation prevention practices. This component would further support RGoB's support to strengthen and build capacity within the Ministry of Agriculture to systematically and effectively coordinate a programme of activities in order to help anticipate and manage land degradation in the country.

The second project is the medium-sized project on sustainable land management funded by GEF through the UNDP. The three-year project is expected to result in: (i) formulation of a National Action Program (NAP) to combat land degradation; (ii) capacity development for sustainable land management; and (iii) mainstreaming of sustainable land management in national development policy and planning framework.

The formulation of the NAP has been initiated using extensive stakeholder consultations and validation of priorities and needs using a multi-disciplinary approach and linking knowledge, perceptions and insights at central, *dzongkhag* and *gewog* levels. Capacity development for sustainable land management will be pursued through human resources capacity assessment and development, strengthening of institutional capacity for assessment, documentation and dissemination of sustainable land management practices, development of project proposals including those identified through NAP, and establishment of linkages with UNCCD-related organizations such as the Global Mechanism. The mainstreaming of sustainable land management in the national development policy and planning framework will be pursued through incorporation of sustainable land management strategies in the Five-Year Plan process, preparation of policy and legal reform recommendations related to sustainable land management, and incorporation of sustainable land management in other environmental policies.

3.3 Conservation Policy and Legislation Development

Environmental conservation is not a modern concept to the Bhutanese. It has always been at the center of national development thinking and policy-making. Traditional values based on the Buddhist philosophy of reverence for all living things have molded a lifestyle and development approach that takes environmental conservation as a fundamental requirement. Over the years, a strong set of conservation policies and laws has evolved to ensure protection, management and sustainable use of biodiversity resources. Bhutanese conservation policies and laws are essentially geared towards contributing to the overarching national development objective of GNH, which embraces environmental sustainability as one of its four pillars. The Constitution of the Kingdom of Bhutan, which enshrines environmental conservation as a constitutional mandate, and *Bhutan 2020*, the country's vision document to maximize GNH, serve as over-riding policy instruments. Complementing these two documents, several policies and laws exist related to biodiversity conservation and these are described herein.

3.3.1 National Forest Policy

The National Forest Policy is the earliest policy document related to biodiversity conservation in Bhutan. The Policy was first formulated in 1974 and subsequently revised in 1979 and 1991. It serves as the main guiding policy framework for development of forestry programmes, plans, supplementary policies, laws and regulations.

The Policy aims to ensure conservation of the environment, and only thereafter aim at deriving economic benefits from the forest as rationally managed resource. Economic benefits from forest resources are considered secondary and are to be derived only within sustainable limits. It stipulates that at least 60 percent of the country will be maintained under forest cover for all times to come. It hinges on the following four guiding principles:

- Protection of the land, its forests, soil, water resources and biological diversity against degradation, such as loss of soil fertility, soil erosion, landslides, floods and other

ecological devastation and the improvement of all degraded forest land areas, through proper management systems and practices;

- Contribution to the production of food, water, energy and other commodities by effectively coordinating the interaction between forestry and farming systems;
- Meeting the long-term needs of Bhutanese people for wood and other forest products by placing all production forest resources under sustainable management;
- Contribution to the growth of national and local economies, including exploration of export opportunities, through fully developed forest based industries, and to contribute to balanced human resources development through training and creation of employment opportunities.

3.3.2 RNR Sector Policy

The Renewable Natural Resources (RNR) sector policy lays emphasis on attaining greater national food security, conserving and managing natural resources, enhancing rural income, and generating farm-based employment opportunities. It outlines the following objectives:

- To pursue a people-centered development path that would lead to the realization of their aspirations for a better life through active public participation in the development process;
- To pursue economic development that has prospects for long-term sustainability based on the country's resource situation, comparative advantages, and community based self-help institutions;
- To pursue a balanced and equitable development of the country's renewable natural resources and distribution of benefits accruing from them across society and regions;
- To adopt development strategies that are environment friendly and ensure the integrity of the country's fragile ecosystem; and
- To be sensitive and responsive to the rich cultural heritage of the country and ensure its preservation.

3.3.3 National Environment Strategy

The National Environment Strategy titled "The Middle Path" – first published in 1998 – was derived through an inter-sectoral and consultative process. The Strategy, which can be equated to a National Sustainable Development Strategy in essence, enshrines the concept of sustainable development and identifies three main avenues for such development: hydropower development based on integrated watershed management; agricultural development based on sustainable practices; and industrial development based on effective pollution control measures and environmental legislation. It also examines a number of areas of special importance for environmentally and culturally responsive economic development. These include tourism, roads, financing mechanisms for sustainable development, public health, urbanization, gender and natural resource

management, environmental impact assessments, and population management. Finally, it goes on to outline five key cross-sectoral needs that the country must effectively address to integrate environmental considerations into economic development planning and policy-making. These needs pertain to information systems and research, institutional development and popular participation, policies and legislation, training and education, and monitoring, evaluation and enforcement.

3.3.4 Forest and Nature Conservation Act 1995

The first modern legislation to be enacted in the country was the Bhutan Forest Act 1969. This is a clear indication of the importance RGoB attached to the country's forest resources and the need to safeguard them right from the beginning of modern development in the country. Prior to the enactment of the Bhutan Forest Act 1969, the *Thrimzhung Chenmo* or the "Mother Act", which covered certain legal provisions protecting forests and wildlife, provided the legal means to protect the natural environment.

In 1995, the National Assembly ratified the Forest and Nature Conservation Act 1995 repealing Bhutan Forest Act 1969. The 1995 Act was enacted to accommodate evolving conservation needs and to allow for community management of forest resources. The objective of the 1995 Act is to "provide for the protection and sustainable use of forests, wildlife and related natural resources of Bhutan for the benefit of present and future generations". It covers forest management, prohibitions and concessions in government reserved 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.

3.3.5 Forest and Nature Conservation Rules

To support the implementation of the Forest and Nature Conservation Act 1995 and in accordance with the powers and duties conferred under that Act, the MoA promulgated the Forest and Nature Conservation Rules 2000. The Rules establishes regulations for forest management, private and community forestry, establishment and management of protected areas, wildlife protection, and prevention of forest fires, land clearance, and other activities potentially impacting soil, water and wildlife resources, among other things.

The Forest and Nature Conservation Rules 2000 have been revised, updated and expanded, leading to the promulgation of Forest and Nature Conservation Rules 2006. The revised Rules incorporate two additional chapters specifying provisions pertaining to supply of timber and forest produce in rural areas. Legal provisions pertaining to industrial and institutional forests have also been added and the list of totally protected species has been expanded to include white-bellied heron *Ardea insignis*, a species listed as critically endangered in the IUCN Red List of Threatened Species, 2007[51].

51 A proposal to ratify the inclusion of white-bellied heron is to be put forward by MoA in the next session of the National Assembly.

3.3.6 Environmental Assessment Act 2000

The Environmental Assessment Act 2000 is overarching in that it relates to environment in a holistic manner and applies to a wide range of activities across a number of sectors. The Act establishes procedures for the assessment of potential effects of strategic plans, policies, programs, and projects on the environment, and for the determination of policies and measures to reduce potential adverse effects and to promote environmental benefits. The Act requires the RGoB to ensure that environmental concerns are fully taken into account when formulating, renewing, modifying and implementing any policy, plan or program as per regulations that may be adopted within the appropriate provision of the Act. It makes environmental clearance mandatory for any project or activity that may have adverse impact on the environment[52].

3.3.7 Regulations for the Environmental Clearance of Projects and Strategic Environmental Assessment

To implement the Environmental Assessment Act 2000, regulations were promulgated in 2002 for the environmental clearance of projects and for strategic environmental assessment. **The Regulation for the Environmental Clearance of Projects 2002** defines responsibilities and procedures for the implementation of the Environmental Assessment Act 2000 concerning the issuance and enforcement of EC for individual projects and to:

- Provide meaningful opportunities for public review of potential environmental impacts of projects;
- ensure that all projects are implemented in line with the sustainable development policy of the RGoB;
- ensure that all foreseeable impacts on the environment, including cumulative effects are fully considered prior to any irrevocable commitments of resources or funds;
- ensure that all feasible alternatives are fully considered; ensure that all feasible means to avoid or mitigate damage to the environment are implemented;
- encourage the use of renewable resources, clean technologies and methods; ensure that concerned people benefit from projects in terms of social facilities;
- help strengthen local institutions in environmental decision making; and
- help create a uniform, comprehensive data base on the environmental and cultural conditions and assets in the country.

52 Article 6.11 of the EAA defines Environmental Clearance as the decision, issued in writing by the NECS or the relevant Competent Authority, to let a project proceed, which includes terms (and conditions) to ensure that the project is managed in an environmentally sound and sustainable way.

To support the implementation of the EA Act and Regulation, sectoral EC application guidelines have been prepared for highways and roads, forestry, hydropower, industrial projects, mines, power transmission and distribution lines, urban development, and tourism projects. In addition, environmental codes of practice have been formulated for storm water drainage system, installation of underground and overhead utilities, tourism activities, and roads, and environmental discharge standards have been set to control pollution.

The **Regulation for Strategic Environmental Assessment 2002** was promulgated with the specific purpose to:

- ensure that environmental concerns are fully taken into account by all government agencies when formulating, renewing, modifying or implementing any policy, plan or programme, including FYPs;
- ensure that the cumulative and large scale environmental effects are taken into consideration while formulating, renewing, modifying or implementing any policy, plan or programme;
- complement project-specific environmental reviews as per RECOP and to encourage early identification of environmental objectives and impacts of all government proposals at appropriate planning levels;
- promote the design of environmentally sustainable proposals that encourage the use of renewable resources and clean technologies and practices; and
- promote and encourage the development of comprehensive natural resource and land use plans at the local, *dzongkhag* and national levels.

It outlines the duties of government agencies formulating, renewing, modifying, or implementing any policy, plan, or programme, the principles of strategic environmental assessment, and essential contents of the environmental statement.

3.3.8 Livestock Act of Bhutan 2001

The purpose of this Act is to regulate livestock breeding, health and production with the aim to enhance livestock productivity and prevent diseases so as to improve rural income and livelihood. Specifically, the main objectives are to:

- Ensure that only quality and appropriate breeds of livestock, poultry and fish are introduced;
- ensure the units used for semen and embryo production and storage are free from diseases;
- ensure that the introduction and spread of diseases, particularly the notifiable and zoonotic diseases are prevented;
- ensure that the prescribed procedures and standards for export and import of animals, animal products, genetic materials, feed, drugs, animal welfare, and disposal of dead carcasses are met;

- ensure that the safety standards are followed throughout the process of processing meat, fish, eggs, and dairy products for consumption;
- enable privatization of production, import and export, process, and sale of animals, animal products, feed, drugs, and other inputs necessary for enhancing livestock products.

3.3.9 Biodiversity Act of Bhutan 2003

The Biodiversity Act of Bhutan 2003 was enacted to regulate access to genetic resources in the country in realization of the value of biological resources in the development of products, substances and compounds that have medicinal, industrial and agricultural and related applications.

This Act asserts the sovereignty of the country over its genetic resources and the need to promote conservation and sustainable use of biodiversity resources as well as equitable sharing of benefits arising from sustainable use, and the need to protect local people's knowledge and interests related to biodiversity. It lays down the conditions for the grant of access, benefit sharing, and protection, and describes various rights, offences and penalties. Formulation of rules and regulations for implementation of the Act is presently underway.

3.3.10 National Biosafety Framework

The National Biosafety Framework (NBF) was produced in 2006 in response to the need for a framework focusing on the safe transfer, handling and use of modern biotechnology products. It derives legal basis from existing policies, laws, regulations and administrative measures. The purpose is to safeguard the health of the citizens and protect the biodiversity and natural environment of the country from the adverse impacts of modern biotechnology and at the same time acquire benefits from the safe use of modern biotechnology and its products as one of the means to achieve food security, improve human health, and promote industrial development. The framework outlines the guiding principles, institutional mandates, monitoring, inspection and enforcement mechanisms, and public education and participation measures for biosafety.

Biosafety Rules and Regulations 2006 feature as an annexure of the NBF. The rules and regulations stipulate necessary procedures and requirements for the assessment, management and control of potential risks associated with genetically modified organisms (GMOs) and GMO products, and activities associated with them, in order to enable the country to benefit from modern biotechnology and at the same time to protect the biodiversity and people of Bhutan from their potential adverse effects.

3.3.11 National Environmental Protection Act 2007

The National Environmental Protection Act 2007 has been enacted as an umbrella legislation. The Act specifies the powers, functions and operational framework of the National Environmental Commission. The salient features of the Act include:

- Maintenance of environmental quality especially by way of development and enforcement of environmental standards and best environmental management practices to address pollution and environmental hazards;
- Review and monitoring of policies, plans and programmes for protection of forests, biodiversity and ecosystem integrity in order to ensure that a minimum of 60 percent of the country's total land remains under forest cover;
- Right to environmental information and citizen participation in environmental management;
- Provision for establishment of an Environmental Tribunal as a quasi-judicial authority with the power to hear, investigate and pass decisions on environmental disputes.

3.3.12 Biosecurity Policy

The objectives of the Biosecurity Policy 2008 have been stated as: food safety for Bhutanese people; protection of human health from zoonotic and pest-borne diseases; sustainable use of natural resources; protection of agricultural production systems from pests and diseases; preservation of biodiversity and natural environment; and facilitation of safe and sustainable trade and tourism. It provides for the creation of a National Biosecurity Commission to oversee the country's biosecurity system and describes the national and international legislative contexts within which the biosecurity system is to be implemented.

3.3.13 Other Relevant Laws and Regulations

Plant Quarantine Act 1993

The provisions of the Plant Quarantine Act 1993 relate to: (a) prevention of the introduction of pests not already present or widespread in the country; (b) control of pests already in the country by restricting their spread and endeavouring to eradicate; (c) facilities for services for import and export of plants and plant products; and (d) cooperation in the prevention or movement of pests in international trade and traffic.

Mines and Mineral Management Act 1995

The Act recognizes the preservation, protection and setting of environmental standards and conservation of natural resources consistent with the provision of the Act and other environmental legislation as a critical feature of mining practices. It requires that restoration of areas that are mined is carried out in a proper manner with the objective of creating a suitable and acceptable environment as approved by the National Environment Commission. Prior to granting a mining lease, a final mine feasibility study based on an assessment of technical, financial, environmental and social parameters, is required. Among other things, the feasibility study needs to contain a Mine Plan, Environment Management Plan and Restoration Plan.

Mines and Mineral Management Regulations 2002

In exercise of the powers conferred by Article 50 of the Mines and Mineral Management Act 1995, the Ministry of Trade and Industry promulgated the Mines and Mineral Management Regulations 2002. The Regulations stipulate the requirement of environmental clearance (Articles 32-34), conditions for environmental restoration bond (Articles 56-61), maintenance of records on mining operation including environmental protection measures (Article 86 clause 86.8), compliance with all emission limits and ambient air quality standards adopted by the National Environment Commission (Article 154 and 155), water, dust and noise pollution management needs (Articles 159-170), monitoring of environmental quality in and around the mine lease area and reporting of the area's environmental state (Articles 182-184).

Seeds Act of Bhutan 2000

The Seeds Act of Bhutan 2000 was enacted with the purpose of regulating the import and export of agriculture seeds, preventing introduction of unwanted plants and diseases and promoting seed industry with the aim to enhance rural income and livelihood. In accordance with the Act, a National Seed Board has been established to advise the MoA on all matters related to development of national seed programme and to administer the Act. Specifically, the Act provides for regulation of quality of seeds, sale of seeds, certification of seeds, laboratory testing of seeds, and inspection of seeds.

DYT and GYT Chathrims 2002

The *Dzongkhag Yargye Tshogdu* (DYT) and *Gewog Yargye Tshogchung* (GYT) *Chathrims* were enacted with the main aim to support the decentralization policy and empower DYTs and GYTs with the authority and responsibility to decide, plan and implement development programmes and activities, including those concerning biodiversity conservation, at the local community level.

The DYT *Chathrim* 2002 gives the DYT the following powers and functions for biodiversity conservation:

- Make recommendations on activities with major environmental impacts such as construction of roads, extraction and conservation of forests, mining and quarrying (Article 8, Section 13);
- adopt and enforce regulations for designation and protection of areas of special scenic beauty or biodiversity as *dzongkhag* parks and sanctuaries (Article 9, Section 2);
- adopt and enforce regulations for establishment of quarries and mines in accordance with Mines and Mineral Management Act 1995;
- give direction and approval on forest management plan including extraction, conservation and forest road construction in accordance with the FNCA (Article 10, Section 8);

- give direction and approval on protection of forests, *tsamdro* and all types of government and community lands from illegal house and similar construction and other encroachments (Article 10, Section 19)

The GYT *Chathrim* 2002 gives the GYT the power and function to adopt and enforce regulations at the gewog level to protect and harvest edible forest products in the local area in accordance with the Forest and Nature Conservation Act 1995 (Article 8, Section 8), to conserve and protect water resources, lakes, springs, streams, and rivers (Article 9, Section 7), and to protect communal lands, community forests, including *sokshing* and *tsamdro*, medicinal herbs against encroachments on land and forests (Article 9, Section 8).

Land Act of Bhutan 2007

The Land Act of Bhutan 2007 came into force on 1st January, 2008, superseding the Land Act 1979[53]. The new legislation provides for the establishment of a National Land Commission as an independent authority and highest decision-making body in matters related to the implementation of the provisions of the Land Act of Bhutan 2007 through policy and regulatory work, inter-agency coordination, cadastral survey and land registration, and management of national land records among other things. It spells out rights, responsibilities and legal conditions for the management, regulation and administration of the ownership and use of land. In relation to environmental management, the Act provides for grazing management and pasture development on *tsamdro*[54] based on a *tsamdro* management plan and for vegetative and land improvement on *sokshing*[55] based on a *sokshing* management plan.

Land Rules and Regulations for the Kingdom of Bhutan 2007

To support the implementation of the Land Act of Bhutan 2007, the National Land Commission has formulated Land Rules and Regulations for the Kingdom of Bhutan 2007. The rules and regulations define in detail the institutional functions, procedural requirements and regulatory provisions for management of national land records, land ownership entitlements and land rights, land registration, land conveyance, land acquisition and compensation, land grants, allotment of government land, cadastral survey, documentation and mapping, land conversion, land lease, easement, and annulment of land.

