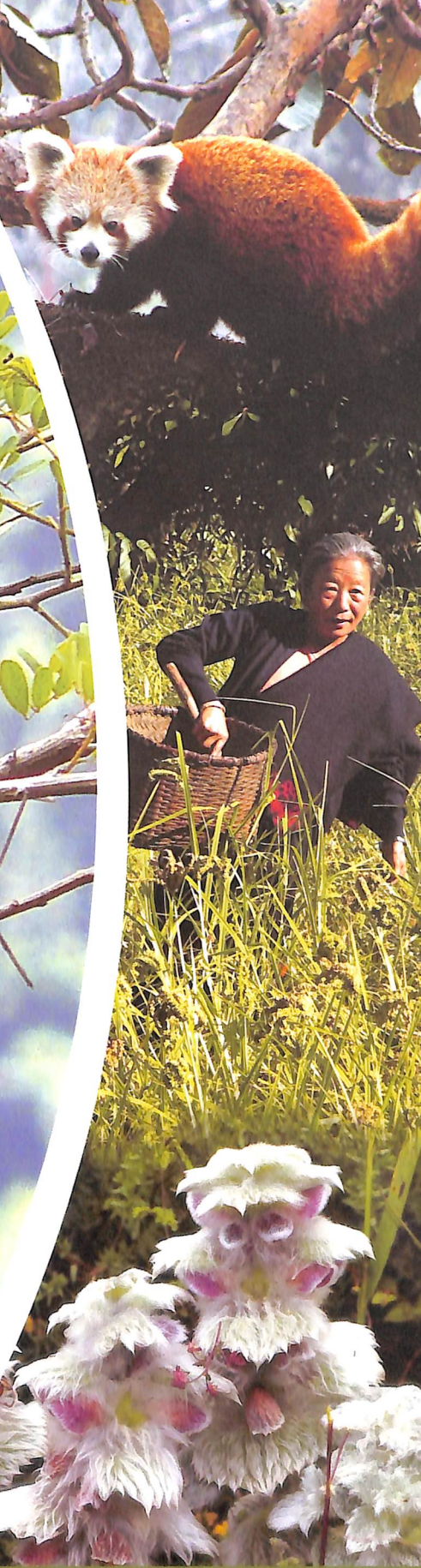


BIODIVERSITY - ALL CREATURES GREAT AND SMALL



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





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2/10/13

BIODIVERSITY - All Creatures Great and Small



Potentilla fruticosa



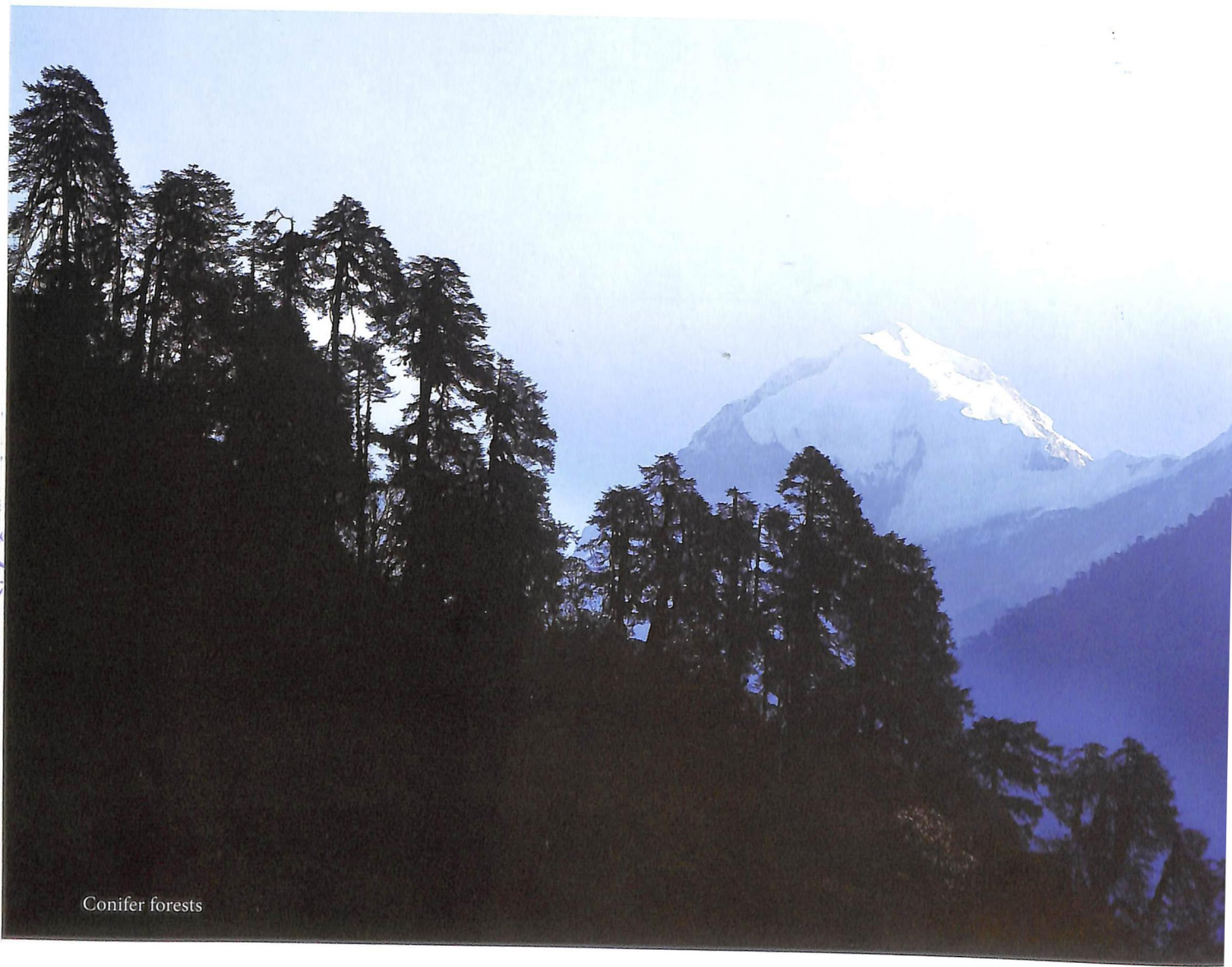
Sikkim Biodiversity Conservation and Forest Management Project (SBFP)
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Snow Partridge



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.

