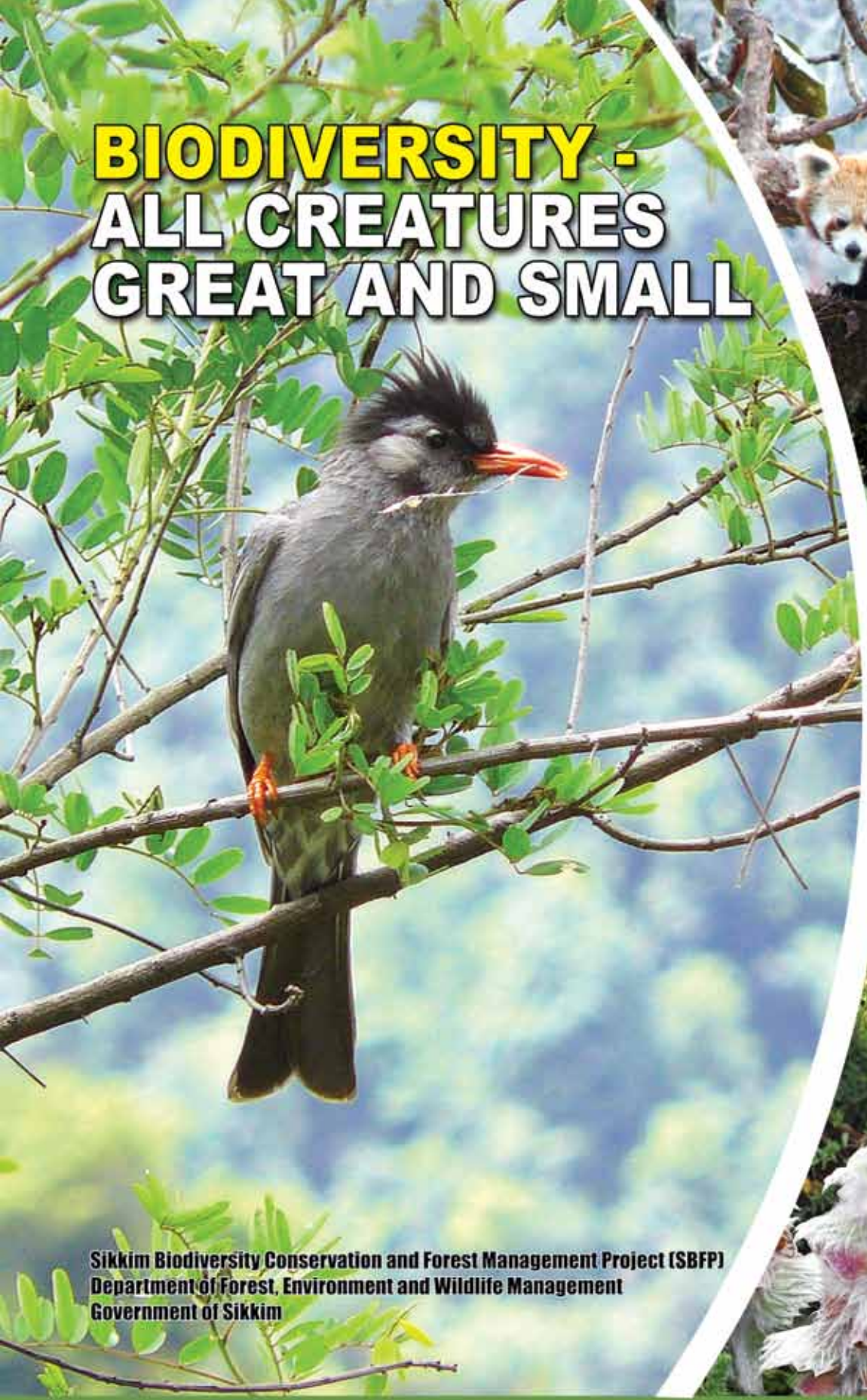
BIODIVERSITY - ALL CREATURES GREAT AND SMALL



Sikkim Biodiversity Conservation and Forest Management Project (SBFP)
Department of Forest, Environment and Wildlife Management
Government of Sikkim

BIODIVERSITY -
All Creatures Great and Small

Potentilla fruticosa

Sikkim Biodiversity Conservation and Forest Management Project (SBFP)
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Gentiana stipitata

BIODIVERSITY -
All Creatures Great and Small

Published by :

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Photographs given by: Sandeep Tambe (Biodiversity Book), Dechen, Anabalagan, Kusel.

Contents

Snow Partridge

Conifer forests

Pawan Chamling
(Honoris Causa)
Chief Minister of Sikkim

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Message

I am delighted to know that the booklet entitled **"Biodiversity – All Creatures, Great and Small"** is being published by the Forest, Environment and Wildlife Management Department.

Biodiversity plays critical economic, social and cultural roles; it helps regulate air quality and climate as well as playing a part in nutrient cycling, plant pollination and flood control, to name but a few. Although the products and services rendered by biodiversity in Sikkim provide a healthy environment for all our citizens, it is also a major source of sustenance and livelihoods for many forest-fringe villagers. In this regard, the JICA-supported Sikkim Biodiversity Conservation and Forest Management Project, is implementing activities to conserve and improve our biodiversity, environment and the livelihood opportunities for forest fringe dwellers.

We all know that human well-being critically depends on the ecosystem services provided by biodiversity. Its loss and continuous degradation throughout the planet present one of the major environmental challenges to human survival and prosperity in the 21st century.

It is incumbent on us all to do everything in our power to protect our valuable biodiversity for the benefit of future generations. Increasing awareness and understanding on biodiversity and its sustainable use is a first step in this process.

I am confident that this book – written in clear, non-technical language - prepared by the Department of Forests, Environment, and Wildlife Management will help in educating people and disseminating knowledge and information on the importance of biodiversity – both globally and in Sikkim.

Pawan Chamling
Chief Minister of Sikkim
Gangtok

Allium wallichii (Jungali Piyaj)- Thangsing, Sikkim

Bhim Dhungel
MINISTER

Message

I am delighted to know that the Japan International Cooperation Agency (JICA) assisted Sikkim Biodiversity Conservation and Forest Management Project (SBFP), Department of Forests, Environment and Wildlife Management is bringing out a booklet entitled "Biodiversity –all creatures great and small".