3.4 Institutional Arrangement

Biodiversity conservation as a national programme started in 1952 with the creation of the DoF. Until the early 1990s, the country's biodiversity conservation programme was by and large limited to forest and wildlife conservation by the DoF. Over the years, the scope and institutional framework for biodiversity conservation have expanded and there is increasing recognition of the need to pursue biodiversity conservation on wider

53 Excepting provisions pertaining to water channel and embankments, and compensation on crop damage by cattle.
54 *Tsamdro* means Government Reserved Forest land leased out for grazing and improved pasture management.
55 *Sokshing* means a plot of Government Reserved Forest land leased out for leaf litter production and collection.

partnerships between different agencies, both within and outside the government. Today, a number of organizations share the responsibility of implementing activities related to biodiversity conservation in Bhutan.

3.4.1 Central Government Agencies

Ministry of Agriculture

The MoA was formed in 1985, bringing together the agriculture, livestock development and forestry sub-sectors, which are now collectively known as the RNR sector. Until then, the forestry sub-sector was under the then Ministry of Trade, Industries and Forests while the agriculture and livestock development sub-sectors were under the then Ministry of Development. Besides the three technical departments of agriculture, livestock and forests, the MoA has a number of non-departmental agencies namely the NBC, Agriculture Marketing Services, Information and Communication Services, and Bhutan Agriculture and Food Regulatory Authority (BAFRA). The Ministry is directly supported by a Planning and Policy Division and an Administration and Finance Division. It has also instituted CoRRB to guide and coordinate the research programmes and activities implemented by the regional RNR-RCs.

The key functions of the MoA are to: develop agriculture, livestock and forests for the benefit of the Bhutanese through continuous research and development process; raise the living standard of rural people through promotion of agro-based income generating activities, reduction of farming drudgery, improvement of nutrition and health, and access to services, market and information; protect the natural environment through sustainable and judicious use and management of its land, water, forest and biological resources; and ensure food safety through preventive and mitigation measures.

Department of Forests

Established in 1952, the DoF is the oldest government department. It is the overall authority for the management of forest resources and wild biodiversity. Within the DoF, the NCD has the direct responsibility for in situ conservation of wild biodiversity through creation and management of protected areas, buffer zones and biological corridors. For field operations, the NCD has established park management offices in all operational protected areas, which currently include Bumdeling Wildlife Sanctuary, Jigme Dorji National Park, Jigme Singye Wangchuck National Park, Royal Manas National Park, Phipsoo Wildlife Sanctuary, Sakten Wildlife Sanctuary and Thrumshingla National Park. Outside the protected areas, the DoF has a countrywide network of 12 territorial forestry divisions for implementation of field programmes and activities related to protection and management of forests and wildlife resources (see Table 12).

Table 12: Territorial Forest Divisions and their Coverage of Dzongkhags

Territorial Forest Division	Dzongkhags Covered
Bumthang Forest Division	Bumthang
Gedu Forest Division	Chhukha
Mongar Forest Division	Mongar and Lhuentse
Paro Forest Division	Paro and Haa
Samdrup Jongkhar Forest Division	Samdrup Jongkhar and Pemagatshel
Samtse Forest Division	Samtse
Sarpang Forest Division	Sarpang
Thimphu Forest Division	Thimphu
Trashigang Forest Division	Trashigang and Trashi Yangtse
Tsirang Forest Division	Tsirang and Dagana
Wangduephodrang Forest Division	Wangduephodrang and Punakha
Zhemgang Forest Division	Trongsa and Zhemgang

Source: DoF, 2007

At the central level, besides NCD, the DoF consists of Forest Protection and Utilization Division (FPUD), FRDD, Social Forestry Division (SFD), and Royal Botanical and Recreational Parks Division (RBRPD). The FPUD is mainly responsible for matters related to forest land allotment/ swapping, leasing, clearance and encroachment, coordination of forest demarcation and coordination and monitoring of supply of forest produce. The FRDD identifies FMUs, carries out forest inventories in the FMUs, prepares forest management plans for the FMUs, and provides technical backstopping for implementation and monitoring of the forest management plans. The SFD provides guidance and coordination for social forestry and extension programmes, specifically community forestry, and also monitors reforestation activities in the field. Additionally, it is responsible for monitoring the occurrence of forest fires and coordinating public awareness and extension programmes for forest fire management. The RBRPD was created in 2008 to coordinate and support management of natural areas for public recreation and education to enhance public appreciation and love for the natural environment.

Department of Agriculture

The DoA, which is made up of Agriculture Division, Horticulture Division and Engineering Division, deals with the development, management and distribution of services and inputs, including infrastructure and machinery, for agriculture. Through coordination and guidance to the *dzongkhag* agriculture staff, the Divisions of Agriculture and Horticulture support the implementation of field programmes for agricultural production including extension, marketing and processing. The Engineering Division provides engineering services for construction and maintenance of farm infrastructure such as farm road and irrigation channels and assists the *dzongkhag* agricultural staff in technical and economic feasibility assessments of farm roads and irrigation channels. With the mandate to oversee, coordinate and provide technical guidance to agricultural production activities, the DoA has the responsibility for ensuring sound management of agricultural lands. Also, under

DoA is the National Plant Protection Centre which functions as a coordinating and advisory agency for activities to prevent and control plant diseases. These include coordination and oversight of pesticide distribution and use, and promotion of integrated pest management practices.

Department of Livestock

The DoL is responsible for coordination, administration and management of services related to livestock production, livestock input supply and livestock health. Livestock production programme includes livestock breeding, feed and fodder development, and livestock products processing at the national as well as *dzongkhag* level. Livestock input supply programme basically consists of establishment and maintenance of national and regional breeding farms and centers, and livestock health programme concerns with delivery of animal health and care services through various veterinary centers and hospitals. DoL's activities pertaining to improvement of breeds, animal health and care, and feed and fodder development have environmental benefits in terms of reducing livestock population and overgrazing of natural areas.

National Biodiversity Centre

The NBC is relatively a young institution, established only in 1998. It serves as the national focal institute for biodiversity conservation and its responsibilities include:

- coordinating biodiversity related activities, including facilitating the implementation of the Biodiversity Action Plan for Bhutan in conjunction with relevant agencies;
- facilitating national decision-making on biodiversity concerns cutting across sectors, divisions and institutions, including ensuring a participatory approach to national consensus building on complex issues related to biodiversity;
- enhancing a national balance between conservation and sustainable use of biological resources in general and between *in situ* and *ex situ* conservation in particular;
- facilitating Bhutan's participation in relevant sub-regional, regional and international cooperation.

To provide policy level guidance and oversight to the NBC, a National Biodiversity Management Board made up of representatives from various agencies of the MoA and from the Ministries of Health, Education, and Trade and Industry, and the National Environment Commission (NEC) has been established. The Board is chaired by the Honorable Minister of Agriculture.

The National Biodiversity Centre is made up of Agro-biodiversity conservation and utilization section, Biodiversity information and Botanical collection section, and Bio-Exploration and Research section.

Council for RNR Research of Bhutan

The CoRRB coordinates RNR research at the national level and ensures an integrated approach to RNR research programming and technology generation. It provides guidance and management of the research programmes and activities carried out by the regional RNR-RCs located at Yusipang (Thimphu), Bajo (Wangdue Phodrang), Jakar (Bumthang) and Wengkhar (Mongar). The research programmes focus on forestry, field crops, livestock development, horticulture, plant protection, soil and soil fertility, water management, and farming systems.

Bhutan Agriculture and Food Regulatory Authority

The BAFRA functions through two divisions, namely Quality Control and Quarantine Division and Analytical and Certification Division. The BAFRA acts as the National Food Inspectorate, regulates the quality of agricultural, livestock and forestry products as per the Food Safety Standards, monitors the movement of plants and animals to prevent or control diseases pertaining to food and agricultural crops and livestock, implements the Acts and bylaws of the RNR sector such as the Plant Quarantine Act and Seeds Act in conjunction with other relevant agencies, and maintains and disseminates information on communicable diseases and non-traditional pests. It has offices at all entry points (Phuentsholing, Paro Airport, Gelegphu, Samdrup Jongkhar and Samtse), regional level (Thimphu, Paro, Wangduephodrang and Bumthang), and in all *dzongkhags*. In addition, it has a city service office at Thimphu and a National Quality Control Laboratory at Yusipang, Thimphu.

National Environment Commission

The NEC was first established in 1989 by Royal Decree as a National Environment Committee under the Planning Commission. Subsequently, in 1992, the NEC was delinked from the Planning Commission to serve as a more vigorous, autonomous government body. It was reconstituted in 1998 and serves as a high level body with inter-ministerial representation for policy decisions and guidance on matters related to environmentally sustainable development and institution of measures to integrate environmental management in overall development process.

The NEC Secretariat (NECS) is organized into Environmental Assessment Division, Monitoring, Information, Communication and Outreach Division, and Policy and Planning Division. The Environmental Assessment Division is responsible for implementation of the Environmental Assessment Act 2000 and supporting regulations, development of capacity of line agencies and *dzongkhag* environmental committees for environmental assessment and monitoring, and development of sectoral guidelines for environmental assessment. The Monitoring, Information, Communication and Outreach Division is responsible for research, monitoring, statistics, information, communication and public outreach. The Policy and Planning Division deals with matters related to environmental policy and programme coordination. At the present, the NECS is the national focal agency for the CBD and UNFCCC. A National Ozone Unit has also been set up within the NECS to carry out the obligations related to the Montreal Protocol on Substances that Deplete the Ozone

Layer and to oversee and ensure the implementation of the recently-adopted Rules and Regulation on Control of Ozone Depleting Substances. There is also a legal unit within NECS to develop, revise and amend environmental laws and regulations, provide inputs to line ministries in the development of environmental laws and regulations, provide guidance and support to other divisions in matters related to environmental legislation, and prepare necessary documents to facilitate ratification of international environmental treaties and conventions.

Other Government Agencies

There are a number of government agencies outside the MoA and NEC whose programmes and activities contribute to biodiversity conservation. In keeping with the requirements of the Environmental Assessment Act 2000 and the Regulation for the Environmental Clearance of Projects and given the very high potential of the industrial sector to impact the environment especially in terms of pollution, the **Ministry of Economic Affairs** (MoEA) has established an Environmental Unit. The Unit's mission is to protect the quality of the country's air, land and water resources while fostering economic development, healthy and safe industries and mines, and increased environmental awareness in the industrial sector. Its responsibilities pertain to control and abatement of pollution from industrial, trade and mining activities, facilitation of environmental assessment and clearance of industrial, trade and mining projects, and environmental monitoring and inspections in close co-operation with the different agencies within the MoEA and the NECS.

The **Department of Geology and Mines**, under MoEA, has the mandate to implement the Mines and Mineral Management Act 1995 and Mines and Mineral Management Regulations 2002, both of which encompass substantive environmental management provisions especially in terms of planning environmental impact mitigation measures and rehabilitation of mined areas.

The **Institute of Traditional Medicine Services**, under the Ministry of Health, is involved in the promotion of domestic propagation of medicinal plants which are threatened in the wild and in research on indigenous knowledge about biodiversity for use in traditional medicine. The ITMS uses 230 plant species, 20 types of minerals, and 16 types of animal parts and products to produce traditional Bhutanese medicines.

The **National Land Commission** (NLC) is a recently formed autonomous government body with the mandate to ensure the implementation of the Land Act of Bhutan 2007 primarily through policy and regulatory work, inter-agency coordination, cadastral survey and land registration, and management of national land records. The membership of the commission is made up of the *Gyalpoi Zimpon*[56], the Secretaries of the Ministries of Agriculture, Works and Human Settlement, Finance, Economic Affairs, and Home and Cultural Affairs, and a representative each from the agency responsible for international boundary, private sector, NEC, *Thromde Tshogdu*[57], and the Surveyor General of the NLC Secretariat as the member secretary. The NLC is supported by a Secretariat, which is responsible for implementation of the policies, programmes, regulations and guidelines issued by the NLC and for day-to-

56 Royal Chamberlain
57 Municipal Committee

day administration of the provisions of the Land Act of Bhutan 2007 and supporting rules and regulations. The NLC Secretariat is largely made up of managerial and technical staff of the erstwhile Department of Survey and Land Records.

The **Drug Regulatory Authority**, under the Ministry of Health, was established in 2004 with the main objective to protect public health by ensuring safety, quality and efficacy of the medicinal products (including those derived from biodiversity) primarily by means of pre-marketing control, proactive post-marketing vigilance and continuous quality monitoring system. The DRA also has the responsibility to ensure safe disposal of expired medicines so as to prevent harmful effects on the environment.

The **Department of Disaster Management** (DDM), under the Ministry of Home & Cultural Affairs, was first created as a Division and subsequently upgraded to a Department in 2008. DDM's key responsibilities include: coordination of disaster risk management at the national and local levels with relevant agencies; building awareness on disaster risks and their mitigation/ prevention at all levels; capacity development of disaster management authorities at all levels; support to affected communities, especially the poor, through grant of relief after a disaster; support to the local administrations in preparation of their disaster management plans; development of various guidelines and legislative framework related to disaster management; and facilitation of exchange of information, experience and expertise in the area of disaster management.

3.4.2 Dzongkhag and Local Community Institutions

Dzongkhag Level Institutions

The ***Dzongkhag* Administrations** are the executing agency of development programmes and activities at the *dzongkhag* level. Headed by the *Dzongdag*, they are made up of agriculture sector, livestock sector and forestry sector in addition to other government sectors such as health, education and engineering. *Dzongkhag* policies, plans and programmes are reviewed, approved and guided by the DYT. The DYT is made up of: a chairperson, who is elected from among the voting members; *gups* as ex-officio voting members; *mangmis* as ex-officio voting members; a representative of municipalities/ towns as a voting member; *dzongrab*, or in his/ her absence *dzongkhag* administrative officer); as ex-officio non-voting member secretary; *dungpas*, in *dzongkhags* with such posts, as observers; representatives of various sectoral agencies as observers; and other representatives of municipalities/ towns as observers[58].

Since 2004, *Dzongkhag* Administrations and NECS have formed ***Dzongkhag* Environmental Committees** (DECs) with the responsibility to ensure integration of environmental concerns in *dzongkhag* plans and to implement environmental assessment and clearance procedures for *dzongkhag* and *gewog* level projects and activities that are small-scale and unlikely to have any major adverse environmental impacts. The formation of DECs is in line with the RGoB's decentralization policy and the requirement of the Environmental Assessment Act 2000. It is also intended to cut down the bureaucracy and time involved in the environmental assessment and clearance of smaller projects and activities. DECs are in

58 The functioning and structure of DYTs and GYTs would undergo some changes with the enactment of the Local Governance Act, which is under preparation.

place in all the *dzongkhags* and they are usually made up of the *dzongdag* and *dzongkhag* sectoral heads especially those belonging to forestry, agriculture, livestock development and engineering fields. *Dzongkhag* Environmental Officers have been placed in all the dzongkhags to manage the activities of DECs and to assist the *Dzongkhag* Administration in matters related to environmental management and environmental clearance.

Gewog Level Institutions

Responsibilities for *gewog*-level planning, management and implementation of development programmes and activities lie with the GYT, which is chaired by the *gup*. Other members include the *mangmi* and *tshogpas*. *Gaydrung* (gewog clerk) and representatives of various sectoral agencies at the *gewog* level sit in the GYT as observers. Recently, the RGoB has appointed a *gewog* administrative officer to facilitate the implementation of government plans and programmes at the gewog level.

In relation to RNR activities, the GYT is aided by the ***Gewog* RNR Centre**, which is in place in most gewogs. The *Gewog* RNR Centre has extension agents for agriculture, livestock development and forestry. The programmes and activities of the Gewog RNR Centre are supervised and monitored by the respective sectors in the *Dzongkhag* Administrations.

3.4.3 Independent/ Non-Governmental Organizations

Royal Society for the Protection of Nature

Non-governmental organizations (NGOs) are few in Bhutan and the RSPN is the only one specifically dedicated to nature conservation. RSPN was founded in 1987 and legally incorporated as a non-profit NGO in 1997. The mission of the organization is to "inspire personal responsibility and actively involve the people of Bhutan in the conservation of the Kingdom's environment through education, applied research and information dissemination, and collaboration with concerned agencies and indigenous institutions". The forte of the RSPN is environmental education and this is very well reflected in the vast network of school nature clubs that they have created and sustained across the country. The RSPN is also actively involved in activities to protect the black-necked crane *Grus nigricollis* and, of late, white-bellied heron *Ardea insignis*. It is currently entrusted by the MoA with the responsibility to plan and implement conservation management activities in Phobjikha, Kangpara, Ada, Kamechhu, and Haa/Samtse/Chukha tri-junction conservation areas on a full-fledged basis.

Târâyana Foundation

Formally launched in 2003, Târâyana Foundation is an NGO which is working towards the socio-economic upliftment of vulnerable and disadvantaged individuals and communities, thus complementing government efforts to alleviate poverty. Although the Foundation's direct involvement in biodiversity conservation is currently limited, there is considerable potential in the future for it to develop and support activities that link conservation and sustainable use of biodiversity with poverty reduction goals. At the present, it is involved

in a project to help the local communities of Kheng Silambi to regenerate bamboo and cane species for use in production of artisan crafts.

Bhutan Trust Fund for Environmental Conservation

The BTF was created in 1992 and legally incorporated under the Royal Charter in 1996 as an independent grant making organization to sustain environmental conservation in the country. Under the guidance of a high-level management board, the BTF use its annual income generated by its US$ 40 million-endowment to support a wide range of environmental projects.

3.4.4 Corporations

Natural Resources Development Corporation Limited

The Forestry Development Corporation Limited, recently reconstituted as Natural Resources Development Corporation Limited (NRDCL), is a quasi-autonomous corporate entity. Its main responsibility is to carry out sustainable harvesting operations in the FMUs according to approved forest management plans and to cater to the market demands for timber and timber products. With its reconstitution, it has also the mandate to cater to the market demands for other natural resources such as sand and stone in a sustainable manner.