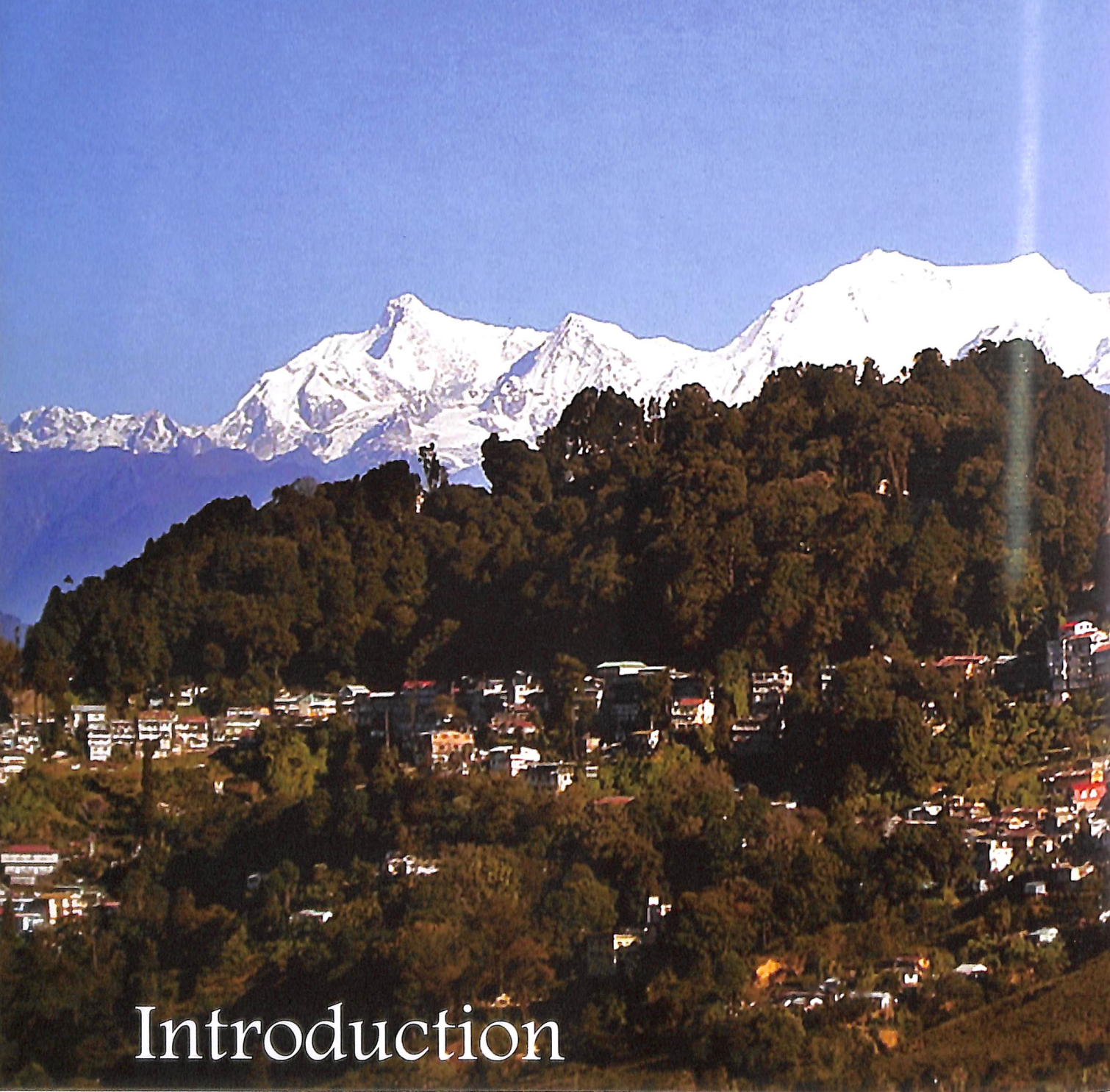
Such publications will add to the efforts to the conservation programmes by motivating people to contribute to the work of protection of nature creating awareness among the various sections of the society so that willing support of communities can be obtained in this endeavour of ours.

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


(Bhim Prasad Dhungel)

Minister Forest, Env. & WL Mngmnt. Deptt/
Tourism & Civil Aviation
Government of Sikkim