Sikkim with just 0.2% of the total geographical area of the country has tremendous biological diversities, and we are privileged to witness it at present and are committed to conserve it for the generations to come. The State Government has taken several measures to preserve our ecological treasure house.

This booklet will generate awareness about fundamental facts like what is biodiversity, what can be done to protect and conserve it and what we are doing in Sikkim in particular and also what we are doing in the country. This will further create clear understanding that the key to environmental and ecological security depends on conservation of biological diversity that we have, so that we can pursue our goal of a clean and green State, Nations and the World at large.

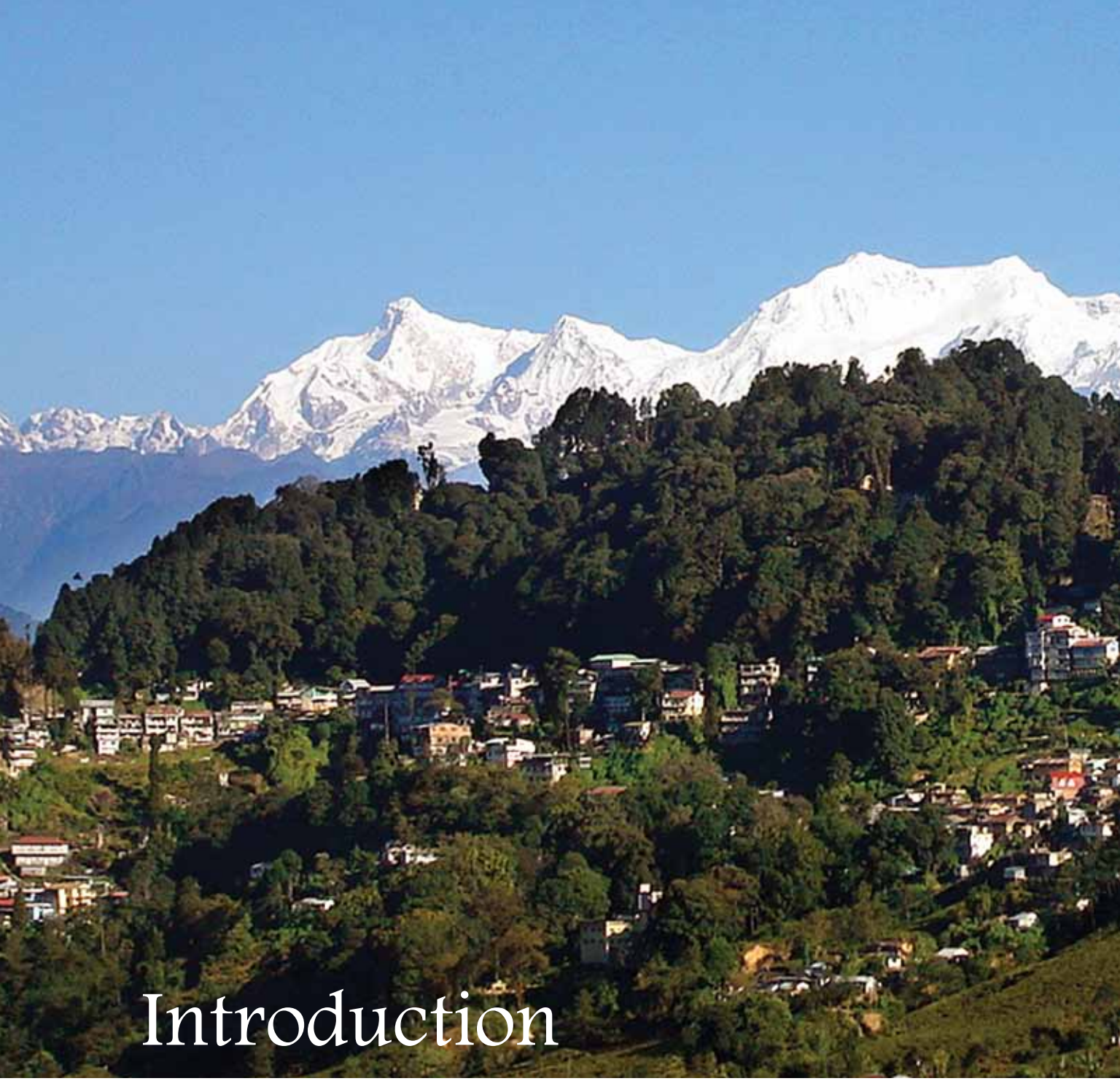
Such publications will add to the efforts to the conservation programmes by motivating people to contribute to the work of protection of nature creating awareness among the various sections of the society so that willing support of communities can be obtained in this endeavour of ours.

I am sure that this booklet will serve the objective of inculcating interest in preservation of our natural heritage. I congratulate the Project under Forest Department for bringing out this booklet.

With best wishes

1/6/2012

(Bhim Prasad Dhungel)
Minister Forest, Env. & WL Mngmnt. Deptt/
Tourism & Civil Aviation
Government of Sikkim



Introduction

Sikkim has an amazing natural environment, with a rich variety of fauna and flora within a very small geographical area. Indeed such is the variety, that the area is termed as a biodiversity 'hotspot' – one of only two in India (and thirty four worldwide). Much of this amazing diversity can be attributed to the enormous altitudinal range found within the State – from about 300m to over 8,500m and the contiguity of habitats, which range from sub-tropical forests to high altitude cold deserts.

Biological diversity is confusing to a lot of people because in fact it is very many things at the same time. Biodiversity, short for biological diversity, describes the variety of living organisms of all kinds--animals, plants, fungi, and microorganisms like bacteria and viruses--that inhabit a particular area. Most commonly, biodiversity is measured by the number of

Mt Kangchenjunga and its range

species in an ecosystem. If you look at it through evolutionary perspectives and think of it in terms of the radiation of evolutionary lines, biological diversity can be seen as a characteristic of natural communities:

Current estimates of this diversity range from 5 to 50 million. Of this, humans know only 1.7 million. It is worth remembering that the human species is ONLY ONE out of these millions!

All levels of biodiversity are required for the continued survival of species and natural communities; and all are important for the survival of us, Humans.

This booklet is intended to explain what biodiversity is, why it is important and what is being, and what can be done, to protect this remarkable heritage with particular reference to Sikkim.

Prek chu valley with Mt Pandim in the backgroud

Besra

What is Biodiversity?