Druk Seed Corporation

The Druk Seed Corporation is a quasi-autonomous corporation affiliated to the MoA. It is mandated to produce and supply seeds and seedlings for food production and horticultural purposes. It also procures and distributes fertilizers and butachlor, a herbicide widely used in paddy cultivation in Bhutan.

3.5 International Cooperation for Biodiversity Conservation

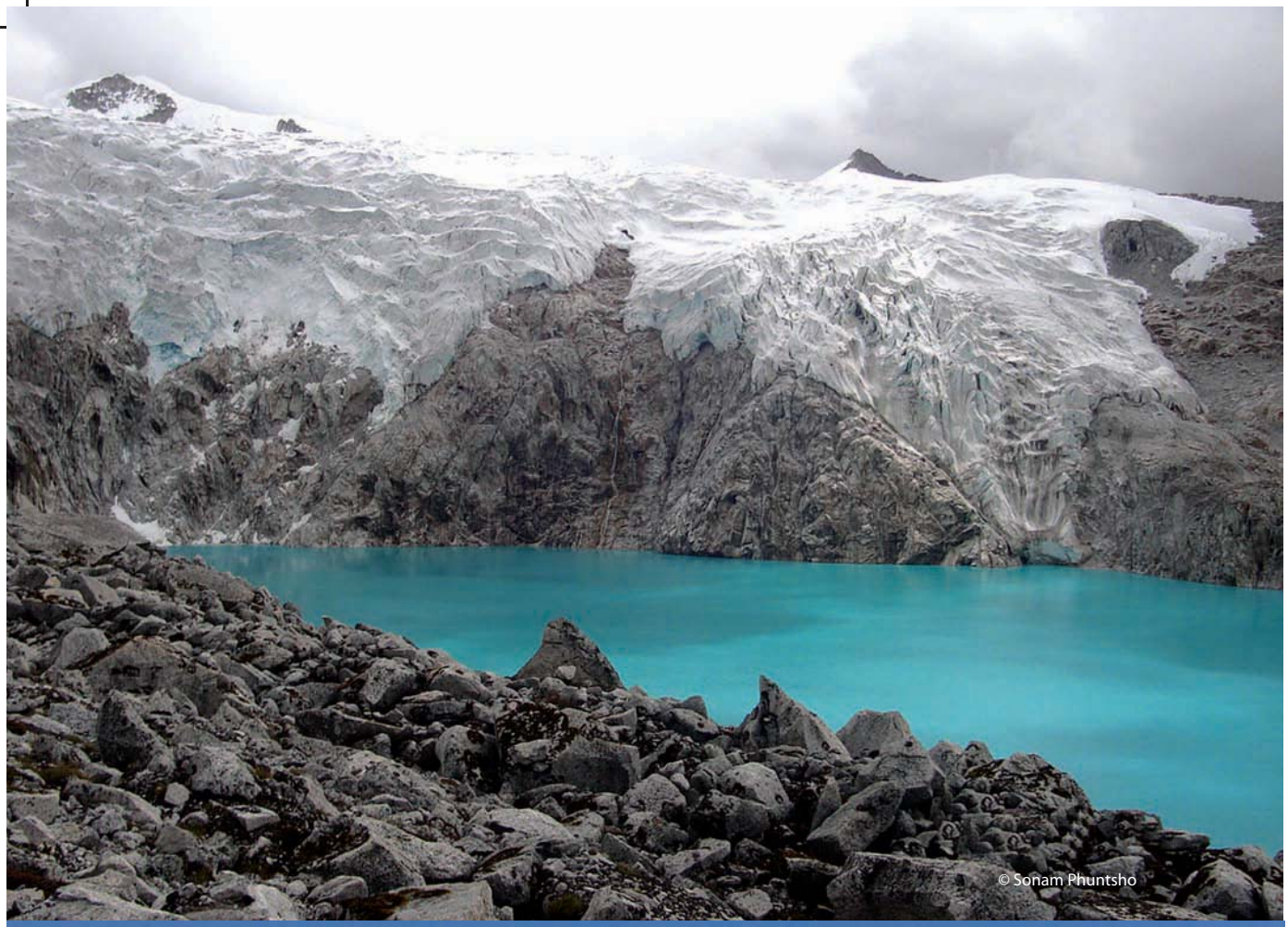
Bhutan's participation in the global conservation movement has increased since the UNCED at Rio de Janeiro in 1992. Recognizing the growing need to address biodiversity conservation and environmental concerns in general through global cooperation and actions and the relevance of international cooperation in addressing its conservation needs, the country has become a party to several international treaties and agreements related to biodiversity. The various international biodiversity conservation and related treaties and agreements to which Bhutan is party are listed in Table 13.

Table 13: International Biodiversity and Related Treaties Ratified/ Acceded to by Bhutan

Treaties/ Agreements	Date/Year of Ratification/ Accession
Biodiversity-specific Treaties/ Agreements	
UN Convention on Biological Diversity	August 1995
Convention on International Trade in Endangered Species of Wild Fauna and Flora	August 2002
Cartageña Protocol on Biosafety to the UN Convention on Biological Diversity	September 2002
Other Related Environmental Treaties/ Agreements	
UN Framework Convention on Climate Change, ratified in August 1995	August 1995
UNESCO World Heritage Convention	October 2001
Kyoto Protocol to the UN Framework Convention on Climate Change	August 2002
International Plant Protection Convention	June 1994
UN Convention on the Law of Sea	December 1982
Statute of the Centre for Science and Technology of the Movement of Non-Aligned Countries and other Developing Countries	February 1985
UN Convention to Combat Desertification	August 2003
Vienna Convention for Protection of Ozone Layer	April 2004
Montreal Protocol on Substances that Deplete Ozone Layer	April 2004

In adherence to the CBD, Bhutan produced its first Biodiversity Action Plan in 1998 and an updated version in 2002. At the World Summit on Sustainable Development 2002 held in Johannesburg, the country presented the National Assessment of Agenda 21, aptly titled *Bhutan: The Road from Rio*, giving a succinct yet comprehensive account of the country's path and progress in the implementation of Agenda 21 outlined at UNCED 1992. In addition, National Biosafety Framework has been produced under the framework of Cartegana Protocol on Biosafety.

Apart from the international treaties/ agreements listed in Table 13, Bhutan has entered into a multi-lateral partnership with Benin, Costa Rica and the Netherlands. This partnership is called the Sustainable Development Agreement and is built on the central idea that sustainable development is a two-way exchange between donors and recipients of environmental aid. Then there is the South Asian Association for Regional Cooperation, involving Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, within which five Ministerial Meetings on Environment have been so far held – the last one having been hosted by Bhutan.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Chapter 4

CURRENT TRENDS AFFECTING BIODIVERSITY

The country has done extremely well to enter the 21st century with much of its natural environment in a pristine state. This has been possible largely due to strong political commitment and far-sighted leadership, traditional values and way of life that revere nature, belated modern development, and relatively small population size. However, conservation and sustainable use of biodiversity are becoming increasingly challenging as the country opens up to meet new development needs of a growing and modernizing population. Localized deforestation, overgrazing, forest fires, and conversion of natural habitats to accommodate urbanization and infrastructure development are the key challenges that the Bhutanese face today in the area of biodiversity conservation. At the same time, new environmental trends are emerging in the form of pollution, waste and climate change.

4.1 Direct Causes

4.1.1 Forest Harvesting

Traditional Bhutanese house construction is timber-intensive. In the rural areas, almost all housing structures – floor, roof, staircase, windows and doors, and beams and pillars – are made of wood. With dilapidation of old houses, population growth and fragmentation of families, construction of new houses and renovation of old houses become necessary. Use of fuelwood is even higher with fuelwood being the main source of energy in the rural areas. Although collection of dry fuelwood in the form of fallen twigs and driftwood is common, bulk of the fuelwood needs is met from natural forests. According to the Department of Energy, in 2005, fuelwood alone accounted for 57.7 percent of the total primary energy supply[59].

In order to cater to the demands for timber and fuelwood of the Bhutanese population, logging operations are carried out based on forest management plans and working schemes. The Forest Resources Potential Assessment 2004 (FRPA 2004) has forecasted a fairly balanced scenario of estimated demand-potential production of timber and fuelwood for the country as a whole from 2005 to 2014. However, major problem will be the spatial distribution of wood production and demand in the country. FRPA 2004 suggests that *dzongkhags* in the eastern region and with high population density are likely to face wood deficits. Thimphu, Trashigang, Mongar, Trashi Yangste, Pemagatshel, and Samdrup Jongkhar *dzongkhags* are likely to be most affected by wood deficits. Therefore, there is concern that in the wood-deficit *dzongkhags* wood demand may be met from ad hoc sources. Extraction of wood from such sources could lead to unsustainable extraction of wood causing forest degradation and biodiversity loss.

59 DoE, 2007.

A villager stacking fuelwood. The per capita fuelwood consumption in Bhutan is reportedly one of the highest in the World.

Localized deforestation is visible in certain parts of the country, where population densities are high and forest use is intense such as in a number of villages in the eastern and southern parts of the country. Moreover, selective harvesting of certain preferred species such as *Quercus* spp for fuelwood is highly likely to have caused attrition of species.

The FRDD has developed planning guidelines for management of forest areas outside the FMU system so that these areas can be used for extraction of forest resources based on simple but sound silvicultural principles and practices. A major challenge will be the implementation of these guidelines, including compliance monitoring. This will require development of the capacity of the territorial forestry divisions to effectively implement the guidelines.

Apart from timber and fuelwood, there is a long list of non-wood forest products that the rural Bhutanese use. These include medicinal and aromatic plants, forest foods such as mushrooms, ferns and wild greens, bamboo and cane for local handicrafts, plant barks and pulps for traditional paper-making, wood for agricultural and household implements, animal fodder, and leaf litter for farmyard manure. To give an idea of the magnitude of the importance of biodiversity resources in Bhutanese life, here are some facts and figures: more than 300 species of plants are said to be used in traditional Bhutanese medicines; almost all of Bhutanese farming is based on use of farmyard manure where forest leaf litter is an indispensable component; and a partial ethnobotanical inventory of Jigme Singye Wangchuck National Park recorded more than 20 species of forest plants that the local people consume for food.

There are several examples from across the country of biodiversity resources becoming scarce due to unsustainable harvesting. For instance, in Bumdeling *gewog*, excessive collection and unsound harvesting techniques have depleted Daphne plants to the extent that several families traditionally involved in paper-making had to give up the activity[60]. Similarly, bamboo and cane in the Monpa area of Jigme Singye Wangchuck National Park, which were once abundantly available in the immediate vicinity of the villages, now have to be collected from three to four hours of walking distance[61].

4.1.2 Livestock Grazing

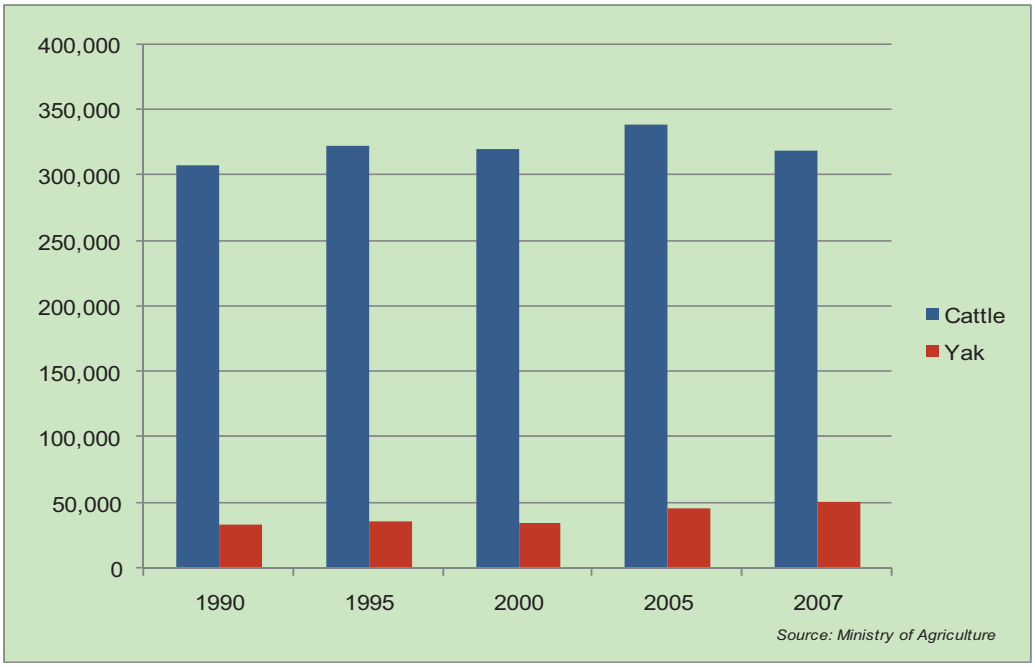
Livestock rearing is an important economic activity among the rural communities. Cattle are owned by almost all of the rural households in the country and it dominates the temperate and subtropical regions of the country. In the alpine and sub-alpine regions of the country, such as Laya and Lingshi, yaks are the dominant animals, and the economy is solely based on yak products. Yaks are reared for dairy products, meat and transportation of goods. In 2007, there were 319,308 cattle and 51,500 yaks in the country[62]. While the cattle population has increased marginally by about 3.6 percent since 1990, the yak population has increased by a significant 55.9 percent during the same period.

Cattle and yak population density based on total land area is 10 animals per km^2. However, effective density of cattle and yak population based on total area of pasture land is much higher. The Facts and Figures of RNR Sector 2003 show that there is 1,737 km^2 of pasture land in the country. This translates to 213 animals (cattle and yak) per km^2 of pasture land.

It is important to recognize that livestock rearing is integral to rural livelihood and has evolved as a part of the rural culture in the country, and that grazing at low or moderate level can have certain positive impacts on biodiversity. For instance, in Phobjikha, grazing of bamboo scrubs by yaks in the summer is known to check the overgrowth of bamboo and, in the process, enable black-necked cranes to roost in these scrubs during winter. Grazing becomes an environmental problem when it is excessive and lacks proper management.

60 Norbu UP, 2003
61 Norbu UP, 2002
62 Livestock Population Statistics 2008, Ministry of Agriculture

Figure 5: Cattle and Yak Population 1990-2007



Source: Forest Resources Development Division, Department of Forestry, 2004

Where livestock densities are high, overgrazing readily occurs and consequent impacts on pasture and forest may lead to decline in land productivity and exacerbation of soil erosion. Overgrazing of pastures and forests, mainly in broadleaf forests, may lead to attrition or loss of species, reduction of land productivity and soil erosion. Forest regeneration is also hampered and change in vegetation is induced where grazing is rampant. Not only does overgrazing affect forest regeneration and land productivity, it also affects the availability of forage to wild ungulates. This can lead to two major consequences, both relating to crop and livestock depredation by wildlife. One, wild ungulates would increasingly raid field crops when forage in the forest becomes scarce. Two, insufficient forage in the forest would weaken the natural prey base and, consequently, predator species would turn to lifting livestock.

4.1.3 Forest Fires

Forest and Nature Conservation Act 1995 prohibits the setting of forest fire and imposes fines and penalties including imprisonment. In spite of such stringent legislation and regular public awareness programmes, forest fires are a recurrent and widespread phenomenon. The DoF has recorded 526 incidents of forest fire, affecting nearly 70,000 hectares of forest, between 1999/2000 and 2007/08. Figure 6 illustrates a down-ward trend in both the number of forest fire incidents and area burnt from 1999-2000 until 2003/04 before rising again from 2004/05. Forest fire occurrence was particularly drastic in 2006/07

Forest fires are a recurrent and widespread phenomenon in Bhutan. The Department of Forests has recorded 526 incidents of forest fire, affecting nearly 70,000 hectares of forest land in the past ten years.

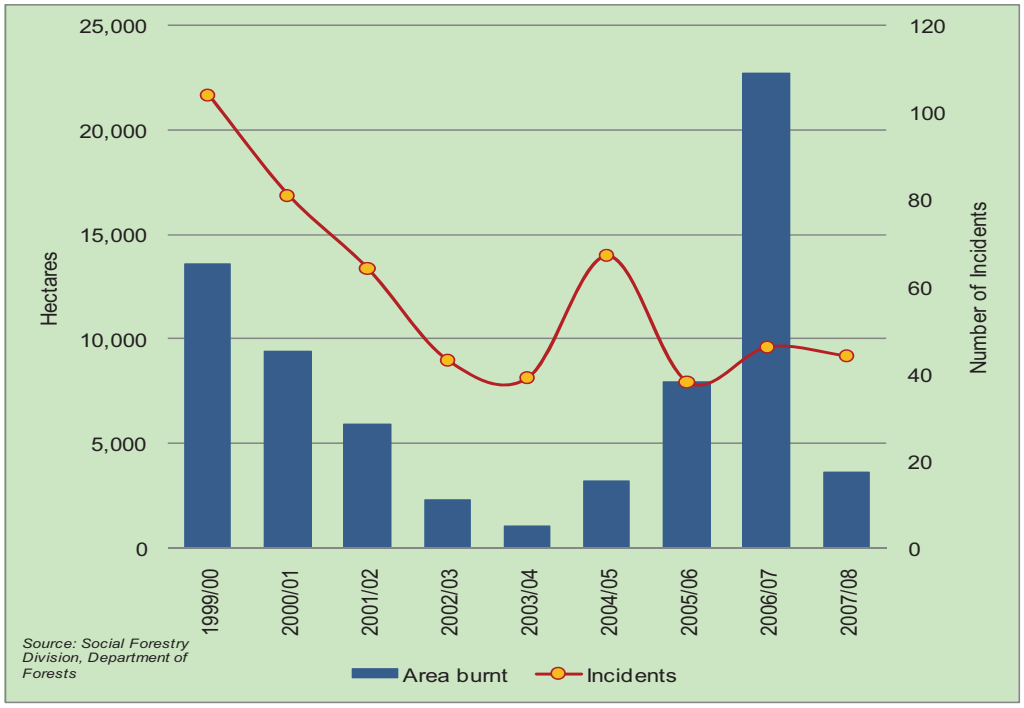
(see Figure 6). One particular fire incident that occurred in Athang, Wangduephodrang *dzongkhag*, in May 2007 razed more than 15,000 hectares of forest and killed a number of wildlife including a few of the critically endangered white-bellied herons[63].