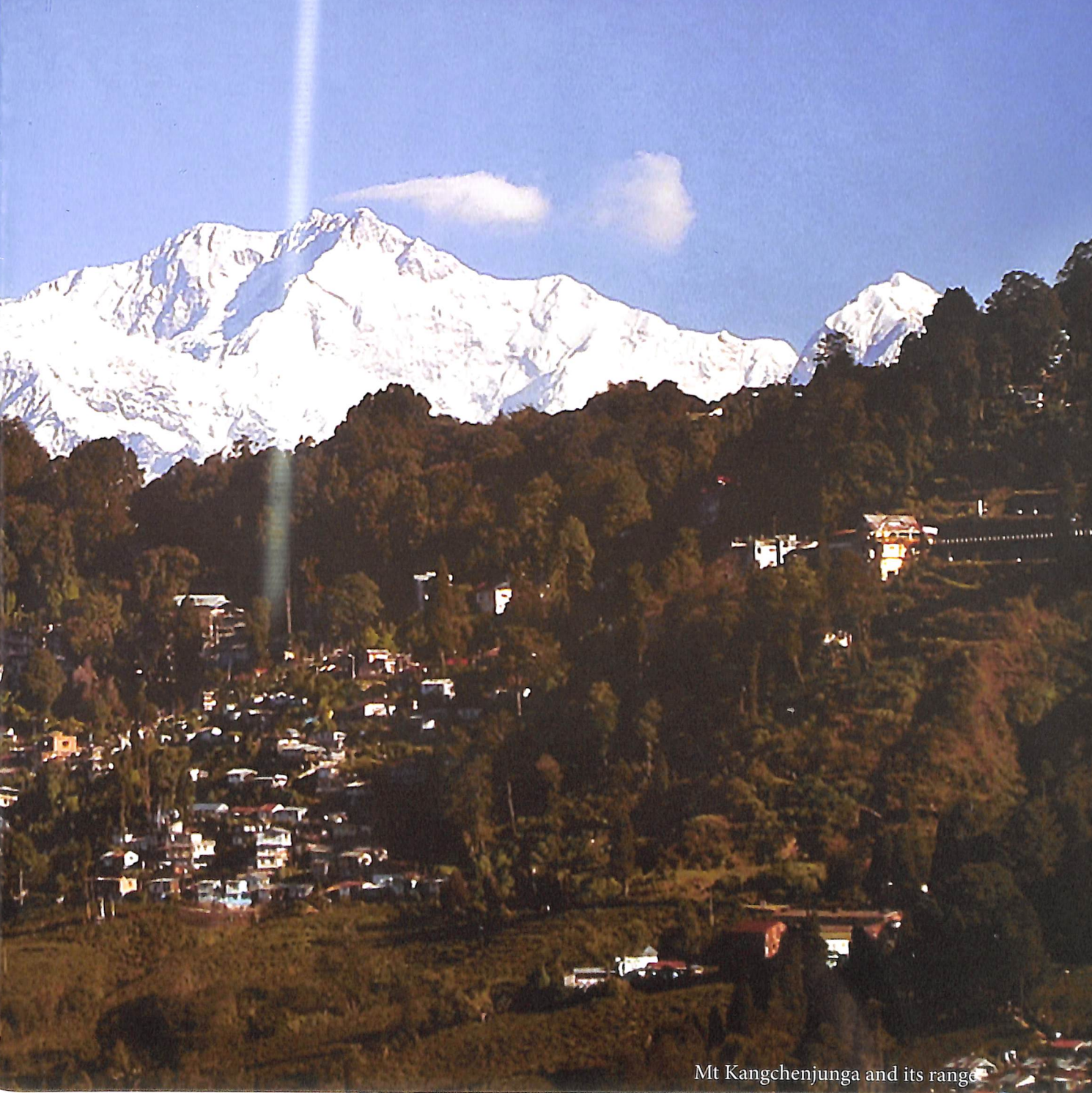


Introduction

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



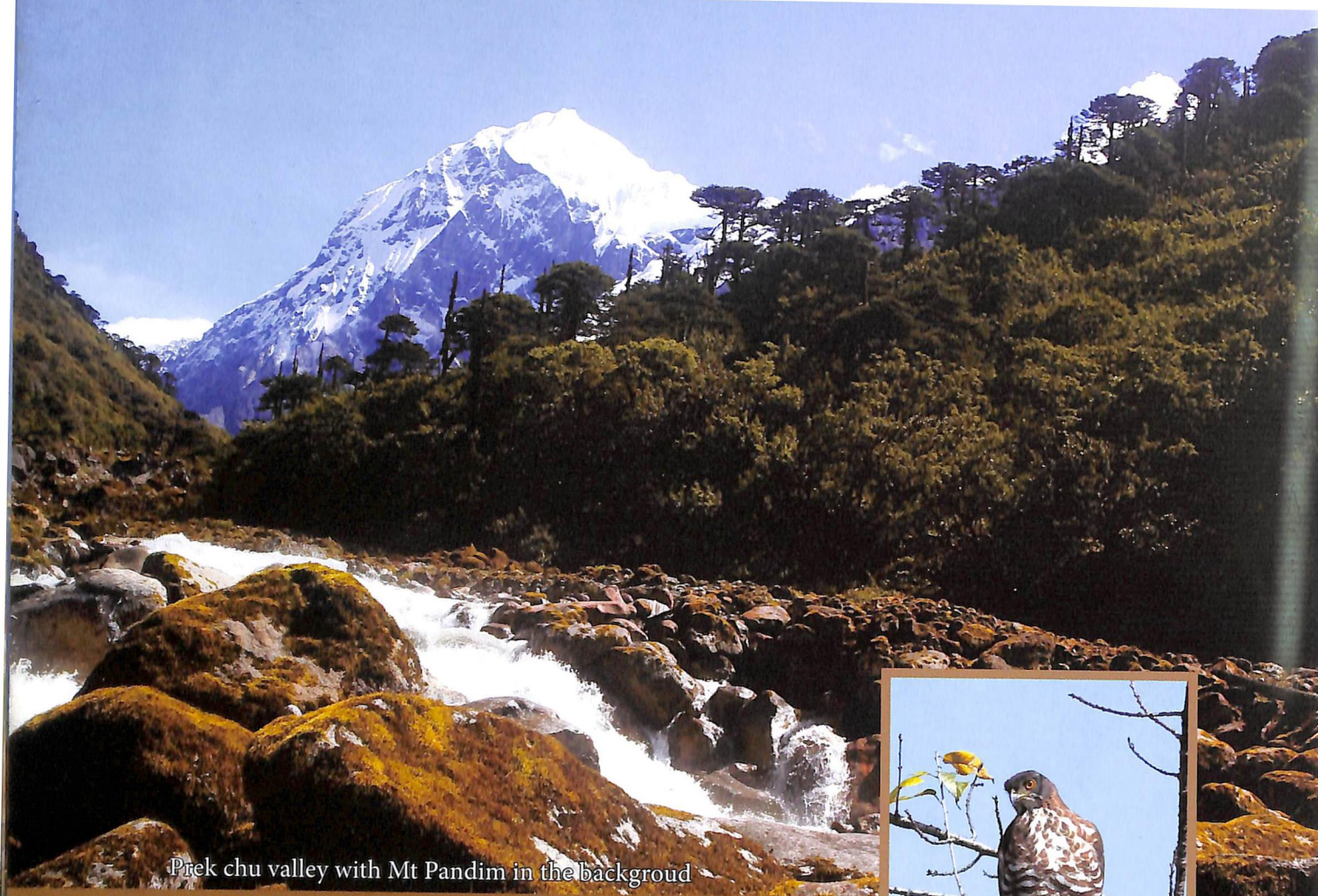
Mt Kangchenjunga and its range

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 background



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.