Through four billion years of evolution, life on earth has expanded to almost infinite diversity, each species interacting with others and molding itself to its habitat until a global ecosystem developed. This diversity of life forms is commonly referred to as **biodiversity**.

The word Biodiversity is a contraction of two words: 'Biological' and 'Diversity'. Literally it refers to the number, variety and variability of all life forms on the earth. These include millions of plants, animals and micro-organisms, the genes they contain, and the intricate ecosystems of which they are the part. Most commonly, biodiversity is a measure of the number of species in an ecosystem. If you look at it through evolutionary perspectives and think of it in terms of the radiation of evolutionary lines, biological diversity can be seen as a characteristic of natural communities.

The Convention on Biological Diversity (1992) defines biodiversity as:

The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

What is the importance of Biodiversity

Biodiversity matters for each and every one of us. At the most basic level, biodiversity provides the very foundation of Planet Earth's life support system. All species, including humans, require a range of basic resources to keep them alive and healthy. Humans need oxygen to breathe, water to drink, food to eat and shelter from the weather. The living things on our planet provide many of these things for us, so their conservation is vital if we are to survive.

Preserving Planet Earth's biodiversity is also essential because:

- No-one knows just what other benefits may be lost when species become extinct or what impact this will have on other species or habitats.
- Species and genes cannot be created but they are being destroyed due to continued anthropogenic pressures
- Healthy natural ecosystems help control flooding, drought and soil erosion.
- The quality of our lives is greatly enriched by the natural environment
- All species have as much moral right to exist as humans.

Human life itself depends on the relationships between all living creatures and their environment, yet a lot of human activity is having a negative impact on biodiversity across the world: the growth of urban settlements and industrial development, intensive farming methods, the introduction of non-native species, transport and pollution have all led to huge habitat and species decline and in some cases, extinction. The need to restore this 'balance of nature' has never been so urgent.

Tangible Benefits

Biodiversity is not only crucial, but also brings immeasurable benefit to human lives. Some of these are as follows

Food

Plants are the primary producers on our planet. They can convert inorganic components of the environment into complex organic compounds in the presence of sunlight. More than 90% of the calories consumed by people worldwide come from about 80 plant species, out of which staple food is provided mainly through three main species: wheat, rice and maize.

Valley rice cultivation at Sang-Martam, East Sikkim

Timber, fuel, fibre and other resources

Biodiversity provides us with timber, bamboo and rattans to build our houses and make our furniture; a variety of fibres to make our clothes (like cotton, jute and silk), fuel to burn and other resources such as oils, resin, gums, rubber etc.

Ningro-Edible Fern

Cordyceps sinensis (Yarcha Gompu)

Medicines

It is estimated that 80% of the world's population uses plants as a primary source of medicine. About 30% of commercial pharmaceuticals are also developed from plants, animals and micro-organisms. Many antibiotics (such as penicillin) are extracted from fungi, anti-malarial drugs are extracted from the bark of chincona trees, ovarian and breast cancer treatments have been developed from yew bark (Taxus sp), laxatives and anti-inflammatory drugs are developed from Terminalia species, etc.

Intangible Benefits

Ecosystem Services

White-capped Water Redstart

Biodiversity provides us with many life-sustaining services.

For example:

Air and Water Purification

Plants maintain the air we breathe and the water we drink. Forests play a great role in sequestering carbon dioxide, releasing oxygen, regulating water vapour and recycling nutrients. They also have an impact on the climate of an area and play a crucial role in maintaining the water cycle. Wetlands and the species inhabiting them also act as water filters. Further, algae living in oceans also take up carbon dioxide and release oxygen.

Drought and Flood Control

Plant communities, especially in forests and wetlands, help to control floods by acting as soil binders and recharge ground water resources. Their root systems hold soil, preventing erosion and mudslides. By regulating water vapour in the atmosphere, they help to prevent drought. These natural flood and drought control services are particularly important for people living along rivers and in arid regions.

Cycling of Nutrients

Scientists have estimated that one pinch of soil can contain more than 30,000 protozoans, billons of bacteria, a large number of fungi and algae and many insects, worms and mites. These help to break down dead plants and animals and recycle nutrients into organic materials which enrich the soil.

Habitat Conservation

Forests, wetlands, oceans, lakes and rivers provide shelter to thousands of birds, fish, animals, insects etc. Even open spaces in cities can harbour significant biodiversity.

Pollination

It is estimated that 30% of our food crops rely on services of natural pollinators such as honey-bees, birds, bats, insects, butterflies, spiders, etc. However, we seldom recognize their value in economic terms. Elimination of a species of insect which is solely responsible for the pollination of a particular plant species can, lead to the loss of that plant species.

Ecotourism

Many countries around the world earn a lot of revenue by promoting tourism in their areas of natural beauty. Sikkim is famous for its natural beauty and biodiversity. There is potential to earn millions of rupees from tourism – homestays, camping, hiking, wildlife photography etc. in such areas.

Mein Moi Tso Lake

Biodiversity in Sikkim

Snow Leopard

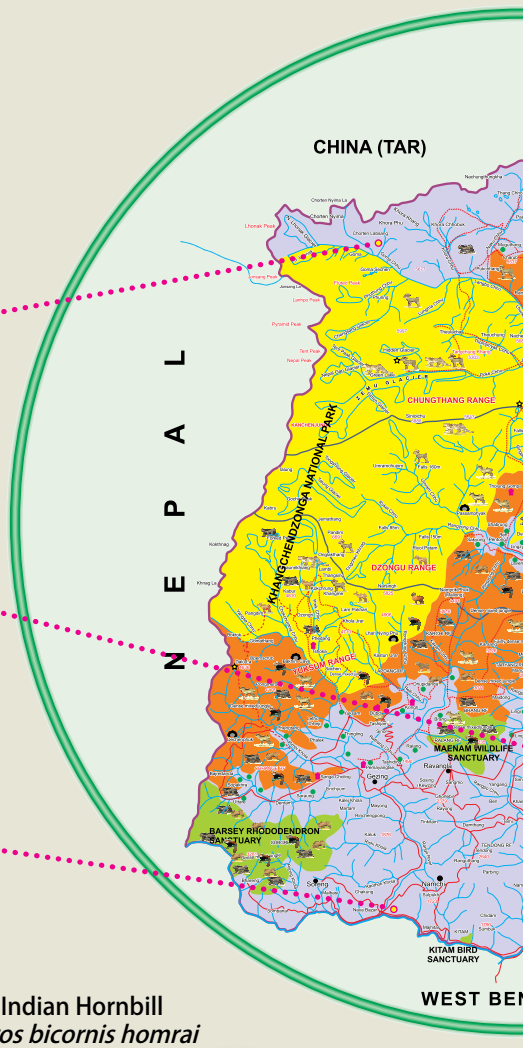
Rhododendron niveum

Mt. Khangchendzonga

TRANS-HIMALAYAN SIKKIM extend from 4500 m to 5500m with characteristic cold desert vegetation exclusive restricted to the north of Sikkim

Sub-Tropical ecoregion Fambong Lho Wildlife Sanctuary in East Sikkim and Maenam Wildlife Sanctuary in South Sikkim are the two protected areas in this ecoregion

Tropical ecoregion extends roughly from the foothills of the outer Himalayas to an altitude of about 1200m.