Depending on the local site conditions, the negative impact of forest fires may be immediate or on a long term[64]. In steep areas the negative impact may be immediate, especially if heavy rains follow a forest fire. The rainwater washes away topsoil and ash, depriving the exposed area of nutrients to support natural regeneration. When such a process recurs several times, a succession process is triggered whereby the site may completely degenerate into a barren area. However, some species such as Chir pine *Pinus roxburghii* can tolerate a few forest fires. Nevertheless, recurrent forest fires year after year 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 are most widespread and recurrent in the eastern region, which accounted for nearly two-third of the forest area burnt between 1999/00–2007/08. This can be largely attributed to the prevalence of dry weather conditions, forests with high fuel load, and fire-dependent economic activities such as grazing and lemon-grass oil production.

63 Forest fire records maintained by the Social Forestry Division and RSPN Annual Report on Heron Field Studies.

64 Forest fires are not always necessarily detrimental. In some natural areas, for instance in Manas and Kaziranga National Parks in India, controlled burning of ground vegetation is used as a habitat management tool. It is also believed that in chir pine forest, which is a fire-adapted ecosystem, moderate frequency of fires can have beneficial effects.

Figure 6: Forest Fire Occurrence, 1999/00-2007/08



4.1.4 Human-Wildlife Conflicts

Crop depredation by wildlife is common and widespread in the country. Every year, wild animals, especially wild pigs, deer, monkeys, bears and elephants plunder massive quantities of crops across the country, inflicting immense losses to the farmers. Crop damage by wild pigs is prevalent in almost all the *dzongkhags* of the country. The southern *dzongkhags* are beset by incursions of wild elephants on field crops and farm properties, including homes. Wild elephant incursions have increased in the recent years largely as a consequence of habitat fragmentation along the southern border areas.

In addition to direct loss of crops from wildlife incursions, farmers have to bear several indirect costs such as loss of time, added costs of production, expenditure on items such as torches and batteries, kerosene, used tins, and building of guard sheds, and disruption in family life. Although rare, there have also been cases of human injury or death due to wildlife attacks. It therefore comes as no surprise that farmers in ten *gewogs* across the country, where a wild boar crop damage survey was carried out in 1996, unanimously ranked the protection of their crops against wildlife incursions as the most arduous amongst all the farming adversities[65]. This fact is corroborated by RNR Statistics 2000, which ranks crop damage by wildlife as the most severe constraint faced by farm households.

65 Choden D and Namgay K, 1996

A farmer guarding crops from wildlife

A horse killed by a Royal Bengal Tiger

Crop and livestock depredation by wildlife is a major human-wildlife conflict issue which impacts the livelihood of the rural communities throughout the country.

Livestock depredation by predator species, especially tigers, leopards, wild dogs and black bear, is also prevalent albeit on a smaller scale and less uniformly than crop depredation. In Bumdeling Wildlife Sanctuary alone, local communities have reported to have incurred losses of 17 cattle, five yaks and one equine every year between 1997 and 1999. In another example, 30 percent of the households in Jigme Singye Wangchuck National Park have reported loss of livestock to predators.

Although stringent conservation laws and social tolerance to wildlife inculcated by religious sentiments have so far prevented human-wildlife conflict from going out of hand, retribution killing in the form of hunting, trapping and poisoning of predator species by frustrated farmers is not uncommon. It is highly probable that these farmers may resort to retaliatory killing if crop and livestock depredation by wildlife exacerbates or persists for long.

A very comprehensive National Human-Wildlife Conflicts Management Strategy is now in place. The implementation of this strategy is expected to considerably alleviate the socio-economic impacts of human-wildlife conflict and lessen consequent resentment of wildlife among rural communities.

4.1.5 Wildlife Poaching

The country has several species of wild animals and plants of great commercial value in the international market, especially for use in production of traditional oriental medicines. A porous international border both in the north and south, inadequate law enforcement personnel, and general lack of public awareness make controlling poaching a difficult job. Of late, study visits for DoF officials to various cross-border protected areas in India have been organized to facilitate sharing of field experiences, knowledge on protected management and ideas for cooperation between them and their Indian counterparts. It is expected that these study visits will progress into better coordination and systematic cooperation between the Bhutanese and Indian authorities to curb poaching and illegal wildlife trade in the border areas.

Wildlife poaching and trade occur covertly and are especially prevalent along the remote borders and within certain interior areas. The main species targeted for poaching are musk deer *Moschus chrysogaster* and Chinese caterpillar fungus *Cordyceps sinensis* because musk pods and Cordyceps, both highly valued for their medicinal properties, are easy to conceal and smuggle through the borders. Poaching is driven by the ready and lucrative market for wildlife parts and products for use in traditional oriental medicines. Illegal fishing also occurs but is largely done for subsistence and recreation.

The existing schedule of penalties related to poaching of wildlife is in general soft and not deterring enough, especially considering the high commercial value of wildlife parts and products in the international market. The totally protected species list of the Forest and Nature Conservation Act 1995 has also been found to be lacking sound rationale. Some of the species that are not threatened, e.g. spotted deer, and snow down lily, have been listed whereas some that are known to be highly endangered, e.g. capped langur, hispid hare and white-bellied heron, are missing from the list. Clearly, there is a need to rationalize the existing schedule of penalties as well as the totally protected species list based on a comprehensive set of national, regional and international criteria, including the status of the species on the IUCN Red List of Threatened Species and the CITES Appendices.

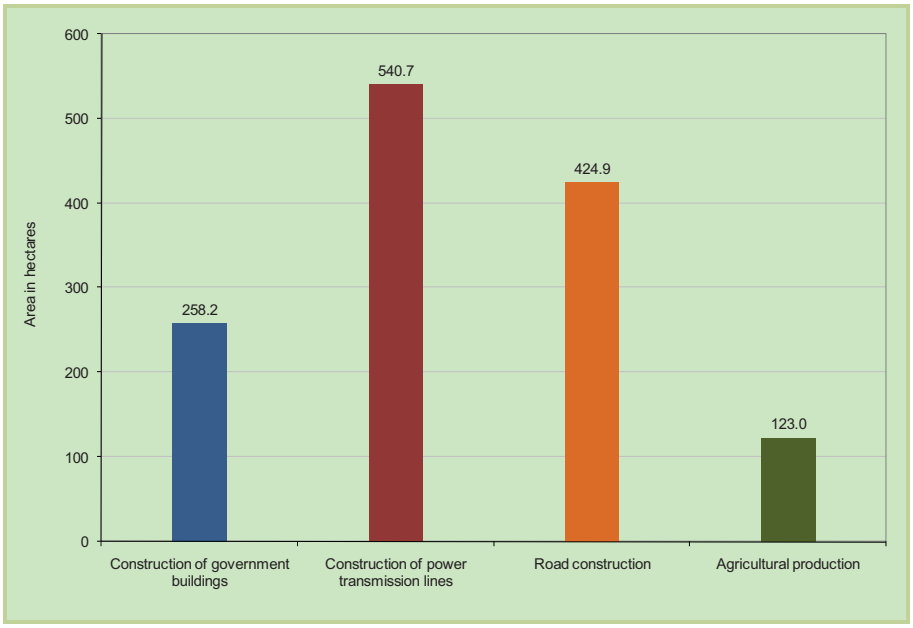
4.1.6 Land Use Change and Conversion

The Bhutanese population must make its living within rugged and geologically vulnerable ecosystems. Bhutan's usable land resource is limited due to difficult and high mountain terrain, vast areas of snows and barren rocks, and large forest coverage which is mandated to be maintained at a minimum of 60 percent in perpetuity. While 69 percent of the population depend primarily on agriculture, arable agriculture land is less than eight percent mostly located in the central valleys and mountains, and in the southern foothills.

Forest cleared for agricultural production at Buli, Zhemgang. ***More than 1,300 hectares of forest land have been cleared between 2001-2005 for infrastructure development and agricultural production.***

This limited area has to also support other development activities of a population, which is currently growing at 1.3 percent each year. While conservation of the natural environment is an overriding national priority, intensification of economic activities and support systems have led to encroachment and/or conversion of forest lands. Data compiled by the DoF show that more than 1,300 hectares of forest land have been cleared between 2001-2005 for infrastructure development and agricultural production. Roads and power transmission lines alone accounted for more than 70 percent of the total forest area converted to other land use (Figure 7).

Figure 7: Forest Land Conversion to Other Uses 2001-2005



Source: Ministry of Agriculture, 2006

4.1.7 Urbanization

Urbanization has taken place at an alarmingly rapid pace over the last ten years or so. During the Eighth Five-Year Plan (July 1997-June 2002), the urban population was estimated to be only 15 percent of the country's total and at the onset of the Ninth Five Year Plan (July 2002-June 2007) it was estimated at 21 percent. By 2005, the proportion of Bhutanese urban population had grown to 31 percent. There were 61 towns with a total population of 196,111, accounting for 31 percent of the country's total population, according to Population and Housing Census of Bhutan 2005 (PHCB 2005).

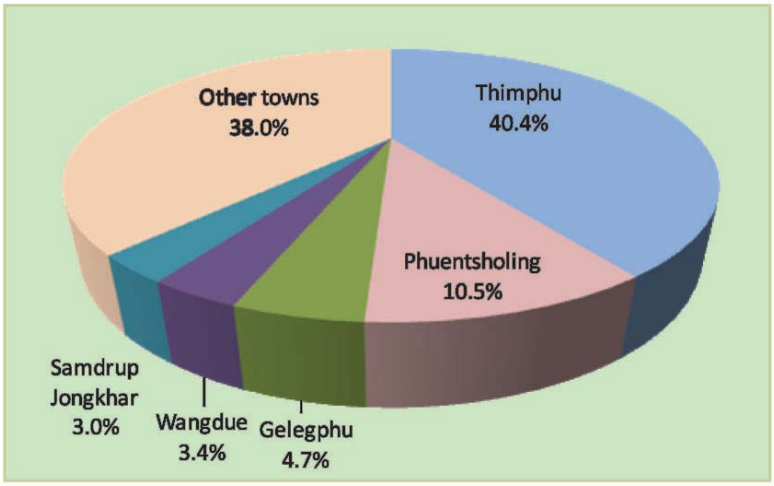
The single largest factor contributing to urban population growth in the country is rural-urban migration. The many difficulties associated with rural mountain life, inadequate

development infrastructure and facilities in the rural areas, and the perception of better economic prospects in the urban areas have led many people to the towns. Net life-time rural-urban migration has been estimated at 91,778 according to PHCB 2005. This implies that nearly 47 percent of the urban population are people who have migrated from rural areas. This is indeed an extremely high rate and more so in a country such as Bhutan where the geologically fragile mountainous ecosystem, rugged terrain and agrarian cultures are not easily reconciled with urbanization.

What is even more disconcerting is that more than half of the urban population is concentrated in just two towns – Thimphu and Phuentsholing. Thimphu alone has more than 40 percent of the total urban population while Phuentsholing has more than 10 percent (see Figure 8). Burgeoning urban population has created several environmental problems such as air and water pollution, water shortage, municipal waste generation, congestion of traffic and buildings, and land degradation. In order to accommodate surplus population and develop concomitant infrastructure, urban centers have consumed prime agricultural lands in the valleys and encroached on hill slopes which were once forested. In the smaller urban centers, the lack of proper infrastructure and facilities for drainage, sanitation and waste disposal will have cumulative adverse impacts on land and water resources. Furthermore, there is increased extraction of sand and stones from the river banks and roadsides, and harvesting of timber from adjacent forests to cater to the growing construction demands in the urban centers. Rural-urban migration and the influx of expatriate workforce for construction work in the urban centers have spawned squatting populations in and around the urban centers and exacerbated illicit collection of fuel wood and small timber from adjacent forests.

In addition, the urban influx has impacted heavily on Bhutan's ability to sustain its orientation to animal welfare and animal rights – ingrained within the Buddhist orientation to life – particularly with regard to increasing consumption of meat, a crisis of stray dogs in many urban centers, and concerns dating to the early 1980s over rabies outbreaks.

Figure 8: Distribution of Urban Population



Source: PHCB 2005

4.1.8 Mining and Quarrying

As of 2006, there were 39 mines and 24 quarries[66]. The mines are mostly concentrated in the southwestern and southeastern parts of the country, specifically in Samtse, Samdrup Jongkhar and Pemagatshel *dzongkhags*. Over the years, overall mineral production has increased and mining has become one of the fastest growing economic sectors. In particular, the production of gypsum and talc has increased enormously – almost by 100 percent – between 2002-2006 (see Table 14). Mining operations have direct physical impact on the landscape. The primary impact on biodiversity is through the removal of surface features during the extraction of materials, thus altering or destroying natural habitats and biodiversity. Secondary effects such as noise, dust, pollution and waste generation also impinge on plants and animals, including aquatic life as a result of changes in water sedimentation.

With the boom in construction activities and growing urbanization in the last few years, several stone and sand quarries have also opened up especially along mountain slopes and river beds, which are potentially prime habitats for many bird and mammal species. A case in point is the threat to the habitats of the critically endangered white-bellied herons due to increased sand quarrying along the banks of Puna Tsang Chhu.

Table 14: Mineral Production in Bhutan, 2002 - 2006

Minerals	2002	2003	2004	2005	2006
Dolomite (metric tonnes)	388,056	367,402	452,336	388,711	476,516
Limestone (metric tonnes)	506,268	551,525	560,807	536,030	581,333
Gypsum (metric tonnes)	105,658	122,829	131,236	150,585	204,198
Slate (square feet)	6,100	57,970	126,789	2,908	5,873
Coal (metric tonnes)	88,567	66,324	29,631	85,279	97,965
Marble (square feet)	3,207	6,228	3,385	4,005	3,813
Quartzite (metric tonnes)	47,464	52,058	42,599	52,694	40,198
Talc (metric tonnes)	23,118	23,101	39,797	42,791	54,208
Stone (metric tonnes)	319,702	316,068	252,207	146,767	232,187
Granite (square feet)	5,559	11,579	2,152	9,436	8,311

Source: Department of Geology and Mines (Statistical Yearbook of Bhutan 2007)

4.1.9 Infrastructure Development

Construction of roads and electrification of towns and villages among other things have become necessary to realize socio-economic development objectives. The road network has increased from 4,007 km in 2003 to 4,545 km in 2006[67]. Bhutan being a developing nation, more infrastructure development activities are expected to take place in the future.

66 Report on Mining Operations in Bhutan, Royal Audit Authority, 2007.
67 Department of Roads, Ministry of Works and Human Settlements, cited in Statistical Yearbook of Bhutan 2007

The political campaigns leading to democracy in 2008 also suggested that roads would be built sooner or later in each of the 47 constituencies. According to the Tenth Five Year Plan Programme Profiles (2008-2013), more than 480 km of new roads, including farm roads will be constructed to improve access and connectivity to remote areas and to improve alignment of existing roads. In addition, during the same period, 468 km of existing roads will be upgraded and 40 km will be widened[68].

New road construction from Samtse to Dorokha. ***Construction of roads can have severe adverse environmental impacts if necessary mitigation measures are not employed during the design and construction of roads.***

Another key infrastructure development activity that affects biodiversity is the construction of power transmission grids and distribution lines. The commissioning of new hydroelectric projects such as Tala and Basochhu would necessitate installation of more power transmission lines. In the Tenth Five Year Plan, the RGoB plans to undertake inter-regional power transmission and distribution works to provide stable and adequate power supply for regionally balanced socio-economic development. The development of these infrastructure is environmentally challenging given the rugged terrain and fragile geologic conditions.Where adequate environmental safeguards and mitigation measures are not employed, development of these infrastructure almost inevitably cause problems such as slope instability, deforestation, disturbance to wildlife habitats, and sedimentation of water bodies. In addition to direct impacts, these infrastructure development projects inherently bring in additional demographic pressure on surrounding natural resources as a result of mass influx of migrant workers.

68 Tenth Five Year Plan (2008-2013): Programme Profiles

4.1.10 Invasive Species

Invasive species are species not native to a country or region but which successfully establish themselves in the new environment, out-competing native species and taking over pre-existing ecosystem. On a global scale, invasive species constitute one of the most serious threats to biodiversity. The control of invasive species can be difficult, if not impossible, making prevention particularly important. Although there is presently no scientific assessment of invasive species and their impacts in the country, some environmental and socio-economic impacts of invasive species are already being felt to some degree. For example, Bhutanese rice farmers are losing crops to the invasive alien waterweeds such as *Potamogeton distinctus*. Terrestrial weeds like *Lantana camera*, *Parthenium* spp, and *Mikania micrantha* are invading the Bhutanese forests, just as they have proven themselves to be problems the world over. Alien invasive plant diseases like chili blight caused by *Phytophthora capsici*, rice blast caused by *Pyricularia oryzae*, and potato late blight caused by *Phytophthora infestans* are nuisances to Bhutanese farmers and cause heavy crop losses.

4.1.11 Hydropower Development

High precipitation, extensive forest cover and well-preserved watersheds have endowed the country with immense potential for hydropower production. The DoE has estimated the country's hydropower potential at about 30,000 megawatts (MW). At present, the installed hydropower capacity is 1,488 MW. In the next 20 years, the country plans to develop another six hydropower projects with a combined capacity of over 4,385 MW.

Apart from being the main driver of socio-economic development in the country, hydropower is viewed as an essentially clean source of energy and a means of reducing the country's dependence on traditional solid fuels, e.g. fuelwood, which are much more environmentally damaging and expensive. Furthermore, as a major source of revenue, hydropower development provides a strong economic rationale for environmental conservation as its sustenance depends on the sustainable management of the watersheds. Nevertheless, hydropower projects in many places around the world are known to adversely impact the surrounding natural environment, especially where large or multiple reservoirs are involved. The most commonly reported impacts of hydropower projects are disturbance in river flow and degeneration of aquatic life.