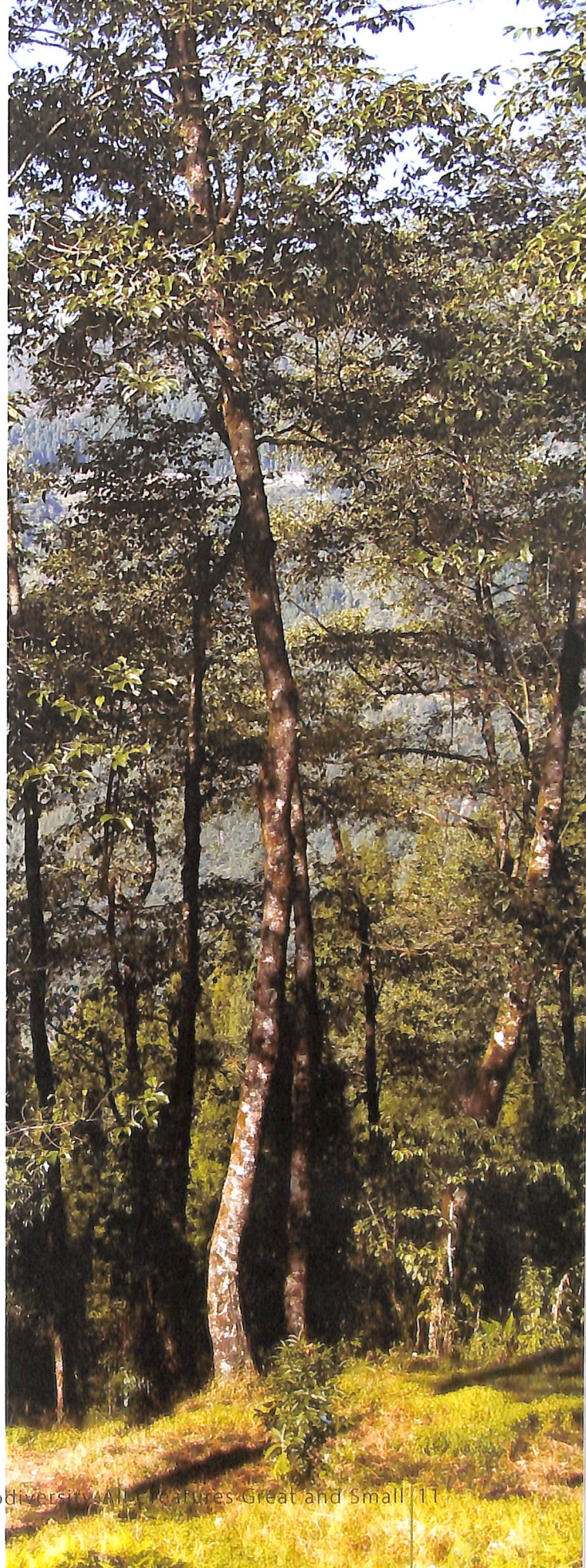
What is the importance of Biodiversity

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.