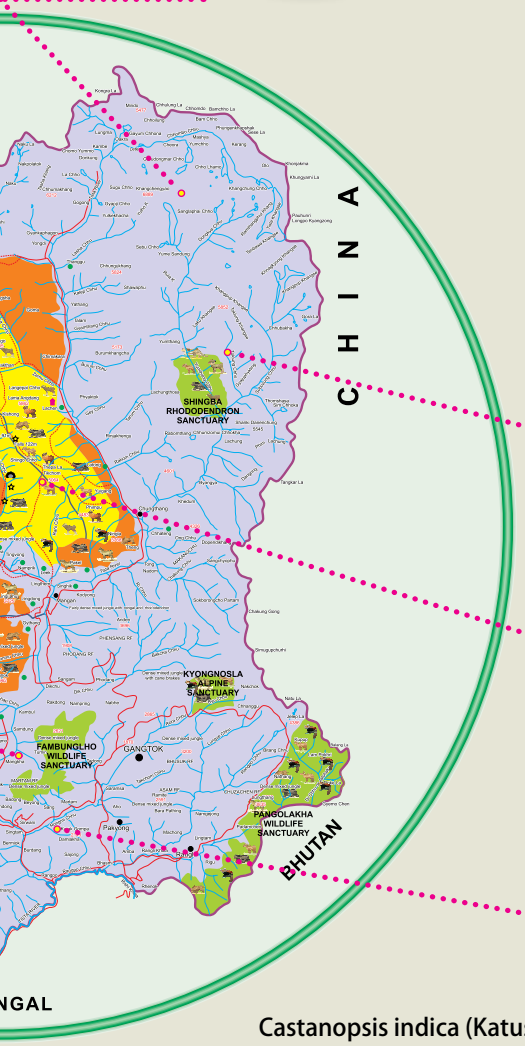
Takydromus sikkimensis

The Rangit Valley Sal *Shorea robusta* in this region shows a unique association with the Chir Pine *Pinus roxburghii.*

Great Indian Hornbill *Buceros bicornis homrai* locally called 'Hongraio'

Tibetan Argali

Blue Sheep



Temperate ecoregion
The Temperate and Alpine ecoregions are protected in four wildlife sanctuaries at Shingba (North), Kyongnosla (East), Pangolakha (East) and Barsey (West) and one national park namely Khangchendzonga National Park (North and West)

Seabuckthorn-Leh Berry

Temperate ecoregion
extends from 3000m to 4000m with mixed coniferous forests

Maling and Tsuga-Spruce forest

Sub-Tropical ecoregion
extends up from about 1800 m to 3000m. The rainfall in this zone is the heaviest and conditions remain humid throughout the year.

Castanopsis indica (Katus)

Satyr Tragopan

Cultural and Inspirational attributes

Our Sikkimese culture invokes respect for and protection of nature. We revere the sun, the soil and water in our hymns and scriptures. Many plants and animals have been identified as sacred and are used in our religious, spiritual and cultural beliefs. Many of our rituals, festivals and holidays are based on plant and animal species. Nature is also an unsurpassed source of relaxation, beauty and peace which helps to relieve us of our stress and rejuvenate our mental health.

Red Panda

Leopard Cat

Why should we be worried?

In recent years, human activities have caused a rapid decline in biodiversity, mainly through over-exploitation and habitat destruction. Some species become naturally extinct over time. Based on fossil records, scientists have estimated that one to ten species are lost every year as a part of this natural process. However, during certain periods of geological time, a large number of species have been lost quickly, for example, when the dinosaurs died out. Scientists have documented five mass extinctions since the emergence of life on this planet. It is widely accepted that the rate of extinction is exceptionally high now, mainly due to anthropogenic (man-made) pressure. A growing human population, over-exploitation of natural resources, industrialization and urbanization and the resultant pollution of the environment are exerting an unprecedented pressure on the planet, thus affecting its biological diversity. Many of the species becoming extinct have not even been described by scientists.

It is important that we promote sustainable development and take action to conserve our natural resources.

What causes Biodiversity loss?

The leading causes of reduced biodiversity include loss or fragmentation and degradation of natural habitats, over-use of natural resources, pollution, climate change and the introduction of invasive alien species.

Habitats all over the world are changing because of disturbances created by humans

Paphiopedilum ferranium

- clearing forests, intensive industrialization, draining wetlands, building new settlements, mining etc. These actions change landscapes, affect the natural flow of water and affect species composition. Many landscapes become eroded. Others are fragmented into smaller patches, isolating many species and leading to in-breeding, loss of genetic diversity and local extinction. Further, some plants, animal and fish species are used at a greater rate than at which they can replace themselves. This leads to depletion of such species.

Scientific studies also indicate that the global climate is changing with increased industrialization and burning of fossil fuels. This increases the levels of carbon dioxide and other gases in the atmosphere, leading to changes in natural climate, causing floods in certain areas and droughts in others.

Effluents from industries and municipalities, and run-off seeping into rivers, lakes and coastal environments negatively affect aquatic ecosystems. Chemical pesticides used in agriculture can harm non-target wild insect pollinators. Environmental pollution can also kill organisms or interfere with reproduction, thus affecting their future population.