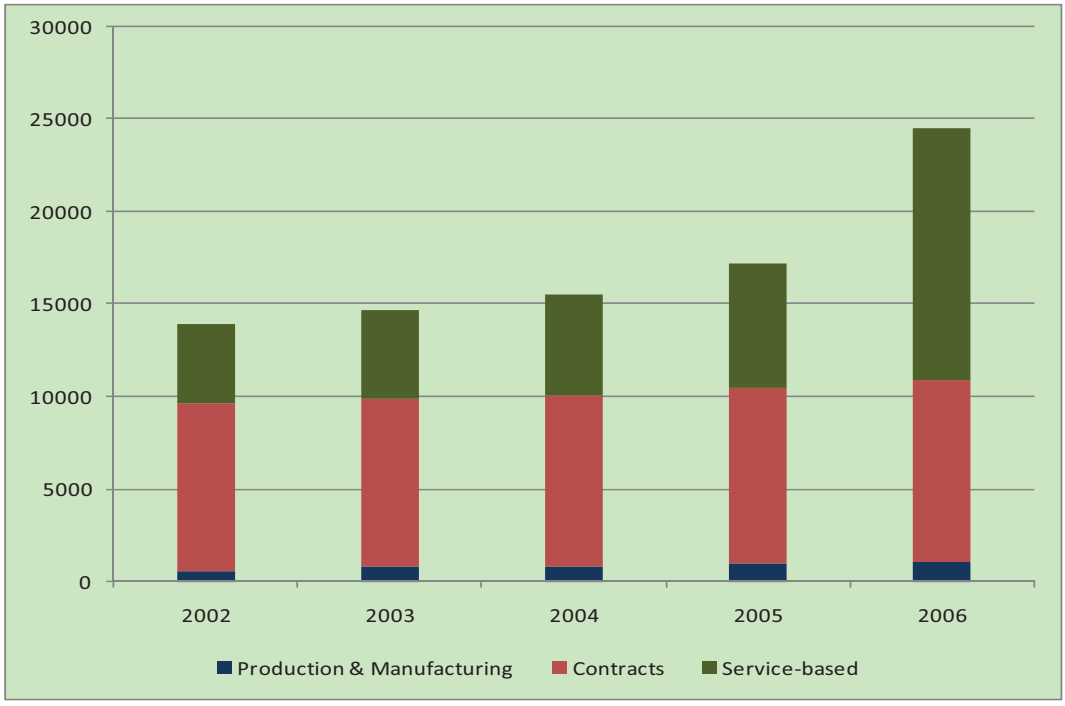
In the case of Bhutan, a major issue is that the construction of hydropower projects is based on labor-intensive technology. Mass influx of expatriate laborers increases demographic pressure on surrounding natural resources, particularly forests and water. In addition, construction of dams, access roads, and power transmission lines have a bearing on land stability and biodiversity, more so in a mountainous country with fragile geology as Bhutan.

4.1.12 Industrial Development

Industrial development is critical for employment generation and economic development. However, demographic and biophysical factors pre-empt any large-scale industrial development in Bhutan. As of 2006, the Department of Industry had issued 24,505 industrial licenses – about 76 percent more than in 2002 when licenses issued numbered 13,908 (see Figure 9). Of these, a tiny 4.6 percent are production and manufacturing industrial units while the rest pertain to contracts (39.9 percent) and service-based enterprises (55.5 percent). Only a tiny 0.3 percent of all the industrial licenses issued in 2006 fall in the "large-scale" category.

While there are yet no studies on the impacts of industries on biodiversity, air and water pollution problems generally associated with industries may have harmed surrounding animal and plant life especially in major industrial towns like Gomtu and Pasakha. Furthermore, forest-based industries – which make up 41.5 percent of production and manufacturing industries – are likely to be cause for loss of wild biodiversity especially when extractions of raw materials are not replenished suitably.

Figure 9: Industrial Licenses Issued 2002-2006



Source : Department of Industries as cited in Statistical Yearbook of Bhutan 2007

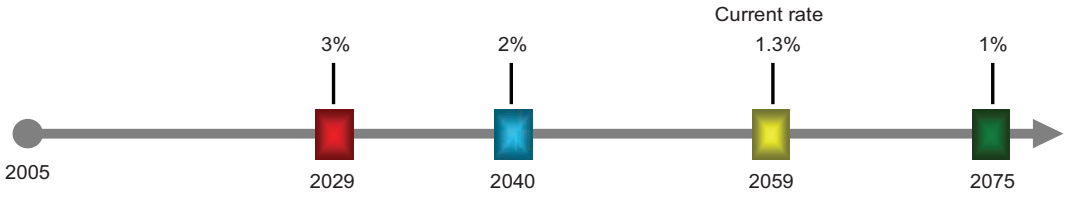
4.2 Indirect Causes

4.2.1 Population

The Population and Housing Census of Bhutan (PHCB) 2005 has estimated the country's population at 634,982 with a growth rate of 1.3 percent per annum and a density of 16 people per km^2. Although, on the whole, the country's population growth rate and population density is low compared to most countries, its rugged topography and severe climatic conditions limit arable and habitable conditions to only a small proportion of the country and, in the process, creates much greater demographic pressure on land and natural resources than the overall population density may suggest.

At the current growth rate, our population would double by the year 2059. Figure 10 illustrates population doubling time at different growth rates. Though the country's population in general does not pose a serious problem at the present, localized population pressure exists due to skewed population distribution. For instance, on one hand Gasa *dzongkhag* has a population of only 3,116 people at a density of less than one people per km^2, on the other Thimphu *dzongkhag* has a population of 98,676 people at a density of 51 people per km^2 (Table 15).

Figure 10: Population Doubling Timeline at Various Growth Rates



Crowd at Thimphu Tshechu, 2008. ***At the current growth rate of 1.3% per annum, Bhutan's population is expected to double by the year 2059.***

Table 15 : Population and Population Densities of Most and Least Populated Dzongkhags

Dzongkhag	Population	% of the total population	Population density (people/km²)
Most populated dzongkhags			
Thimphu	98,676	15.5	51
Chhukha	74,387	11.7	41
Samtse	60,100	9.5	38
Least populated dzongkhags			
Gasa	3,116	0.5	0.7
Lhuentse	15,395	2.4	5
Bumthang	16,116	2.5	6

Source: PHCB 2005

Another concern pertains to the demographic distribution of the population. The population-age differentiation structure of the country has a broad base with nearly 45 percent of the population being under the age of 20 years. This implies that the population is likely to increase at a higher rate in the near future as a result of growing section of individuals nearing their prime fertility age. Add to this the fact that the Total Fertility Rate is high, at approximately 2.9, while the Contraceptive Prevalence Rate is quite low, at 31 percent[69].

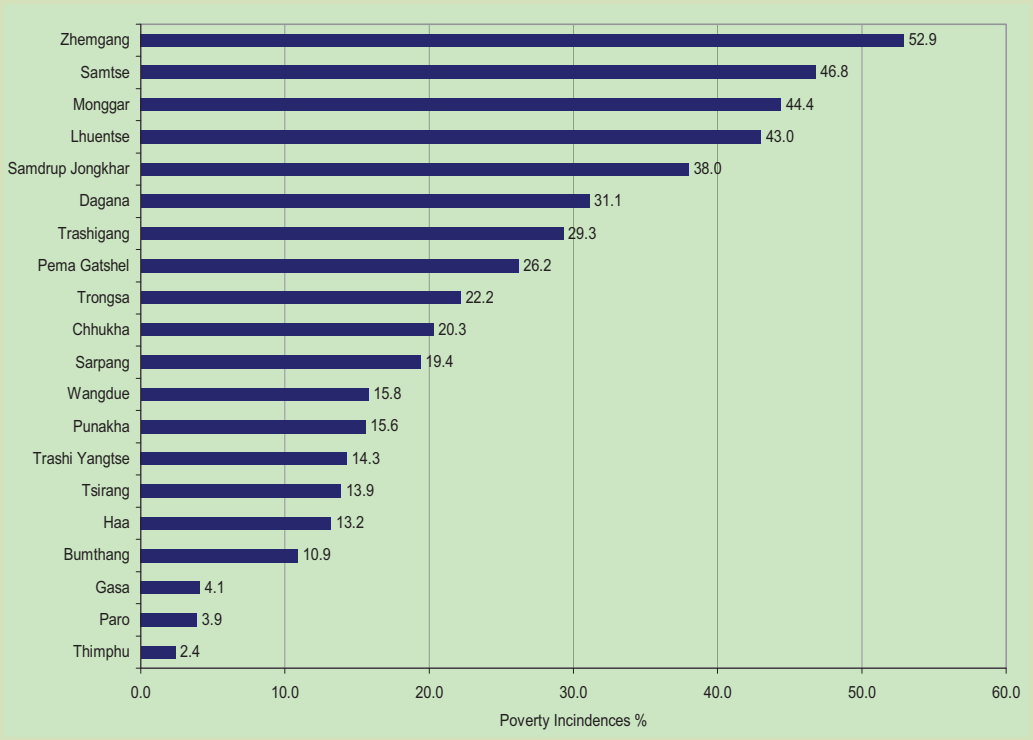
While our current population growth rate is only about 1.3 percent, increase in the population growth rate in the near future due to the young age structure and geographically-skewed distribution of our population pose major challenges to the conservation and sustainable use of biodiversity. A more coordinated effort between family planning and conservation outreach services in the country is required to stabilize our population growth within the given geographic and demographic contexts of the country.

4.2.2 Poverty

Despite an impressive economic growth with Gross Domestic Product growth averaging seven percent since 1980, there is relatively a high level of poverty although abject poverty and destitution are virtually absent. The existing state of poverty can be mainly attributed to the country's rugged and harsh terrain, limited infrastructure and availability of land for economic activities, shortage of labor and markets due to a small and scattered population, largely subsistence-based way of life in the rural areas, and nascency of the private sector.

69 Cited from Population Reference Bureau (www.prb.org)

Figure 11: Poverty Incidences by Dzongkhags



Source: Poverty Analysis Report, National Statistics Bureau, 2007

The Bhutan Living Standards Survey 2007 established the total poverty line at Nu. 1,096.94 per person per month, which is about US$ 28[70]. An estimated 23.2 percent of the country's population live below the aforesaid total poverty line. Poverty in the country is relatively a rural phenomenon, with 30.9 percent of the rural population living below the total poverty line compared to 1.7 percent of the urban population. Poverty incidences are highest in Zhemgang, Samtse, Mongar, Lhuentse, and Samdrup Jongkhar *dzongkhags* and lowest in Thimphu, Paro, Gasa, Bumthang, and Haa *dzongkhags* (Figure 11).

Poverty can be both the cause and effect of environmental degradation. Impoverished communities if not provided with livelihood and income-generating opportunities will be prone to engage in activities, for example wildlife poaching and illegal fuelwood collection, that adversely impact biodiversity. On the other hand, effective conservation initiatives which among other things promote access to, and sustainable use of, biodiversity resources by the poor can create substantial opportunities for the impoverished communities to enhance their livelihoods and break away from the poverty cycle.

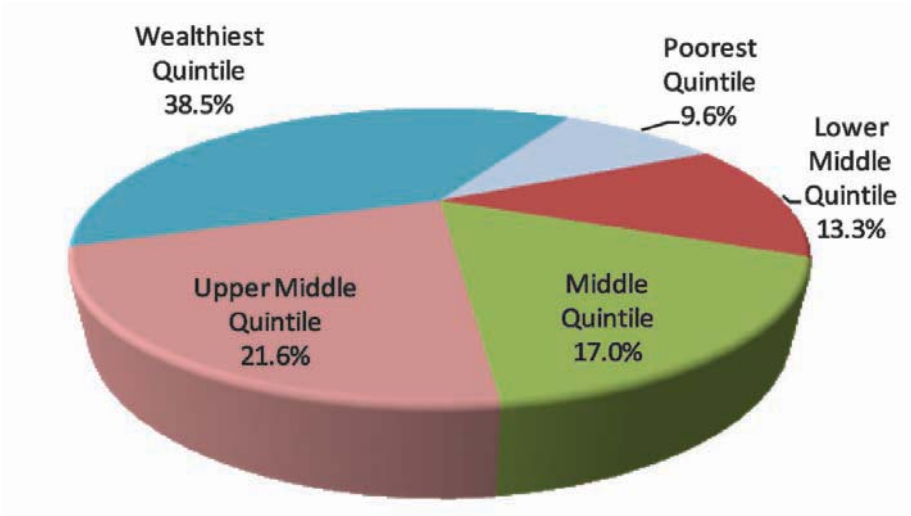
70 One US$ equaled about Nu. 48 as of January 2009.

4.2.3 Consumption Trends and Market Forces

Increasing affluence and modernizing lifestyle of the Bhutanese, combined with population growth, have inadvertently led to higher consumption habits leading to pollution of air, water and land, and increasing use of natural resources. Per capita consumption levels of basic environmental products and services, such as wood and hydro-electricity, are reportedly very high in the country. According to the DoE, urban Bhutanese have the highest per capita electricity consumption (1,174 kilowatt hours per year as of 2005) in all of South Asia. Furthermore, agricultural production is enormously influenced by market forces. Consumer demands for cheaper agricultural produce has led farmers to grow high-yielding, but often imported, varieties of crops such as paddy, maize and wheat. In some places, for instance Bumthang, traditional crops such as buckwheat are being replaced by cash crops such as potato. Similarly, people are giving up rearing of Jakar sheep as they increasingly find it economically unviable.

As is the general trend across the world, the wealthiest have far extravagant consumption habit when compared to other sections of the population. In Bhutan, the wealthiest 20 percent of the population account for 38.5 percent of the total national consumption while the poorest 20 percent account for 9.6 percent (Figure 12). In terms of average per capita consumption, a person belonging to the wealthiest 20 percent of the population consumes 6.7 times more than a person belonging to the poorest 20 percent[71]. This basically implies that as more people attain wealth, consumption trends are likely to grow unless certain interventions are effectively implemented to curb wasteful consumption[72].

Figure 12: Share of National Consumption by Poverty/ Wealth Population Quintiles, 2007



Source: Poverty Analysis Report, National Statistics Bureau, 2007

71 NSB, 2007[b].
72 Such interventions may be policy, social (e.g. education and awareness), or economic (e.g. taxation).

4.2.4 Climate Change

People and the natural environment are becoming increasingly vulnerable to the impacts of climate change. Although ecosystems have adapted to changing climates in the past, current changes in climate are occurring at rates not experienced historically. In general, the faster the climate changes, the greater the impact on people and their natural environment. The impacts of climate change to Bhutan's natural environment have not yet been properly assessed. Nonetheless, the country has experienced in the recent past a number of incidents that have brought to the fore the dangers of climate change. For example, the winter of 1998/99 was characterized by a prolonged spell of dry (snowless) weather. This exacerbated incidents of forest fires that winter, with such fires occurring even in places where they were earlier not known. Subsequently, the summer of 2000 was witness to the worst ever monsoon rains in the country's recent history. The heavy rains triggered off unprecedented number of floods and landslides, causing loss of dozens of human lives and damage to infrastructures and natural resources. Climate change is also resulting in the receding of several glaciers in the Himalayas, increasing the risks of dangerous glacial lake outbursts. Recent studies by the International Centre for Integrated Mountain Development (ICIMOD) mention that several glacial lakes in Bhutan and Nepal have high risks of outbursts due to global warming. In fact, in 1994, there was a major glacial lake outburst in Lunana in northwestern Bhutan, resulting in a flash flood that caused extensive damage to agricultural lands and pastures, and loss of several human lives and livestock along the Pho Chhu. There are about 2674 glacial lakes existing in the country, of which 24 are classified as potentially dangerous lakes[73]. Of these, the most immediate threat comes from the Raphstreng and Thor Thormi lakes in the headwaters of the Puna Tsang Chhu. These lakes are adjacent to each other separated by just a moraine wall. The combined discharge of outbursts of these two lakes is estimated at 53 million cubic meters – three times more than the 1994 Lugge Tsho glacial lake outburst flood.

Biodiversity and climate change have a two-way linkage. Just as climate change affects biodiversity, deterioration of biodiversity can contribute to climate change. Land use changes resulting in biodiversity losses can cause increased greenhouse gas emissions. Forests play a major role in storing up carbon, so when forests are cut down, or burnt, carbon dioxide is released into the atmosphere. On the other hand, careful management of biodiversity can lead to higher levels of carbon sequestration and consequently mitigation of climate change and its impacts. Bhutan has hitherto been spared the drastic consequences of climate change that many other mountainous countries have faced because of its relatively well-forested watersheds and hitherto moderate human disturbances of natural resources.

73 ICIMOD, 2000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Chapter 5

ACTION PLAN

5.1 General Premise

Gross National Happiness, being the country's overarching development concept, provides the fundamental essence for the development of this Action Plan. It shall inherently contribute to the objective of environmental sustainability but shall also seek to contribute to economic growth, poverty alleviation, food security, and human health. As stressed in *Bhutan 2020*, the vision document to maximize GNH, this Action Plan takes into account the potential to use our biodiversity as an asset for socio-economic development but in a manner that is within the limits of sustainability and without impairing the ecological and spiritual values of the natural environment. Poverty reduction is a central theme of the Tenth Five Year Plan (July 2008-June 2013). Therefore, this Action Plan also looks at poverty-environment mainstreaming to the extent that biodiversity conservation measures sufficiently consider poverty reduction and livelihood enhancement objectives.

The Action Plan attempts to address the various trends affecting biodiversity in the country, as described in Chapter 4. A matrix correlating the objectives and strategies to the trends affecting biodiversity is provided in Annex 4.

5.2 Goal and Objectives

The overall goal of this Action Plan is "the conservation and sustainable use of Bhutan's natural biodiversity for the economic, environmental and emotional wellbeing of the present and future generations."

Specifically, it seeks to achieve the following objectives:

1. Protect natural ecosystems from degradation and fragmentation as a consequence of environmentally-intrusive human activities and their impacts;
2. Protect species and genetic diversity in general but more especially those species and their genetic variants that have immense ecological, economic, scientific, and cultural values;
3. Integrate poverty reduction and enhancement of local livelihoods in biodiversity conservation programmes in a mutually-reinforcing manner;
4. Create public appreciation and support for biodiversity conservation through nature-based recreation and education;
5. Use biodiversity resources as a development capital for national economic growth but within the limits of environmental sustainability.