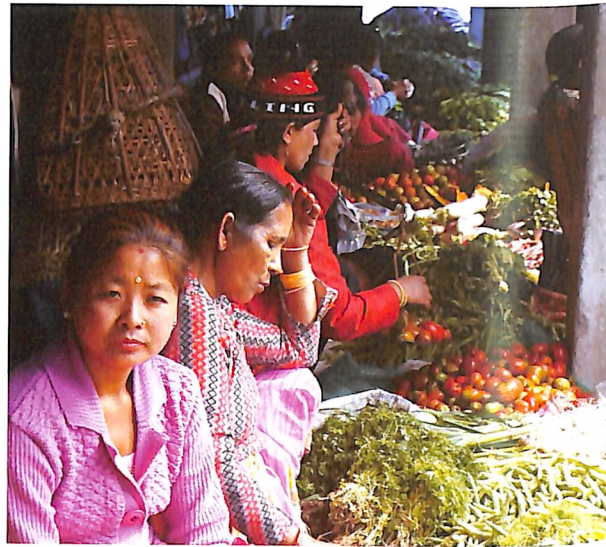
Tangible Benefits

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



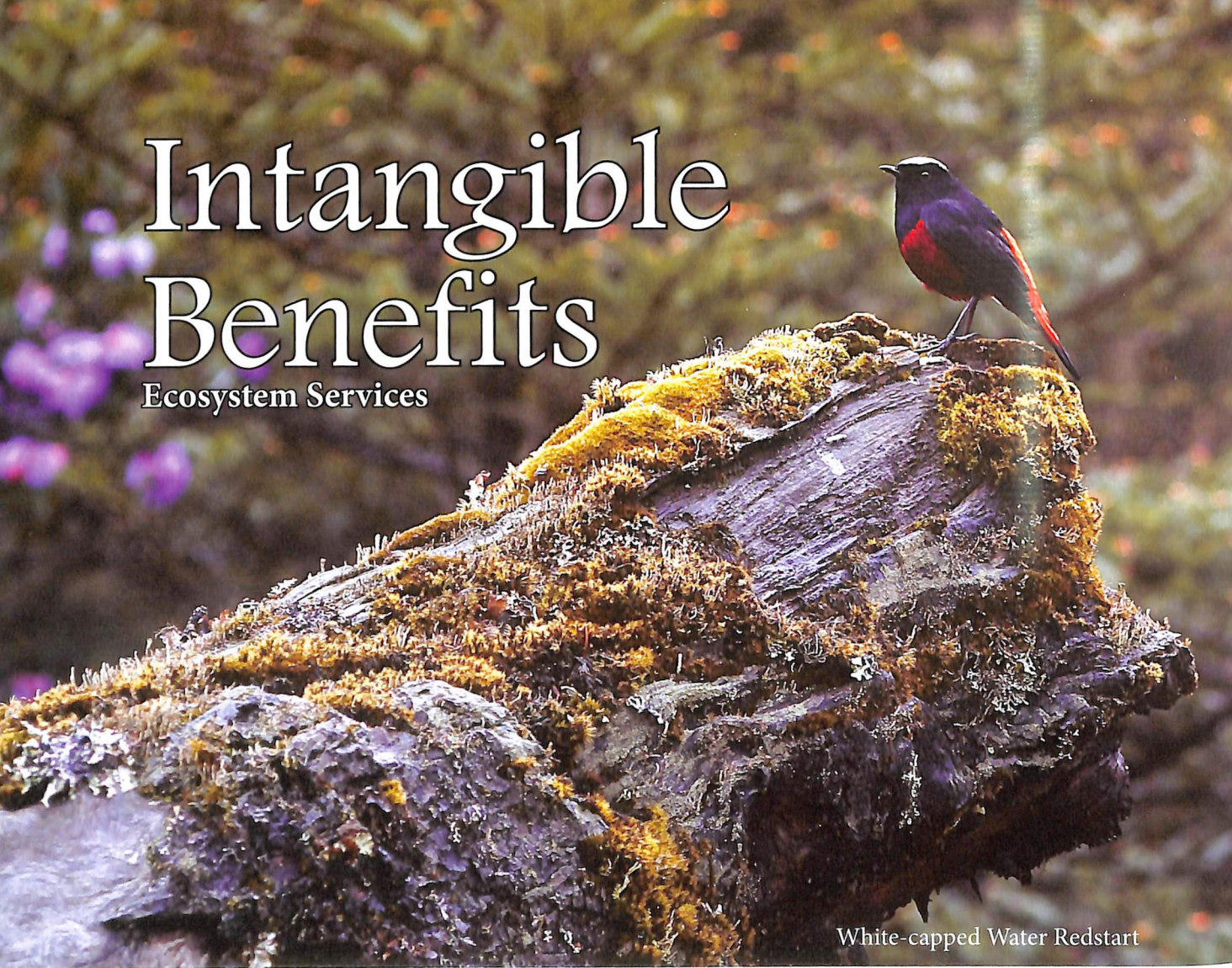
Cordyceps sinensis (Yarcha Gompu)