Further, people are also responsible for introducing exotic (non-native) species to an area, either by accident or on purpose. These species, generally, do not have their natural predators to keep populations in check and hence, they can rapidly affect local species and invade large tracts of land and water. For example, Titebati (*Artemesia milagirica*) and Banmara (*Eupatorium adenophorum*) are spreading fast in parts of Sikkim. They suppress the natural regeneration of the natural flora, and can cause reduced yields and increased harvesting costs on agricultural land. Some invasive species (e.g. *Parthenium*) also can cause animal health problems and taint milk.

The loss of biodiversity is affecting the natural ecosystems of the world and the valuable services provided by them. It is difficult to quantify these impacts but it is estimated that many varieties of food, medicines, timber, fuel and other resources will be lost forever and many ecosystem services such as climate regulation, flood and drought control, nutrient recycling, clean air and water and pollination will be affected. This can have unforeseen effects on our resources and economy, and in some cases, severely limit quality of life.

Tragopan, Kasturi

Rhododendron barbatum

The Current Status of our Biodiversity

India

India is a 'mega-diversity' country. With only 2.5% of the world's land area, it accounts for 7.8% of globally recorded species, because of its varied physiography, diverse climatic conditions and variety of habitats. Two of the world's thirty four biodiversity hotspots exist in India (Eastern Himalayas (which includes the State of Sikkim) and Western Ghats). A 'hotspot' is defined as an area or region with a high level of endemic species.

Sikkim

Although Sikkim comprises only 0.2% of the land area of India, it contains an astounding 26% of the nation's biodiversity (including 4,500 species of flowering plants, 550 species of birds and more than 600 species of butterflies). This is mainly due to the huge altitudinal range found within the state: from 300 m to 8,598 m, and the many different ecosystems that can be found as a result. There is also a huge range of rainfall – from 5,000 mm per annum to almost none in the high altitude alpine desert zones. All this in an area of just over 7,000 sq km! A glimpse of Sikkim's remarkable range of biodiversity is given in Table 1 below.

Dendrobium thyrsiflorum

Table 1: A profile of Sikkim Biodiversity

Category	Approx. Number of Species
Flowering Plants	4,500
Orchids	527
Rhododendrons	36
Bamboos	20
Ferns and Ferns allies	362
Tree Ferns	9
Primulas	30
Oaks	11
Mammals	144
Birds	550
Butterflies	600 +
Fishes	48

Source: Sikkim Biodiversity Strategy and Action Plan (2011) (draft)


Rufous-Breasted Accentor

Other biodiversity-rich areas in the state are its wetlands. There are 227 lakes in Sikkim. The state has recently submitted a proposal for three important wetlands – the Khacheodpalri-Khangchendzonga Lohnak (KLL) Wetland Complex, the TsoLhamo Plateau-Lashar Yumesamdong-Tembao Wetland Complex and the Tsomgo Bedang Tso Wetland Complex to be included on the RAMSAR Wetlands list. These areas are havens for migratory birds. Many rare species of birds visit them during winter. They also support a large diversity of fish and other flora and fauna. The RAMSAR Convention is an inter-governmental treaty that provides the framework for national action an international cooperation for the conservation and wise use of important wetlands and their resources. It is the only global environmental treaty that deals with a particular ecosystem. India is one of 160 signatories to the convention.

Though large-scale biodiversity studies have not yet been carried out in the state, a large number of species has been recorded from the forest areas and wetlands.


Pleione species

Tso Lhamu

What can we do?

There is enough evidence which shows that we humans are a major contributor to biodiversity loss. Hence, we need to take corrective steps. This requires accurate and reliable scientific data. Many organizations are involved in collecting data about biodiversity.

Studying biodiversity helps us to understand how ecosystems work and the role of species in complex habitats. It also gives us information to help us decide whether a particular development programme is appropriate for a given area or not. Other benefits are that it helps us to take action to avoid fragmentation of biodiversity-rich habitats, take care not to introduce non-native species and prevent the decline of keystone species. Biodiversity studies can help us to make an initial assessment of the area, look for changes, identify the causes of these changes and suggest actions to promote conservation.

One way to slow down biodiversity loss is to set up protected areas. More than one-third of the land area of Sikkim is protected – the

Alpine Accentor

highest proportion of any state in India. There are six wildlife sanctuaries and one national park. (See table 2 below.)

Table 2: Protected Areas in Sikkim

	Area (sq km)	Year established	District	Altitudinal Range (m)
Khangchendzonga National Park (KNP)	1784.0	1977	North & West	1,400 – 8,598
Barsey Rhododendron Sanctuary	104.0	1996	West	2,110 – 4,100
Kitam Bird Sanctuary	6.0	1992	South	320 - 875
Maenam Wildlife Sanctuary	35.3	1987	South	2,000 – 3,263
Fambong Lho Wildlife Sanctuary	51.8	1984	East	1,524 – 2,749
Pangolakaha Wildlife Sanctuary	128.0	2000	East	1,760 – 4,390
Kyongnosla Alpine Sanctuary	31.0	1992	East	3,292 – 4,116
Shingba Rhododendron Sanctuary	43.0	1992	North	3,048 – 4,575