5.3 Strategies and Actions

5.3.1 Strategies and Actions to Achieve Objective 1

Objective : To protect natural ecosystems from degradation and fragmentation as a consequence of environmentally-intrusive human activities and their impacts.

Strategy 1: ***Protection and management of protected areas and connecting biological corridors***

Action 1.1: Conduct field surveys and prepare conservation management plans for Wangchuck Centennial Park, Khaling Wildlife Sanctuary, Phipsoo Wildlife Sanctuary and Torsa Strict Nature Reserve;

Action 1.2: Identify personnel needs for Wangchuck Centennial Park, Khaling Wildlife Sanctuary, Phipsoo Wildlife Sanctuary and Torsa Strict Nature Reserve, and accordingly mobilize the required personnel in coordination with the Royal Civil Service Commission;

Action 1.3: Identify funding needs for Wangchuck Centennial Park, Khaling Wildlife Sanctuary, Phipsoo Wildlife Sanctuary and Torsa Strict Nature Reserve, and accordingly mobilize requisite funds in coordination with the Ministry of Finance;

Action 1.4: Develop basic conservation management infrastructure for implementation of the conservation management plans in Wangchuck Centennial Park, Khaling Wildlife Sanctuary, Phipsoo Wildlife Sanctuary and Torsa Strict Nature Reserve;

Action 1.5: Revise all outdated conservation management plans of protected areas and establish a system for timely review and updating of the conservation management plans to effectively respond to evolving conservation circumstances and needs of the respective protected areas on a continuous basis;

Action 1.6: Carry out and complete zoning of the existing six operational protected areas and complete physical demarcation of the boundaries of these protected areas;

Action 1.7: Identify priority biological corridors for conservation management based on tiger status surveys, snow leopard status surveys, and other biodiversity surveys that may be carried out from time to time;

Action1.8: Conduct field surveys and prepare conservation management plans for the priority biological corridors covering at least 25 percent of the existing biological corridors;

Action 1.9: Identify personnel needs for the priority biological corridors, and accordingly mobilize the required personnel in coordination with the Royal Civil Service Commission;

Action 1.10: Identify funding needs for the priority biological corridors, and accordingly mobilize requisite funds in coordination with the Ministry of Finance and GNH Commission;

Action 1.11: Review the ongoing conservation management activities in the biological corridors adjacent to Thrumshingla National Park and consolidate them into a full-fledged conservation management programme for further implementation.

Strategy 2: ***Protection and management of conservation areas outside the protected areas system***

Action 2.1: Formulate regulations and procedural guidelines for the establishment and management of conservation areas outside the protected areas system as legal entities, and incorporate these regulations and guidelines as an addendum to the Forest and Nature Conservation Rules 2007. This action is critical because currently the legal status of conservation areas outside the protected areas system is vague. Without legal recognition, the enforcement of regulations contained in the conservation management plans of such areas can be defied by people especially whose economic interests are in conflict with the nature conservation objectives;

Action 2.2: Identify priority conservation areas[74] outside the protected areas system for conservation management within the next five years, conduct biodiversity and socio-economic surveys in these areas, and prepare conservation management plans in accordance to the approved regulations and procedural guidelines (refer foregoing action);

Action 2.3: Mobilize funding and human resources for implementation of the approved conservation management plans in the priority conservation areas and implement the conservation management plan.

Strategy 3: ***Management of forest resources for sustainable production and utilizatio***n

Action 3.1: Assess old FMUs, particularly in wood-deficit *dzongkhags*, that can be potentially revived for sustainable production and utilization of forest resources with some protection and enrichment planting over a period of time, and carry out requisite replenishment activities in these FMUs;

74 These areas may include Chelela, Kangpara, and the Chukha/Haa/Samtse tri-junction area as preliminary assessments of these areas have been already undertaken.

Action 3.2: Develop the capacity of the territorial forestry divisions to effectively implement the planning guidelines for management of forest areas outside the FMU system for sustainable production and utilization of forest resources. Capacity development should not only include staff training but also installation of necessary computers and software required for implementation of the planning guidelines;

Action 3.3: Implement the planning guidelines in at least one forest area in each territorial forestry division and evaluate the applicability and effectiveness of the guidelines in these forest areas. The results of the evaluation will be useful in improving the planning guidelines for more widespread use;

Action 3.4: Carry out detailed evaluation of the effectiveness of FMUs through out the country in the context of environmental sustainability and socio-economic development, and use the results of the evaluation in enhancing the planning and management of FMUs.

Strategy 4: ***Development and implementation of a comprehensive forest fire management programme***

Action 4.1: Fully assess occurrence and trends of forest fires and study the fire ecology in various forest ecosystems;

Action 4.2: Based on the aforesaid study, develop forest fire management strategies for the various forest ecosystems;

Action 4.3: Develop and implement community-based forest fire management schemes. These may include setting up of village-level forest fire management groups and development of mechanism for coordination between such groups, local forest authorities and local administrations;

Action 4.4: Evaluate the results of ongoing trials on prescribed burning and depending on the results replicate/ adapt prescribed burning at additional sites;

Action 4.5: Develop and implement public education and awareness programmes using avenues such as rural theatre, folk music, school cultural events, religious festivals, and painting/ quiz/ debate competitions;

Action 4.6: Review and strengthen institutional arrangements for networking, reporting and forest fire fighting. Institutional strengthening would also include procurement and management of forest fire fighting equipment such as helmets, fire-proof gear, walkie-talkie, first-aid kit, and binoculars. It would also entail identification of focal persons in various agencies for mobilization of fire fighters and setting up of a toll free number (in coordination with Bhutan Telecom) for reporting of forest fire occurrence.

Strategy 5: ***Reduction of grazing pressures on natural ecosystems***

Action 5.1: Provide effective animal health coverage to provide the security that will encourage farmers to keep smaller but more productive herds of livestock;

Action 5.2: Carry out studies to determine carrying capacities in varying scenarios. Depending on the results of these studies, revise taxation scheme on the basis of livestock holding in adult equivalents to discourage the rearing of excess livestock;

Action 5.3: Enhance livestock sterilization service through better coverage, including mobile units;

Action 5.4: Improve yak and cattle breeds through selection of superior bulls from local population on the basis of pedigree and/or progeny performance, distribution of bulls from other areas to introduce new blood lines and reduce inbreeding and artificial insemination with imported semens;

Action 5.5: Establish farmers' cooperatives that will among other things oversee proper utilization of forage resources through monitoring of stock numbers, grazing duration and grazing time, nutrient management, and shrub and weed control;

Action 5.6: Conduct studies on forage competition between wild ungulates and domestic cattle and yak to aid planning and implementation of sound grazing management interventions where forage competition is most severe;

Action 5.7: Establish hay meadows with high-yielding fodder legumes and grasses under high nutrient supply condition to reduce grazing pressure on forests;

Action 5.8: Introduce controlled burning or mechanical clearing of shrubs followed by reseeding with selected species and protection from grazing based on applied research and extension;

Action 5.9: Establish community and homestead forests of species with high forage and soil conservation values, and preferably with other ethnobotanical values using participatory strategies with local people. This will necessitate establishment of forest nurseries, where such nurseries do not exist.

Action 5.10: Identify barren and/or degraded forest lands that can be potentially leased for pasture management as per the provision of the Land Act of Bhutan 2007;

Action 5.11: Prepare and implement management plans for pasture development on leased barren/ degraded forest lands on a pilot scale, starting with one or two sites in each *dzongkhag*.

Strategy 6: ***Development and implementation of measures to protect natural ecosystems against invasive species***

Action 6.1: Carry out a national inventory of invasive species that occur in the country and identify current and potential risks posed by these species;

Action 6.2: Prioritize high-risk invasive species for management interventions and develop species-specific management plans for long-term control of these species;

Action 6.3: Building upon the foregoing actions and using additional insights, develop a national programme to control invasive species. Such a programme will need to be integrated into the regular programmes and plans of the RNR sector at the central and *dzongkhag* levels and as well as in those of the RNR-RCs;

Action 6.4: Raise public awareness on invasive species and their impacts through mass media and by way of production and distribution of educational/ extension materials;

Action 6.5: Incorporate provisions to control invasive species, especially with regards to import of foreign species, within relevant laws such as the Plant Quarantine Act 1993 and the Seeds Act of Bhutan 2000.

Strategy 7: ***Sustainable land management to protect the productivity and stability of various land uses***

Action 7.1: Develop and implement models of sustainable land management in vulnerable agricultural production landscapes such as on steep slopes and geologically unstable lands. This would basically entail building up on ongoing NLMC activities, consolidating the positive experiences and integrating them in agricultural production systems;

*Action 7.*2: Prepare a National Action Program to combat land degradation with a cross-sectoral perspective and an integrated approach to sustainable land management[75].

75 The preparation of NAP has commenced recently and is scheduled for completion by the end of June 2009.

Strategy 8: ***Development and implementation of measures to mitigate the impacts of climate change on natural ecosystems***

Action 8.1: Artificially lower Thor Thormi lake to curb the intensity of potential glacial lake outburst flood and its impacts on aquatic ecosystems, forest lands, agricultural lands, and rangelands along the Puna Tsang Chhu basin.

Strategy 9: ***Enforcement of environmental impact assessment requirements***[76]

Action 9.1: In keeping with the Environmental Assessment Act 2002, all potentially intrusive development projects and operations, should be subjected to detailed environmental impact assessment and environmental clearance requirements;

Action 9.2: Assess the compliance of the environmental impact assessment process and procedures, and the terms and conditions under which environmental clearance is issued to projects especially focusing on (but not necessarily limited to) production and manufacturing industries and mining operations. Based on the results of the assessment, strengthen mechanisms to monitor compliance and penalize defaulters;

Action 9.3: Carry out detailed environmental audits, including assessment of implementation of relevant environmental laws and regulations, of intrusive development projects and operations on a biennial basis and make recommendations for enhancement of environmental management of such projects and operations;

Action 9.4: Make it mandatory for all production and manufacturing industries and mining operations to produce environmental performance reports and make such reports available for public scrutiny and feedback.

Strategy 10: ***Harmonization of biodiversity conservation and infrastructure development/ urban development plans.***

Action 10.1: Conduct an assessment of road construction in relation to positive and negative impacts, and develop vigorous compliance monitoring mechanisms for implementation of existing environmental codes of practice for road construction;

Action 10.2: Review the Master Plans for hydropower development and road construction and revise them to avoid critical natural habitats;

Action 10.3: Amend Forest and Nature Conservation Rules 2007 to regulate construction of power transmission lines through government reserved forests;

76 This strategy is also relevant to Objective 2

Action 10.4: Implement the existing national urbanization strategy to create regionally-balanced urban development and alleviate concentrated urban pressure on natural ecosystems;

Action 10.5: Develop and implement a national rural-urban migration management strategy, outlining among other things measures to improve quality of rural life by way of good local governance, improved access, creation of employment opportunities in rural areas, and better rural development services.

5.3.2 Strategies and Actions to Achieve Objective 2

Objective: Protect species and genetic diversity in general but more especially those species and their genetic variants that have immense ecological, economic, scientific, and cultural values.

Strategy 1: ***Control and reduction of poaching of wildlife and illegal trade in their parts and products***

Action 1.1: Identify key areas and species vulnerable to poaching threats and assess the magnitude of the threats, including identification of poaching hotspots;

Action 1.2: Augment anti-poaching measures, including strengthening of anti-poaching squads and local informants' network and upgrading of surveillance equipment, on the basis of the aforesaid assessment;

Action 1.3: Establish warden and guard posts to cover all transit points related to wildlife trade;

Action 1.4: Revise the totally protected species list based on CITES appendices, global status as per the IUCN red list of threatened species, and national significance;

Action 1.5: Rationalize the existing schedule of fines related to poaching and trade in wildlife parts and products based on the national status of the species and the actual value of their parts and products in the international and regional markets;

Action 1.6: Conduct yearly inter-agency workshops to update various law enforcement personnel on poaching and wildlife trade and to coordinate activities to control poaching and wildlife trade;

Action 1.7: Build on ongoing trans-boundary cooperation with protected area and wildlife authorities in India, and develop it into a systematic trans-boundary anti-poaching programme focusing among other things on coordinated patrols and intelligence networking. Study the possibility of

initiating similar collaboration with the Chinese authorities to curb cross-border poaching along the northern border;

Action 1.8: Develop database and produce annual reports to monitor poaching and trade in wildlife parts and products in keeping with the requirements of CITES.

Strategy 2: ***Conservation of globally threatened species and their habitats***

Action 2.1: Develop field-based information on tiger and ungulate prey population status (ecology, demography, genetics), with initial focus on the most critical tiger habitats in various altitudinal regions;

Action 2.2: Curb hunting of tiger and prey species and halt illegal trade of tiger parts and products as a key component of the overall anti-poaching programme;

Action 2.3: Assess the status of tiger and prey habitats and change over time using Geographic Information System and remote-sensing technology and identify critical habitat management needs, and integrate them in the overall protected area and wildlife management strategies;

Action 2.4: Create enabling conditions for tiger conservation by way of public awareness, trans-boundary cooperation, development of in-country scientific expertise, and increase in the number of adequately trained staff for tiger conservation.

Action 2.5: Carry out status surveys of snow leopard population, distribution, habitats and prey base through out the country and develop field-based information using SLIMS approach;

Action 2.6: Based on the results of the status surveys, develop and implement a comprehensive programme for snow leopard conservation using sound social and scientific strategies;

Action 2.7: Analyze existing research data on white-bellied heron and develop a conservation programme for further research and direct conservation actions for the protection of the species and its habitats;

Action 2.8: Identify critical heron habitats and declare these areas as protected zones or special conservation areas, with special rules and safeguards for enforcement.

Strategy 3: ***On-farm conservation of plant genetic resources (PGR) in arable agriculture ecosystems***

Action 3.1: Establish *in situ* PGR conservation sites, in addition to the ones already established through the BUCAP project;

Action 3.2: Refine and employ Participatory Plant Breeding (PPB) and PVS techniques and related skills;

Action 3.3: Develop and implement tools and methodology for participatory research, such as FFS;

Action 3.4: Integrate PGR conservation into research, extension and academic institutions, through internship, participatory planning, and incorporation of PGR topics in the curriculum of College of Natural Resources, Lobesa;

Action 3.5: Conduct awareness programs on PGR through farmers' fairs, field days, and dissemination of information using audio-visual and print materials;

Action 3.6: Establish community seed banks to improve access to and facilitate exchange of seeds among local producers;

Action 3.7: Develop field gene bank for live collection and conservation of diversity of fruit trees and other vegetatively propagating crops.

Strategy 4: ***Ex situ conservation of PGR for sustainable agriculture***

Action 4.1: Carry out collection and conservation of whole crop diversity (orthodox seeds);

Action 4.2: Process and evaluate seed quarantine testing of collected germplasm samples;

Action 4.3: Carry out and complete taxonomic identification of collected samples;

Action 4.4: Carry out repatriation of possible germplasms of Bhutanese origin from other gene banks;

Action 4.5: Expand the plant germplasm collection at the NGB-PGR to approximately 6,000 accessions;

Action 4.6: Establish a duplicate gene bank in natural perma-frost environment for conservation of safety duplicates of all samples conserved at the NGB-PGR;

Action 4.7: Initiate collection and preservation of recalcitrant seeded crops in the country.

Strategy 5: ***Establishment of a full-fledged gene bank for sustainable livestock development and production***

Action 5.1: Develop and validate cryopreservation methods of semen/ embryo of different species/ breeds of livestock;

Action 5.2: Develop protocols for semen collection/processing/freezing of different species of livestock; number of collections per breed and the sampling strategy; and sustainable use of gene bank collection of germplasms;

Action 5.3: Carry out collection and preservation of germplasms in accordance to the aforesaid protocols;

Action 5.4: Document morphological/ genotype characterization of different livestock breeds.

Strategy 6: ***Conservation of indigenous breeds of livestock using farm-based approaches***

Action 6.1: Review/ assess threats and associated risks to the existence of a particular species or breed of animal for the formulation of short- and long-term intervention measures;

Action 6.2: Identify sites and establish participatory field breeding programmes and nucleus breeding farms for prioritized indigenous livestock breeds;

Action 6.3: Monitor the performance of prioritized indigenous livestock breeds in the field as well as in the cross-breeding programmes, and fully computerize data accrued from genetic investigation and from monitoring of the performance of prioritized indigenous livestock breeds, and produce reports to aid the conservation and development of these breeds;

Action 6.4: Secure approval of pending Livestock Breeding Policy to have clear policy direction for planning and implementation of livestock breeding programmes[77];

Action 6.5: Develop a sound policy framework on animal genetic resources with conservation mandates for all breeds of livestock and poultry;

Action 6.6: Identify successful and sustainable approaches to encourage farmers to maintain traditional breeds through the ongoing integrated livestock and crop conservation program and replicate/adapt in different areas.

77 The Policy is currently in draft form.

Strategy 7: ***Development and implementation of measures to mitigate the impacts of climate change on keystone/flagship species.***

Action 7.1: Carry out detailed studies on the potential impacts of climate change on keystone/flagship species and restricted-range species, and their natural habitats, and develop conservation measures to mitigate the impacts.

Strategy 8: ***Development of a national biodiversity information system that will aid monitoring of the state of biodiversity resources, identification of existing and emerging pressures, and planning of appropriate conservation responses.***

Activity 8.1: Continue biodiversity surveys and strengthen existing information on plants, birds and mammals. This should essentially include completion of ongoing work such as inventory and documentation of pteridophytes;

Activity 8.2: Carry out additional biodiversity surveys with emphasis on fish fauna, invertebrates, insect-fungi, and herpetofauna, building upon preliminary surveys carried out in the past;

Activity 8.3: Initiate genetic assessment of all endangered species and of species that bear high ecological, economic and cultural values;

Activity 8.4: Take stock of all pre-existing and new data (gathered through the aforesaid actions), and consolidate them into a national biodiversity information system encompassing taxonomic characteristics, population, distribution, threats, and vulnerability.