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



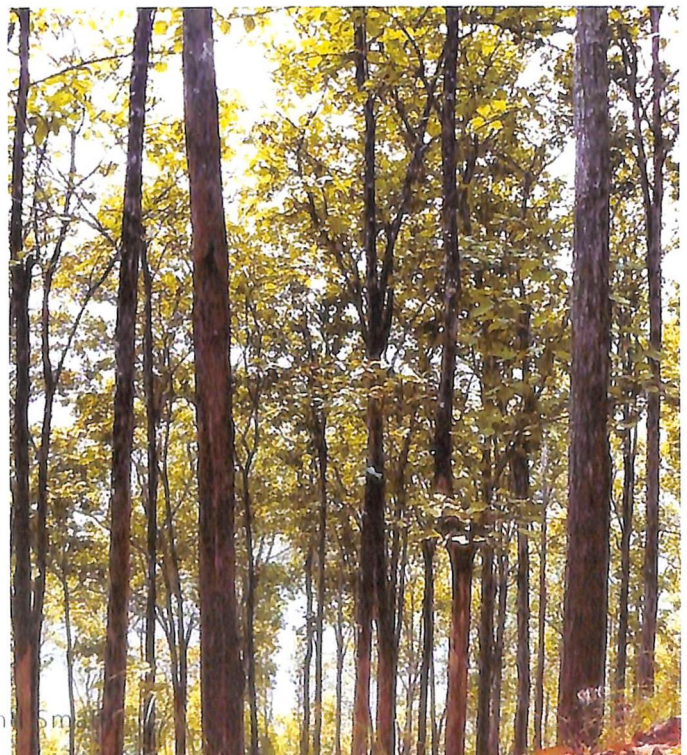
White-capped Water Redstart

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, billions 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