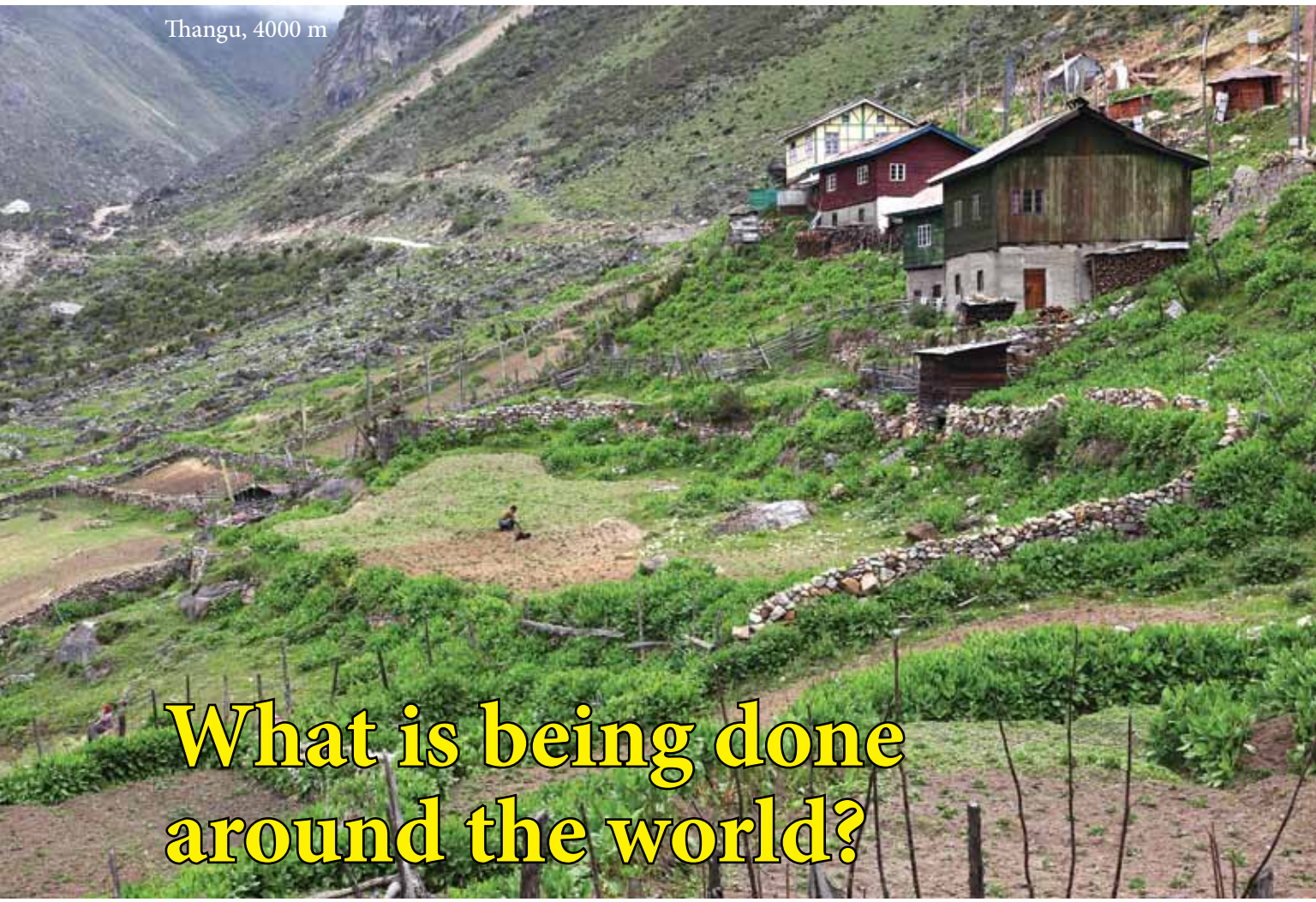
Khangchendzonga National Park (KNP), which comprises more than a quarter of the land area of the State has recently been nominated for recognition as UNESCO World Heritage Site on account of its remarkable range of biodiversity, which includes populations of a number of rare and endangered species, and its 20 picturesque peaks over 6,000m, including Mt Khanchendzonga (8,586 m) – the third highest mountain in the world. It is an area of spectacular wilderness which is almost undisturbed. For local communities, KNP and its buffer zone have significant cultural and religious values, which complement the integrity of the value of its natural beauty and biodiversity.

Other initiatives for the ecological restoration of degraded ecosystems include wetland conservation programmes, soil conservation works, tree plantation activities (especially of indigenous species), building water harvesting structures etc. Biodiversity studies are also being carried out to ensure that biodiversity rich areas are retained in their natural form.

Botanical Gardens and Zoos can also play an important role in protecting plant and animal species. They bring wildlife closer to the general public, as well as helping in *ex-situ* conservation. Sikkim has one botanical garden at Rumtek, and a zoo near Gangtok. A Butterfly Park is planned at Rangrang, North Sikkim and a Bird Park at Rabdentse, West Sikkim.


Himalayan Black Bear


Large Yeoman


Thangu, 4000 m

What is being done around the world?

Biological Diversity is a priceless global asset. Nevertheless, the threat to the gene pool, species and ecosystems has never been greater, which explains why so many global organizations are involved in conserving the planet's resources. Organizations active in this field include the World Conservation Union (IUCN), the United Nations Development Programme (UNDP), the Global Environment Facility (GEF), the UN Conference on Trade and Development (UNCTAD), the World Bank, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the UN Educational, Scientific & Cultural Organization (UNESCO) and the Secretariat of DIVERSITAS. One of the most important agreements, ratified by 192 countries of the world (including India) and the European Community, is the Convention on Biological Diversity.