5.3.3 Strategies and Actions to Achieve Objective 3

Objective: Integrate poverty reduction and enhancement of local livelihoods in biodiversity conservation programmes in a mutually-reinforcing manner.

Strategy 1: ***Development and implementation of integrated conservation and development programmes (ICDPs)***

Action 1.1: Evaluate existing ICDPs to assess their strengths and weaknesses and draw lessons on what have worked and what have not;

Action 1.2: Complementary to the foregoing action, review existing strategies and approaches used for ICDPs and improve upon them, including development of a complete suite of planning, monitoring and evaluation guidelines and tools for ICDPs;

Action 1.3: Design and implement ICDPs to address the core issues of poverty and human-wildlife conflict. Recommended strategy is to focus on the 10 poorest *gewogs* and the 10 *gewogs* where human-wildlife conflict is most

severe and subsequently adapt/ replicate to additional *gewogs* depending on implementation capacity[78].

Strategy 2: ***Mitigation of human-wildlife conflicts and their impacts on biodiversity conservation and socio-economic development[79]***

Action 2.1: Develop and initiate workable crop and livestock insurance schemes for recovery of crop and livestock losses caused by wildlife incursion and predation;

Action 2.2: Reactivate the currently stalled livestock compensation scheme for wildlife predation. This would involve development of a financing plan and overhauling of procedures and protocols for assessment of compensation claims and disbursement of compensation. Revised procedures and protocols would need to look at incorporating community-based mechanisms for increased transparency and veracity;

Action 2.3: Design and implement measures to effectively protect crops against wildlife incursions. These may include improved fencing, use of visual and noise devices to deter wildlife, and planting of buffer species along farm boundaries;

Action 2.4: On a pilot scale and based on adequate ecological studies, initiate regulated hunting of wild pig as a part of sustainable nature tourism to generate direct economic benefits for the local communities. This intervention may need to be implemented on a priority basis, starting first in areas where crop depredation by wild pig is most severe;

Action 2.5: Carry out field surveys of overlaps between human settlements and wildlife habitats and migratory routes, and identify conflict hotspots. Based on the findings of the surveys, plan and implement voluntary resettlement and land-swapping programmes;

Action 2.6: Conduct detailed socio-economic surveys related to human-wildlife conflicts, establish baseline data, and create a central database on human-wildlife conflicts to monitor future trends and aid planning of appropriate interventions.

78 For synergy, this activity could tie up with the UNDP/ UNEP Poverty-Environment Initiative, which is planning to focus on poverty-environment mainstreaming in the 10 poorest *gewogs* on the country.

79 The activities presented herein have been largely extracted from the "Bhutan National Human-Wildlife Conflicts Management Strategy" produced in 2008 but have been stated here with some adaptation for concision and cohesion. It also may be noted several activities that have been outlined in the "Bhutan National Human-Wildlife Conflicts Management Strategy" do not feature here because they are contained, either explicitly or implicitly, in other areas of intervention presented in this Action Plan.

Strategy 3: ***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***

Action 3.1: Develop a social forestry development vision and strategy to realize forest conservation and local community development objectives in a sound and sustainable manner;

Action 3.2: Organize user groups and management plans for establishment of more than 300 community forest schemes within the next five years;

Action 3.3: Prepare management plans and establish 1,000 private forests within the Tenth Five Year Plan;

Action 3.4: Integrate sustainable use of at least 15 types of non-wood forest products in the community forest programmes;

Action 3.5: Evaluate the progress and impacts of the social forestry programmes, and incorporate lessons learnt in the further development of the programmes.

Strategy 4: ***Promotion of biodiversity resources use to support local livelihoods based on community-based natural resource management (CBNRM) framework.***

Action 4.1: Develop and establish CBNRM schemes to promote sustainable use of biodiversity resources that directly benefit local communities, starting with NWFPs for which management guidelines have already been developed by SFD;

Action 4.2: Continue and carry out research trials on domestic cultivation of medicinal and aromatic plants and, depending on the results, carry out extension activities to propagate it in the field using community-based approaches;

Action 4.3: Identify and promote alternatives to biodiversity resources, which are threatened by over-use or fall in core zones/ critical wildlife habitats.

Strategy 5: ***Creation of economic incentives for producers, especially small farmers, to conserve traditional crop varieties.***

Activity 5.1: Assess existing opportunities and potential options to create incentives for crop diversity conservation especially by small farmers;

Activity 5.2: Develop proposals for economic incentive-based crop diversity conservation programmes, including linkages with organic farming initiatives, and implement these programmes.

5.3.4 Strategies and Actions to Achieve Objective 4

Objective: Create public appreciation and support for biodiversity conservation through nature-based recreation and education.

Strategy 1: ***Establishment of a network of biodiversity-based public recreation parks and conservation facilities in various ecological zones.***

Action 1.1: Continue and consolidate the activities of the Royal Botanical Park in the Sinchula-Dochula-Helela cool/ warm temperate eco-zone, focusing on field conservation activities and visitor information development in a mutually-reinforcing manner;

Action 1.2: Develop the forest area around Kuenselphodrang Buddha monument in Thimphu as "Kuenselphodrang Nature Park" for conservation and public recreation purposes. This would include protection of existing forests, reforestation of degraded/ barren areas, development of a visitor center, and a network of trails, vantage points, and designated picnic spots;

Action 1.3: Plan and establish a "Bhutan Orchid Park" in the sub-tropical eco-zone. Preliminary activities would include socio-economic and biodiversity surveys followed by development of infrastructure for conservation works, public recreation and nature education activities;

Action 1.4: Create a service delivery system for technical backstopping and supply of seeds/ seedlings of native ornamental species for development of avenue plantations and municipal parks. Such a service would be built on partnership between the DoF and municipal authorities.

Strategy 2: ***Development and implementation of nature education and visitor information activities as an integral part of conservation management programmes in all protected areas and conservation areas.***

Action 2.1: Develop nature education and visitor information activities into a comprehensive programme, with linkages to sustainable nature tourism and ICDPs to the extent relevant, in all protected areas and conservation areas[80]. Such activities could revolve around unique local cultural and natural heritage.

80 A few protected areas and conservation areas do have comprehensive nature education and visitor information activities. For instance, RSPN is managing an excellent nature education and visitor information programme in Phobjikha conservation area, with activities largely revolving around the theme of black-necked cranes and their habitat. There is a need to develop similar programmes in other protected areas and conservation areas.

Strategy 3: ***Establishment of a fully-functional and well-equipped natural history museum.***

Action 3.1: Develop a plan for establishment of a fully-equipped natural history museum to showcase the country's natural heritage, inspire curiosity and learning of the natural world, and foster public support for nature conservation;

Action 3.2: Assess resources, i.e. land, funds and personnel, required for establishment of the natural history museum and mobilize resources accordingly;

Action 3.3: Establish the natural history museum with requisite infrastructure and trained personnel;

Action 3.4: Develop inter-institutional linkages with natural history museums in other countries for collaborative research and technical assistance in the management of collections and exhibits.

5.3.5 Strategies and Actions to Achieve Objective 5

Objective: Use biodiversity resources as a development capital for national economic growth but within the limits of environmental sustainability.

Basically two components have been identified for use of biodiversity as a development capital for national economic growth. One is bioprospecting and the other is sustainable nature tourism.

Bioprospecting

Rich biodiversity and widespread existence of traditional knowledge and practices regarding biodiversity among local communities make bioprospecting in Bhutan a potentially very lucrative conservation enterprise. Bioprospecting, which basically refers to exploration and utilization of biological materials with commercially and/or scientifically valuable genetic and biochemical properties, enhances the economic and ethical rationale for biodiversity conservation and fits in with Bhutan's policy of integrating biodiversity conservation and economic development objectives. It is particularly meaningful in the context of the country's environmentally sustainable development approach as it represents economic opportunities that are not resource use intensive and also helps attach a more precise value to preservation of biodiversity.

Although the potential for bioprospecting in Bhutan was recognized in BAP I itself, no concrete measures to promote bioprospecting have materialized largely because of a lacuna in the institutional setting and absence of legal framework. It is doubtful if any comprehensive bioprospecting programme can be established in the immediate future although some preparatory activities will need to be taken up for developing a full-fledged bioprospecting programme in the long term.

Strategy 1: ***Development of a comprehensive biodiversity policy and legal framework;***

Action 1.1: Review the Biodiversity Act of Bhutan 2003 with the primary purpose to assess its adequacy in addressing issues concerning access to biological resources, benefit-sharing, and protection of traditional knowledge and rights;

Action 1.2: Prepare Biodiversity Rules and Regulations for implementation of the Biodiversity Act of Bhutan 2003 and also incorporating the recommendations that emerges from the aforesaid review. In preparing the Biodiversity Rules and Regulations, inputs would be elicited from a wide range of stakeholders to encompass all relevant legal aspects of access, benefit-sharing and protection of traditional knowledge and rights;

Action 1.3: Finalize and subsequently disseminate the Biodiversity Rules and Regulations by way of printing and distribution of hard copies on a widespread scale as well as posting a soft copy on the internet;

Action 1.4: Print and distribute hard copies of the existing Biodiversity Act of Bhutan 2003 (which has been printed and distributed only limitedly since its enactment) on a widespread scale;

Action 1.5: Develop national policy framework and strategic guidelines on how to go about judicious utilization of biodiversity within the context of the country's overall sustainable development agenda.

Strategy 2: ***Systematic documentation and protection of traditional knowledge associated with biodiversity***

Action 2.1: Develop biodiversity-based traditional knowledge documentation format and collect data/ information based on this format;

Action 2.2: Develop database for biodiversity-based traditional knowledge and effectively manage the database for ready access by potential users;

Action 2.3: Concurrent with the foregoing actions, develop personnel capacity to document traditional knowledge and manage the database;

Action 2.4: Establish mechanisms for intellectual property rights enforcement and application with respect to biodiversity.

Strategy 3: ***Development of institutional mechanisms and technical capacity for bio-exploration;***

Action 3.1: Establish a well-equipped Bio-Exploration Laboratory within NBC. This would involve procurement and installation of laboratory equipments, tools and operational amenities;

Action 3.2: Construct a treatment plant for chemical wastes emanating from the Bio-Exploration Laboratory;

Action 3.3: Develop technical capacity for: PCR/HPLC analysis; biochemical extraction and fermentation; biochemical assays; and handling and maintenance of laboratory equipment;

Action 3.4: Record and consolidate information on medicinal plants, and prioritize for targeted research;

Action 3.5: Conduct bio-research and assays based on extract library and demand;

Action 3.6: Develop and diversify herbal products through scientific validation of traditional knowledge;

Action 3.7: Carry out marketing of bio-chemical and herbal products and of research results and services.

Strategy 4: ***Development of regional/international collaboration for bioprospecting;***

Action 4.1: Develop regional/international collaboration and negotiation skills of NBC and other relevant government agencies in relation to access and benefit-sharing of biodiversity resources;

Action 4.2: Visit regional/international bioprospecting and research companies and establish linkages;

Action 4.3: Establish regional/international collaboration arrangements by means of undertaking of Memorandum of Understanding (MoU) and Memorandum of Agreement (MoA) with appropriate bio-prospecting and research companies;

Action 4.4: Initiate advanced collaborative bio-research with bio-prospecting and research companies with whom MoU and MoA have been undertaken.

Sustainable Nature Tourism

Bhutan has the potential to be a premier destination for nature tourism in the region owing to its pristine assemblage of scenic landscapes, rich flora and fauna, vibrant traditions and culture, and small population size.

There is considerable scope for Bhutan to increase its economic gains from nature tourism without endangering its natural environment. Jigme Dorji National Park is already a tourist attraction. Other protected areas such as Thrumshingla National Park, Jigme Singye Wangchuck National Park, Bumdeling Wildlife Sanctuary, Sakten Wildlife Sanctuary and Royal Manas National Park have immense potential to become popular tourist destinations with improvement in infrastructure and access.

Strategy 1: ***Enhancement and systematization of sustainable nature tourism products in Bhutan***

Action 1.1: Assess existing nature tourism products such as the Crane Festival in Phobjikha, nature trek to Nubji-Korphu in Jigme Singye Wangchuck National Park. The assessment would need to look at two aspects. One, it needs to look for ways to enhance existing products especially in terms of socio-economic benefits to the local populace and increasing public appreciation and support for nature conservation. Two, it needs to look at their potential for replication/ adaptation to other areas in the country;

Action 1.2: Identify and develop new products for nature tourism. Some new potential nature tourism products include trout fishing, game hunting[81], health spas, river rafting, rock climbing, and farm stays;

Action 1.3: Streamline existing and new nature tourism products into a national sustainable nature tourism programme, involving tour operators, nature conservation authorities, and other stakeholders. Implement the programme in a phased manner depending on implementation capacity and consumer demand;

Strategy 2: ***Develop markets for sustainable nature tourism in Bhutan*.**

Action 2.1: Explore potential markets for various sustainable nature tourism products and develop marketing strategies, correlating market demands with the salient features of the products;

Action 2.2: Sensitize tour operators on correct marketing practices to build credibility of the country's tourism industry and sustain the markets for nature tourism products.

81 This is to be restricted to regulated hunting of wild pigs as a part of the Human-Wildlife Conflicts Management Strategy.

Strategy 3: ***Develop capacity for implementation and inter-institutional coordination of national sustainable nature tourism programme.***

Action 3.1: Develop and implement training programmes for tour operators to manage sustainable nature tourism;

Action 3.2: Develop best practices and minimum environmental impact codes for various nature tourism products, and train tour operators and guides in the employment of these practices and codes;

Action 3.3: Establish an inter-institutional body for coordinated implementation and monitoring of the national sustainable nature tourism programme, with linkages to the existing Association of Bhutanese Tour Operators

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Annex 1

BAP 2009 Preparation Team

Information Collection, Analysis and Report Writing

Ugen P. Norbu, Consultant, Norbu Samyul Consulting for Environment and Development

Singay Dorji, Senior Biodiversity Officer, National Biodiversity Centre

Project Management and Coordination

Singay Dorji, Senior Biodiversity Officer, National Biodiversity Centre

Advisory Support and Supervision

Dr. Tashi Yangzom Dorji, Programme Director, National Biodiversity Centre

Dr. Ugyen Tshewang, former Programme Director, National Biodiversity Centre

BAP 2009 Technical Group

Ganesh Chhetri, Department of Agriculture

Dr. Tashi Yangzom Dorji, National Biodiversity Centre

Dr. Sonam W Wang, Nature Conservation Division, Department of Forests

Sonam Choden, Nature Conservation Division, Department of Forests

Kaka Tshering, Forest Resources Development Division, Department of Forests

Sonam Lhundrup, Policy and Planning Division, Ministry of Agriculture

Tandin Wangdi, National Biodiversity Centre

Medon Yaganagi, National Biodiversity Centre

Asta M Tamang, National Biodiversity Centre

Rinchen Yangzom, National Biodiversity Centre

Singay Dorji, National Biodiversity Centre

Mahesh Ghimiray, RNR-RC Bajo, Ministry of Agriculture

Dr. Lham Tshering, Department of Livestock

Karma C. Nyedrup, National Environment Commission

Chukey Wangchuk, Bhutan Trust Fund for Environmental Conservation

Tshering Lhamtshok, Royal Society for the Protection of Nature

Vijay Moktan, WWF Bhutan Programme

Dr. Michael Tobias, Dancing Star Foundation, United States

Annex 2

Additional People Who Reviewed/Contributed Information

Sonam Tamang, National Biodiversity Centre
Rinchen Dorji, National Biodiversity Centre
Tshewang, National Biodiversity Centre
Ugyen Phuntsho, National Biodiversity Centre
Ngawang Gyeltshen, National Biodiversity Centre
Cheki Wangmo, National Biodiversity Centre
Dechen Lham, National Biodiversity Centre
Dr. Sangay Wangchuk, Nature Conservation Division, Department of Forests
Dr. Sonam Wangyel Wang, Nature Conservation Division, Department of Forests
Dr. Tashi Dorji, RNR-RC Bajo, Ministry of Agriculture
Sonam Wangdi, Nature Conservation Division, Department of Forests
Ugyen Namgyel, Nature Conservation Division, Department of Forests
Raling Ngawang, Royal Botanical and Recreation Parks Division, Department of Forest
G. B. Chettri, Department of Agriculture
Tshering Tashi, National Environment Commission
Dr. D. B. Rai, Department of Livestock
Dr. J.B. Gurung, Department of Livestock
Dr. Pema Wangda, RNR-RC Yusipang, Ministry of Agriculture
Dawa Penjor, National Mushroom Centre, Ministry of Agriculture
Medon Yaganagi, National Mushroom Centre, Ministry of Agriculture
Dorji, National Mushroom Centre, Ministry of Agriculture
L.B. Tamang, National Mushroom Centre, Ministry of Agriculture
Dr. Tashi Dorji, RNR-RC Jakar, Ministry of Agriculture
Tshewang Dorji, RNR-RC Yusipang, Ministry of Agriculture
Phurpa Wangchuk, Institute of Traditional Medicine Services, Ministry of Health
Sonam Dorji, Institute of Traditional Medicine Services, Ministry of Health
Kuenga Jamphel, Institute of Traditional Medicine Services, Ministry of Health
Tashi, Institute of Traditional Medicine Services, Ministry of Health
Doley Tshering, United National Development Programme
Karma L Rapten, United National Development Programme
Tashi Dorji, United National Development Programme
Sonam Y Rabgye, United National Development Programme
Rebecca Pradhan, Royal Society for Protection of Nature
Ashit Chhetri, Natural Resources Development Corporation Ltd.
Narayan Pradhan, Natural Resources Development Corporation Ltd.