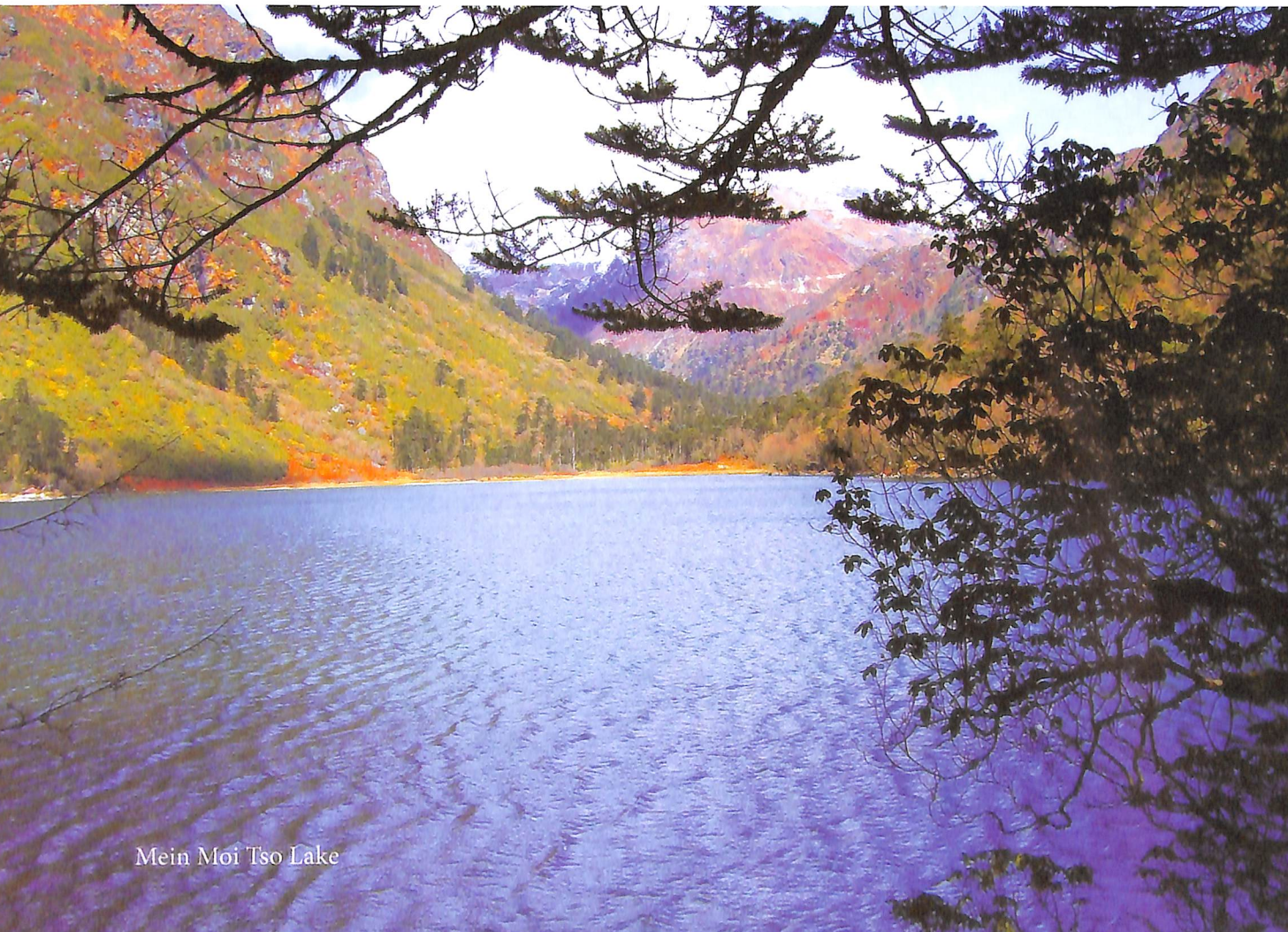
provide shelter to thousands of birds, fish, animals, insects etc. Even open spaces in cities can harbour significant biodiversity.

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