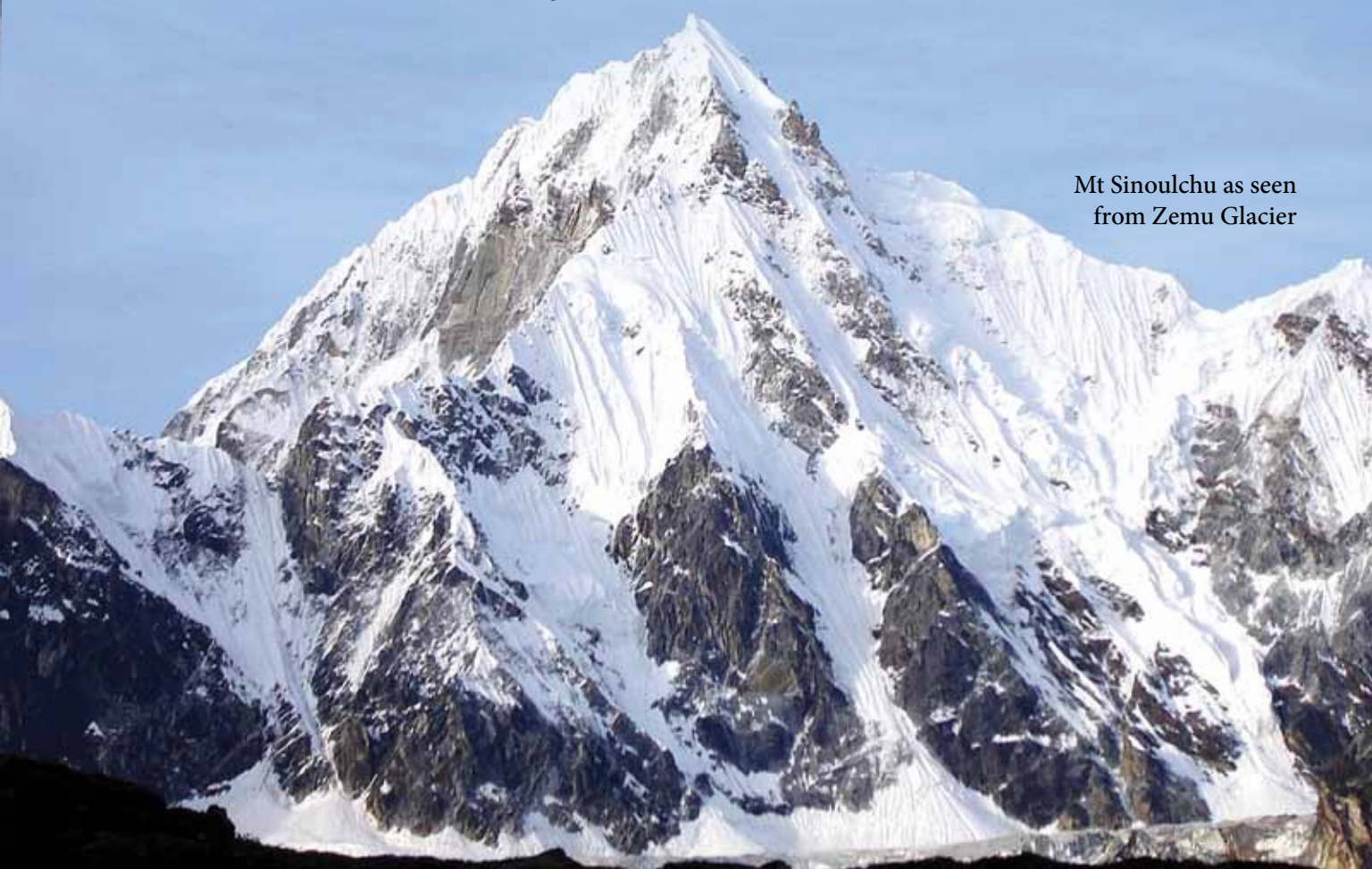
Convention on Biological Diversity

Designed to promote the conservation of biodiversity and sustainable use of life forms, this legally-binding international treaty was adopted in May, 1992 immediately before the Earth Summit in Rio de Janiero. It came into effect in December 1993, and today has been signed by 192 countries and the European Commission. The CBD has three main objectives:

- Conservation of biodiversity;
- Sustainable use of the components of biodiversity; and
- Fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

The Convention functions through the Conference of Parties, which is assisted by a Secretariat in Montreal. It encourages governments of various countries to conserve their ecosystems and natural habitats, identify and monitor biodiversity, promote technical and scientific cooperation, create public awareness and provide incentives to developing countries to conserve their natural resources. National Biodiversity Strategy and Action Plans are the principle instrument for implementing the CBD. A NBSAP outlines the basic principles for biodiversity conservation, sets long-term goals to be achieved as well as short-term policy objectives and related guidelines. Sikkim's Biodiversity Strategy and Action Plan is currently being updated.

Each year, in May, International Biodiversity Day is celebrated throughout the world. This is an opportunity to raise awareness of biodiversity issues and to increase practical action at a local level.



Mt Sinoulchu as seen from Zemu Glacier

Meconopsis horridula
Himalayan Blue Poppy

What is being done in India?

The Biological Diversity Act

Taking cognizance of the provisions of the Convention on Biological Diversity, and to deal with extensive pressure on our biological resources, India has enacted the Biological Diversity Act, 2002.

The Act provides for biodiversity conservation, as well as facilitating access to biological resources in a sustainable manner.

The Act is implemented through the National Biodiversity Authority at central government level, through State Biodiversity Boards at state government level and through Biodiversity Management Committees at the village/town level.

The National Biodiversity Authority is responsible for regulating access to biological diversity by foreigners and Non Resident Indians (NRIs) and ensures that the commercial benefit and intellectual property of the country is shared fairly among all stakeholders, especially local communities.

Nomadic Dokpa grazers in TransHimalayan Sikkim

What is being done in Sikkim?

The Sikkim Biodiversity Board

The Sikkim Biodiversity Board was established in October, 2006 as a statutory body under the Biological Diversity Act to conserve the state's biodiversity and regulate the commercial use of biological resources so that local communities get an adequate share of the economic benefit arising from the use of these resources. Commercial bodies harvesting natural resources from an area for economic benefit are required to obtain clearance from the Sikkim Biodiversity Board and deposit a collection fee. The Board is required to set up Biodiversity Management Committees at village and town level to help it in this activity.

Biodiversity Management Committees keep a record of local natural resources and their use. They comprise members of the local body, school teachers, cultivators, medical practitioners and all other stakeholders whose livelihood depends upon local biological resources, and play an important role in implementation of the Biological Diversity Act at field level. The Biodiversity Management Committees are also entrusted to prepare Peoples' Biodiversity Registers. Information about the local flora and fauna (both wild and domesticated), its use and associated traditional knowledge will be recorded in these registers.

This will help ensure that the natural resources of our country are protected with the active participation of local people.

Red Fox

The Sikkim Biodiversity Conservation and Forest Management Project (SBFP)

Since April 2010, through an innovative ten-year project which is supported by the Japan International Cooperation Agency (JICA), the Government of Sikkim is developing eco-tourism as a tool to achieve the twin objectives of biodiversity conservation and economic development. This is the first project of its kind in India. More than half of the Project's budget is earmarked for forest and biodiversity conservation activities. These include:

- Establishment and implementation of sound management plans for a number of important reserved forests and protected areas. This includes the Khanchendzonga National Park (and support for its inscription as a UNESCO World Heritage Site); The project will also help to create two new Protected Areas (Nimphu Wildlife Sanctuary and Fairrieanum Conservation Reserve), and to rationalize the boundaries of existing protected area boundaries;
- Supporting various *ex situ* conservation measures, including the creation of a Butterfly park in North Sikkim;

- Supporting the creation and management of a number of nurseries which will focus on the regeneration of oak and other threatened species;
- Improving the infrastructure of the Himalayan Zoological Park at Bulbulay, Gangtok. This will also include the establishment of a Sikkim Biodiversity Centre which will generate and disseminate information on biodiversity and best practice;
- Undertaking inventory and monitoring of biodiversity throughout the State;
- Undertake studies on the impacts of climate change and grazing in the Himalayan Ecosystem, as well as on a number of 'flagship' species (such as the Snow Leopard and Red Panda) to better understand the nature and effects of human-nature interactions;
- Enhancement of the spatial and resource information base through the establishment of a modern laboratory for GIS and Remote Sensing.