Annex 3

Brief Descriptions of Protected Areas

Bumdeling Wildlife Sanctuary

With an area of 1,521 km^2, Bumdeling Wildlife Sanctuary is situated in the northeastern corner of the country. It is bordered by Khoma Chhu in the west, the Tibetan Autonomous Region of China in the north, the Indian State of Arunachal Pradesh in the northeast, Womenang Chhu and Kulong Chhu in the east, and Nindari Chhu and Sheri Chhu in the south. The Wildlife Sanctuary came into existence following the revision of the protected areas system in 1993. Prior to that, the area was a part of the huge Jigme Dorji Wildlife Sanctuary, which was virtually a "paper park" with no regular conservation programme in place. Conservation programme was initiated in the sanctuary in 1998 with the initial focus being on carrying out a series of biological and socio-economic surveys, preparing a five-year conservation management plan based on the results of these surveys, and starting off some integrated conservation and development activities to build confidence and a good partnership environment with the local communities and *dzongkhag* authorities. With the development of the conservation management plan and commencement of its implementation in July 2001, a more comprehensive conservation programme has been since underway.

More than 2,200 people live in the sanctuary and adjoining buffer zone. Majority of these people are farmers subsisting on crop agriculture and livestock rearing. The most important crops are millet, maize, paddy and potato. The main livestock kept are cattle, equine and sheep. Only five households possess yaks but their herds are huge, averaging 70 yaks per herd. Also integrated in the rural livelihood system is the collection and use of a wide range of forest products. Apart from construction timber and fuelwood, other forest products that are used include animal fodder, roofing shingles, leaf litter for farmyard manure, bamboo and cane, daphne bark for paper-making, incense and medicinal plants, tree burrs for making wooden bowls and containers, incense and medicinal plants, and forest food such as mushrooms, fiddlehead ferns, wild tubers, and dambru (green leafy vegetable)

The highest point in the sanctuary is at 6,450 m and the lowest is at 1,500 m. However, much of the sanctuary lies between 2,400 and 5,000 m, with temperate broadleaf forest, pine forest, conifer forest, alpine scrub and meadows being the dominant vegetation types. Key fauna include Bengal tiger, snow leopard, Himalayan black bear, musk deer, capped langur, red panda, rufous-necked hornbill, Assamese macaque *Macaca assamensis*, Asiatic wild dog *Cuon alpinus*, and Himalayan serow. More importantly, the Bumdeling valley is the second major wintering habitat for the black-necked cranes in the country, with some 150 – 170 cranes roosting each year.

Wangchuck Centennial Park

Declared in December 2008 as a tribute to the Kings of Bhutan and in commemoration of 100 years of monarchy, Wangchuck Centennial Park is the newest protected area in

the country. The protected area has an area of 4,914 km^2, making it the largest in the country. It has some of the country's highest mountain peaks such as Gangkar Puensum and Rinchen Zoegila, and is the headwater source to three major rivers namely Puna Tsang Chhu, Mangde Chhu and Kuri Chhu. With an altitudinal range from 2,600 m to over 7,000 m, the area has a rich variety of wild fauna and flora. More than 242 species of vascular plants belonging to 51 families have been so far recorded in the park. A large number of these have high medicinal value, adding credence to the portrayal of Bhutan as "Druk Lhomenjon", meaning the land of medical herbs. The park is so far known to harbor 23 mammal species, including several globally threatened species like the snow leopard, Bengal tiger, takin, musk deer, Himalayan black bear, and red panda. Tibetan wolf, found nowhere else in Bhutan, is also known to occur in the park. The park's birdlife is outstanding with more than 134 species recorded so far, including two new species – Brandt's Mountain Finch *Leucosticte brandtii* and the Tibetan Blackbird *Turdus maximus* – earlier not recorded in the country. More than 8,000 people live in eight major villages within the park. Living in the highlands, the local people are mostly yak herders and farmers.

Jigme Dorji National Park

The 4,316 km^2 park is the second largest protected area in the country. It is situated in the northwestern corner of the country, transcending the boundaries of Paro, Thimphu, Gasa and Punakha *dzongkhags*. With altitudes ranging from 1,400 to over 7,000 m, the park contains eight of the eleven classified vegetation zones found in the country. This variety of vegetation zones has given rise to a striking array of flora and fauna. More than 30 species of mammals, 300 species of birds, and 1,400 species of plants have been recorded, including several globally threatened species such as tiger, snow leopard, Himalayan black bear, takin, musk deer, and black-necked crane. The Tsharijathang valley between Lingshi and Laya is perhaps the most important summer ground for takin.

Some 6,500 people live in the park, largely subsisting on semi-nomadic yak-herding, raising of other livestock, agriculture, harvesting of medicinal and incense plants, and use of other forest products. By virtue of having several scenic trails and being relatively close to Thimphu and Paro – where the country's only international airport is located – the park is the most popular destination among trekking tourists. On average, a thousand international trekkers visit the park each year despite limited infrastructure and facilities along the way. In addition, the Gasa *Tsachhu* (hotsprings) attracts a few thousand pilgrims – mostly Bhutanese – every year.

Jigme Singye Wangchuck National Park

Formerly known as Black Mountain National Park, the park came into being as a result of the revision of the protected areas system in 1993. The 1,730 km^2 park is located in the center of the country, covering parts of Trongsa, Zhemgang, Wangduephodrang, Sarpang and Tsirang *dzongkhags*. It shares a contiguous boundary with Royal Manas National Park to its south, which then runs along the Mangde Chhu till Chendebji from where the boundary skews westwards along Khabe Chhu through Khebethang joining Sunkosh at Kame Chhu. From Kame Chhu, the boundary runs along Sunkosh till Hara Chhu.

Around 5,000 – 6,000 people live within the park, with another 10,000 – 15,000 estimated to be living within 3 – 5 km outside of the park boundary. Major human concentrations are in Phobjikha valley, Tangsibji and Langthel *gewogs* in Trongsa, Zhemgang-Tingtibi area, and southern *gewogs* of Doban and Surrey in Sarpang. As in most parts of rural Bhutan, the local people live from crop agriculture and livestock rearing. Agriculture cultivation is practiced by nearly all the households with local communities in Gangtey and Tangsibji having strong orientation to livestock rearing. Major crops grown are paddy, maize, wheat, buckwheat, millet and potato. Major livestock reared by the local people are cattle, yaks, sheep and goat, an equine. Use of forest products is also crucial for local subsistence. A partial ethnobotanical inventory lists some 95 species of plants that the local people use for food, shelter, household implements, and medicine.

With a dramatic variation in altitude from less than 200 m to nearly 5,000 m, the park encompasses a wide range of habitats from the moist sub-tropical forest in the south to the tundra and permanent ice fields in the north. However, what characterizes the park most is the temperate forest, which is reportedly among the largest and richest in the entire Himalayas. Largely as a result of vast tracts of primary forest, the park is very rich in birdlife. 395 species of birds have been recorded to occur in and around the park based on field surveys and literature review. These include rufous-necked hornbill, Ward's trogon, Satyr tragopan, and white-bellied heron. The adjacent Phobjikha valley to the northwest is the most important wintering for the black-necked crane in the country with more than 200 cranes roosting each year. In terms of mammals, more than 50 species have been estimated to inhabit the park, including significant populations of tiger, red panda, musk deer, golden langur and Himalayan black bear. Other important mammal species found in the area include clouded leopard, leopard cat, serow, and Asiatic wild dog.

Khaling Wildlife Sanctuary

With an area of 335 km^2, Khaling Wildlife Sanctuary is the second smallest protected area in the country and lies entirely inside Samdrup Jongkhar *dzongkhag*. The sanctuary is an extended modification of the earlier Neoli Wildlife Sanctuary. It is situated on the southeastern edge of the country, bordered by the Indian State of Assam to its east and south, Nyera Ama Chhu to its west, and Martshala and Shingkhar Lauri *gewogs* to its north.

No protected area surveys have been carried out so far but the area is known to be a very good habitat for the rare pygmy hog *Sus salvanius*, Asian elephant and tiger. Population is concentrated in the southwestern and southeastern niches of the sanctuary, with Samrang and Daifam being the major settlements.

Phipsoo Wildlife Sanctuary

Phipsoo Wildlife Sanctuary is the smallest protected area in the country. The 269 km^2-protected area lies entirely inside Sarpang *dzongkhag* and borders the Indian State of Assam in the south, Sunkosh Chhu in the west, Beteni *gewog* in Tsirang *dzongkhag* in the north, and Hile *gewog* in the east. Although a comprehensive conservation management programme is yet to be developed, basic conservation infrastructure is in place. The

sanctuary is unique for it has the only natural sal (*Shorea robusta*) forest in the country and is a prime habitat of spotted deer *Axis axis*. It has the strongest representation of the tropical/ sub-tropical ecosystem in the country. Other key fauna include tiger, Asian elephant and golden langur. In terms of human population, it is relatively uninhabited except for the southwestern edge.

Royal Manas National Park

The 1,057 km^2-park has the distinction of being the country's oldest protected area. Even prior to its official notification as a protected area in 1966, it was maintained as a *de facto* wildlife preserve for many years under the patronage of the Royal Family. Transcending the boundaries of Samdrup Jongkhar, Sarpang and Zhemgang *dzongkhags*, the park is contiguous to India's Manas Tiger Reserve in the south and Jigme Singye Wangchuck National Park in the north. Together, these three protected areas make the single most important protected region in all of Asia, with a truly unique biological treasure encompassing extremely diverse habitats ranging from grasslands and tropical deciduous forests to alpine meadows and perpetually snow-covered mountain tops in the north.

Tropical monsoon forest, evergreen tropical and sub-tropical forest, and warm and cool broadleaf forests characterize the park. In fact, it has the largest representation of tropical/ sub-tropical ecosystem among all protected areas. More than 900 species of plants have been recorded, including 348 species of trees, 206 species of shrubs, 90 species of climbers and twiners, 192 species of herbs, and nine species of orchids. With respect to fauna, 45 species of mammals and 366 species of birds have been recorded. Mammal species include several globally threatened species such as the Bengal tiger, clouded leopard, Asian elephant, sloth bear *Melursus ursinus*, Himalayan black bear, gaur *Bos gaurus*, wild water buffalo *Bubalus arnee*, serow, golden langur, and hispid hare *Caprolagus hispidus*. Among birds are globally-threatened species such as the rufous-necked hornbill, chestnut-breasted partridge, white-naped yuhina, and Pallas's fish eagle. Tiger status surveys suggest that the country's tiger density would be highest in the Manas area with about one adult tiger in every 50km^2.

Around 2,800 people live inside the park area and 4,500 in the buffer zone (Norbu 1998). The economic mainstay of the local people is largely subsistence crop agriculture. *Tseri* or slash-and-burn cultivation is an important agriculture practice although since the beginning of the Fourth Five Year Plan (July 1997 – June 1982) more sedentary forms of agriculture have been encouraged by the government through construction of irrigation facilities and supply of improved agricultural seeds. Main crops grown are maize, paddy, buckwheat, millet, and foxtail millet. Cash crops include mustard, orange and cardamom. Important livestock kept by the local people include cattle, chicken, pig, and goat. As in other protected areas, use of forest resources is pronounced and complementary to crop farming and livestock rearing. Most prominent of all is the ingenious use of bamboo and cane for a number of varied purposes ranging from food and water containers to fodder and fuel to roofing, walling and flooring of houses.

Sakten Wildlife Sanctuary

The easternmost of all protected areas, Sakten Wildlife Sanctuary is in Trashigang *dzongkhag*. The 741 km^2-sanctuary is bordered by the Indian State of Arunachal Pradesh in the north and east, Phongme *gewog* and Kangpara *gewog* in the west, and Shingkhar Lauri *gewog* in Samdrup Jongkhar in the south. Local anecdotes have it that the abominable snowman Yeti or *Migoe* (the existence of which is yet to be scientifically proven) inhabits the sanctuary. The conservation significance of the sanctuary lies in the vast, pristine mixed conifer forest tracts and the diversity of rhododendron species, which is said to be the highest in the country. Biological and socio-economic assessments have been initiated and their results will form the basis for preparation of a conservation management plan. The development of the conservation management plan and construction of park infrastructure are being financially supported by the MacArthur Foundation.

Thrumshingla National Park

Thrumshingla National Park, 905 km^2 in area, is a product of the revision of the protected areas system in 1993. Mixed conifer and broadleaf forests are predominant, covering more than 66 and 23 per cent of the park area respectively. A prominent feature of the park is the old growth fir forest with thick undergrowth of rhododendrons. Some 622 species of plants have been recorded in the park so far. Plant endemism is high with recent surveys listing 21 endemic species including *Lobelia nubigena*, which is found only in the park and that too in one locality only. In terms of fauna, 68 species of mammals and 341 species of birds have been recorded. Among mammals, key species include the Bengal tiger, leopard, leopard cat, clouded leopard, Himalayan black bear, red panda, musk deer, capped langur, and Malayan giant squirrel. Birdlife includes globally important species such as rufous-necked hornbill, beautiful nuthatch, ward's trogon, white-naped yuhina, and brown wood owl *Strix leptogrammica*. Birdlife International has recognized the park as an Outstanding Important Bird Area in the Sino-Himalayan mountain forests.

Administratively, the park spreads into Bumthang, Mongar, Zhemgang and Lhuentse *dzongkhags*. The park management headquarters is located in Ura with warden posts at Autsho to cover the eastern sector, Lingmethang to cover the central sector, and Ura to cover the western sector. A total of eight guard posts have been planned: at Ladong and Gorsum under Autsho warden post; at Sengor, Tsamang and Ganglapang under Lingmethang warden post; and at Chungphel, Tang and Kheng Shingkhar under Ura warden post. Park infrastructure development is ongoing as a part of the implementation of the conservation management plan, which commenced in July 2002. The park is estimated to have around 2,000 people living inside its boundaries and 11,000 in the buffer zone.

Torsa Strict Nature Reserve

The 610 km^2 Torsa Strict Nature Reserve lies mostly in Haa *dzongkhag* with a very small area spreading south into Samtse *dzongkhag*. It protects the westernmost variant of central, temperate forests in the country. With the reserve being virtually uninhabited, it is known to have one of the most pristine temperate forests and alpine vegetation in the entire Himalayas.

Annex 4

Matrix Correlating Objectives and Strategies to Trends Affecting Biodiversity

Objective	Strategy	Trends Affecting Biodiversity
1. Protect natural ecosystems from degradation and fragmentation as a consequence of environmentally-intrusive human activities and their impacts	1. Protection and management of protected areas and connecting biological corridors	Forest harvesting, livestock grazing, forest fires, wildlife poaching, land use change and conversion
	2. Protection and management of conservation areas outside the protected areas system	Forest harvesting, livestock grazing, forest fires, wildlife poaching, land use change and conversion
	3. Management of forest resources for sustainable production and utilization	Forest harvesting, livestock grazing, forest fires, wildlife poaching, land use change and conversion
	4. Development and implementation of a comprehensive forest fire management programme	Forest fires
	5. Reduction of grazing pressures on natural ecosystems	Livestock grazing
	6. Development and implementation of measures to protect natural ecosystems against invasive species	Invasive species
	7. Sustainable land management to protect the productivity and stability of various land uses	Land use change and conversion
	8. Development and implementation of measures to mitigate the impacts of climate change on natural ecosystems	Climate change
	9. Enforcement of environmental impact assessment requirements	Infrastructure development, industrialization
	10. Harmonization of biodiversity conservation and infrastructure development/ urban development plans	Urbanization, infrastructure development, hydropower development

Objective	Strategy	Trends Affecting Biodiversity
2. Protect species and genetic diversity in general but more especially those species and their genetic variants that have immense ecological, economic, scientific, and cultural values	1. Control and reduction of poaching of wildlife and illegal trade in their parts and products	Wildlife poaching
	2. Conservation of globally threatened species and their habitats	Wildlife poaching, land use change and conversion
	3. On-farm conservation of plant genetic resources (PGR) in arable agriculture ecosystems	Consumption trends and market forces
	4. Ex-situ conservation of PGR for sustainable agriculture	Consumption trends and market forces
	5. Establishment of a full-fledged gene bank for sustainable livestock development and production	Consumption trends and market forces
	6. Conservation of indigenous breeds of livestock using farm-based approaches	Consumption trends and market forces
	7. Development and implementation of measures to mitigate the impacts of climate change on keystone/ flagship species	Climate change
	8. Development of a national biodiversity information system that will aid monitoring the state of biodiversity resources, identification of existing and emerging pressures, and planning of appropriate conservation responses.	Does not correspond to any particular trend but is important for implementation of other strategies

Objective	Strategy	Trends Affecting Biodiversity
3. Integrate poverty reduction and enhancement of local livelihoods in biodiversity conservation programmes in a mutually-reinforcing manner	1. Development and implementation of integrated conservation and development programmes (ICDPs)	Poverty
	2. Mitigation of human-wildlife conflicts and their impacts on biodiversity conservation and socio-economic development	Human-wildlife conflict, poverty
	3. 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	Poverty
	4. Promotion of biodiversity resources use to support local livelihoods based on community-based natural resource management (CBNRM) framework.	Poverty
	5. Creation of economic incentives for producers, especially small farmers, to conserve traditional crop varieties.	Poverty, consumption trends and market forces
4. Create public appreciation and support for biodiversity conservation through nature-based recreation and education	1. Establishment of a network of biodiversity-based public recreation parks and conservation facilities in various ecological zones	All the strategies under objective 4 do not correspond to any particular trend but is important to create a conducive social environment for implementation of other strategies
	2. Development and implementation of nature education and visitor information activities as an integral part of conservation management programmes in all protected areas and conservation areas	
	3. Establishment of a fully-functional and well-equipped natural history museum	

Objective	Strategy	Trends Affecting Biodiversity
5. Use biodiversity resources as a development capital for national economic growth within the limits of environmental sustainability.	*Bioprospecting-related Strategies*	The strategies for bio-prospecting and sustainable nature tourism are basically meant to enhance the economic rationale for biodiversity conservation and are expected to also contribute to poverty alleviation/livelihood enhancement
	1. Development of a comprehensive policy and legal framework for bioprospecting in the country	
	2. Establishment of systematic documentation and protection of traditional knowledge associated with biodiversity	
	3. Development of institutional mechanisms and technical capacity for bio-exploration and research	
	4. Development of regional/ international collaboration for bioprospecting and research	
	Sustainable Nature Tourism related Strategies	
	1. Enhancement and systematization of sustainable nature tourism products in Bhutan	
	2. Development of markets for sustainable nature tourism in Bhutan	
	3. Development of capacity for implementation and inter-institutional coordination of national sustainable nature tourism programme	