Other initiatives of the Government of Sikkim

Over the past two decades, the Government of Sikkim has implemented a number of important initiatives which are also aimed at conserving biodiversity and protecting the environment. These include:

- Banning grazing in reserved forests (1995);
- Banning felling of green trees in forests;
- Use of non-biodegradable materials like plastic and poly bags banned (1998);
- Sikkim declared an "Organic State" (2002): Use of all chemical fertilisers and pesticides banned;
- Strengthening the Protected Area Network which today covers 31% of the land area of the State (and 42.5 % if the Khanchendzonga Biosphere Reserve area is also included (the highest of any State in India);
- Eco-clubs, green funds have been created in a number of schools & colleges.
- Ban on killing of wildlife has been imposed by the Government.
- Our forest cover has increased by 2% growth in the total forest cover in the State.
- Government of Sikkim has decided to make all the road sides full of greenery and aesthetically appreciable. The Rabongla-Namchi Road has been declared as the **ECO- HIGHWAY**

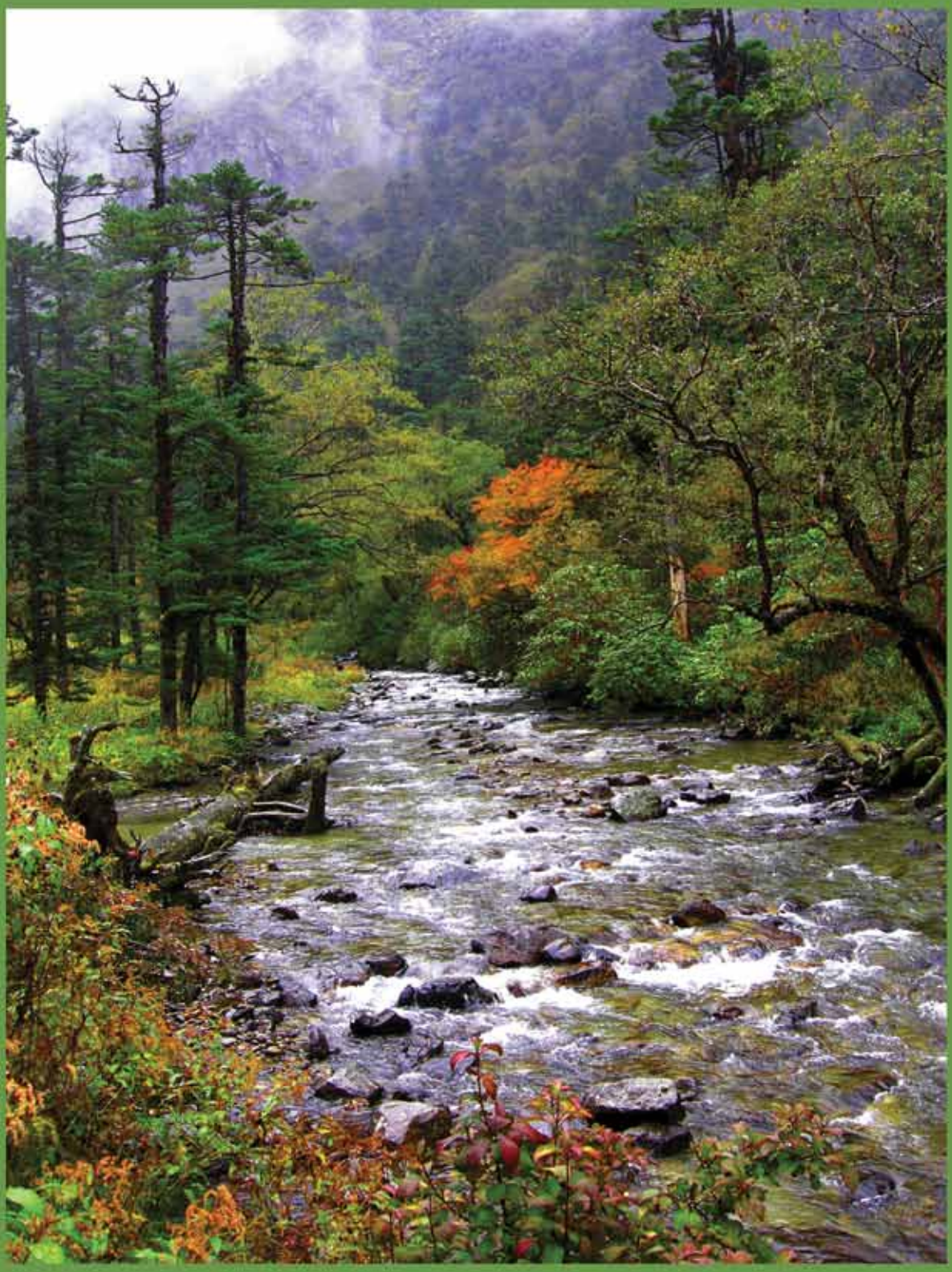
Ecotourism Activities

Propagation Nursery-2

- All Panchayats have been provided with **"Classified Panchayats Bio-diversity Register"** to register every species in their area- as to the kind and the usage especially of the medicinal variety
- State Government under the direction of Hon'ble Chief Minister initiated "Ten Minutes to Earth" programme supporting the United Nation Environment Programme (UNEP) worldwide Tree Planting Campaign "Plant for Planet: Billion Tree Campaign".
- More than 215 Joint Forest Management Committees (JFMCs) and Eco-Development Committees (EDCs) have been created to implement the government's Participatory Forest Management policy. Forest protection and management by local communities living in forest fringe areas offers the best way to ensure the conservation of our biodiversity;
- Designation of Himal Rakshaks (Honorary Mountain Guardians);
- Introduction of the "Smriti Van" (Memorial Forests) programme in all districts and every Gram Panchayat;
- Preparation of the State Biodiversity Strategy and Action Plan (SBSAP);
- State Biodiversity Park created at Tendong in South District;
- 11 Important Bird Areas notified (2003);
- State Green Mission launched to make Sikkim a clean, green and garden state;
- As per the State Industrial Policy (1996), only eco-friendly, pollution-free and green industries are encouraged;

All these measures taken by the present Government over recent years are helping to protect and maintain Sikkim's remarkable biodiversity heritage, for the benefit of present and future generations.


Ecotourism Training at Kitam



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