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Mountain Biodiversity: The region's greatest resource

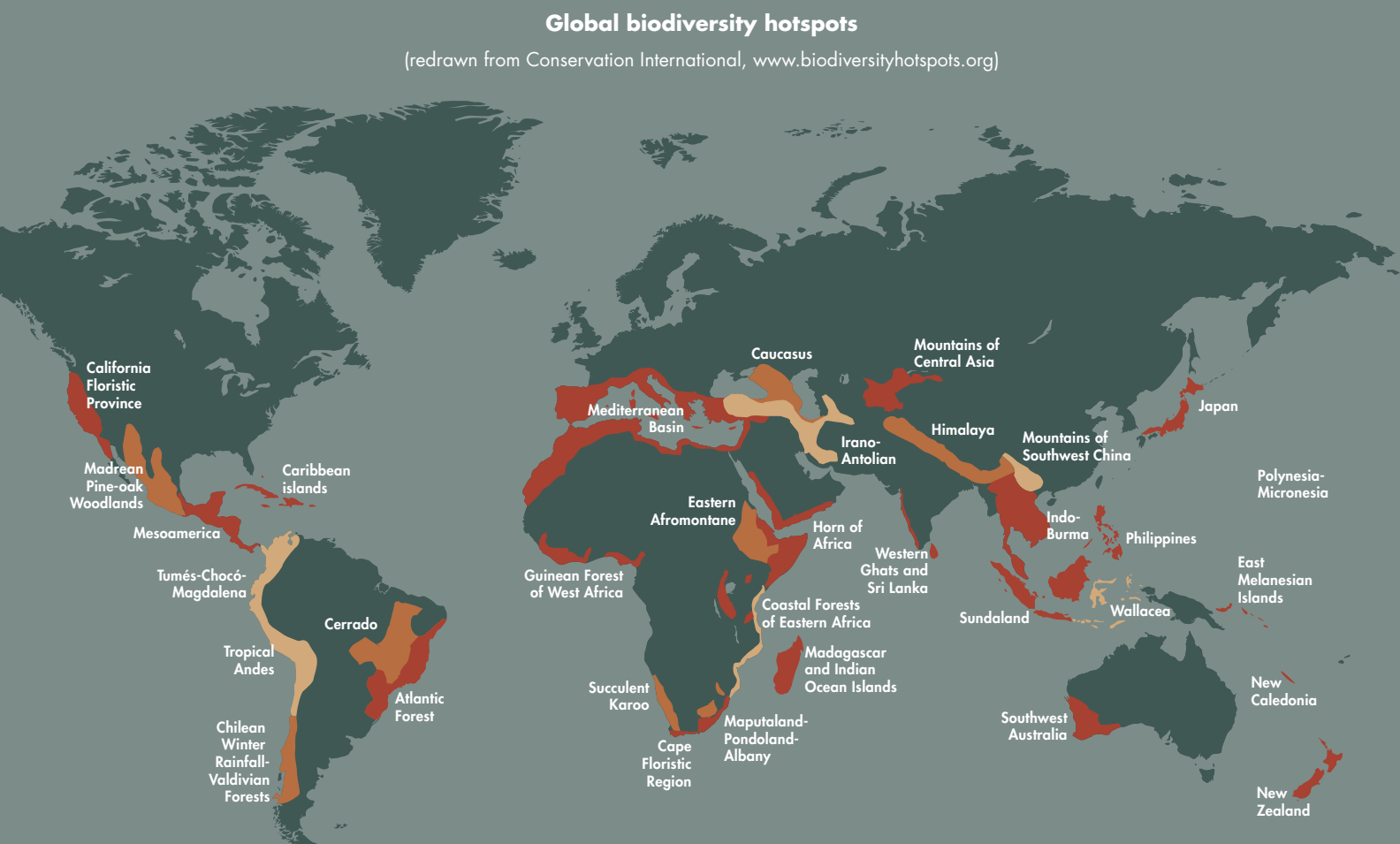
What are global biodiversity hotspots?

The term biodiversity refers to combinations of life forms and their interactions. These interactions occur at different levels (genetic, species, and ecosystem) and depend upon the physical environment. A biodiversity 'hotspot' refers to a region that contains a high proportion of threatened and endemic species, a high degradation of original habitats and high human pressure. Most of the 34 global hotspots are in mountain and coastal areas (see below).

The map on the next double page shows areas of the earth rich in vascular plants. Vascular plants are good indicators of biodiversity because they are found in a wide range of climates from humid to arid regions. The areas shown in red on the map have the greatest biodiversity. The diversity of mountain ecosystems is remarkable. Rich in endemic plant and animal species, they harbour one third of global terrestrial biodiversity.

Why is biodiversity high in mountain regions?

Biodiversity is high in mountain regions because of their wide range of habitats, varied micro-climates, and ecological conditions. These factors have resulted in a high degree of genetic diversity in terms of crop and livestock species and their wild relatives. Altitudinal gradients and ecological zones provide plants with different exposures over short distances. The topography itself is a varied and a fragmented mosaic of habitats or genetic 'islands in the sky'.



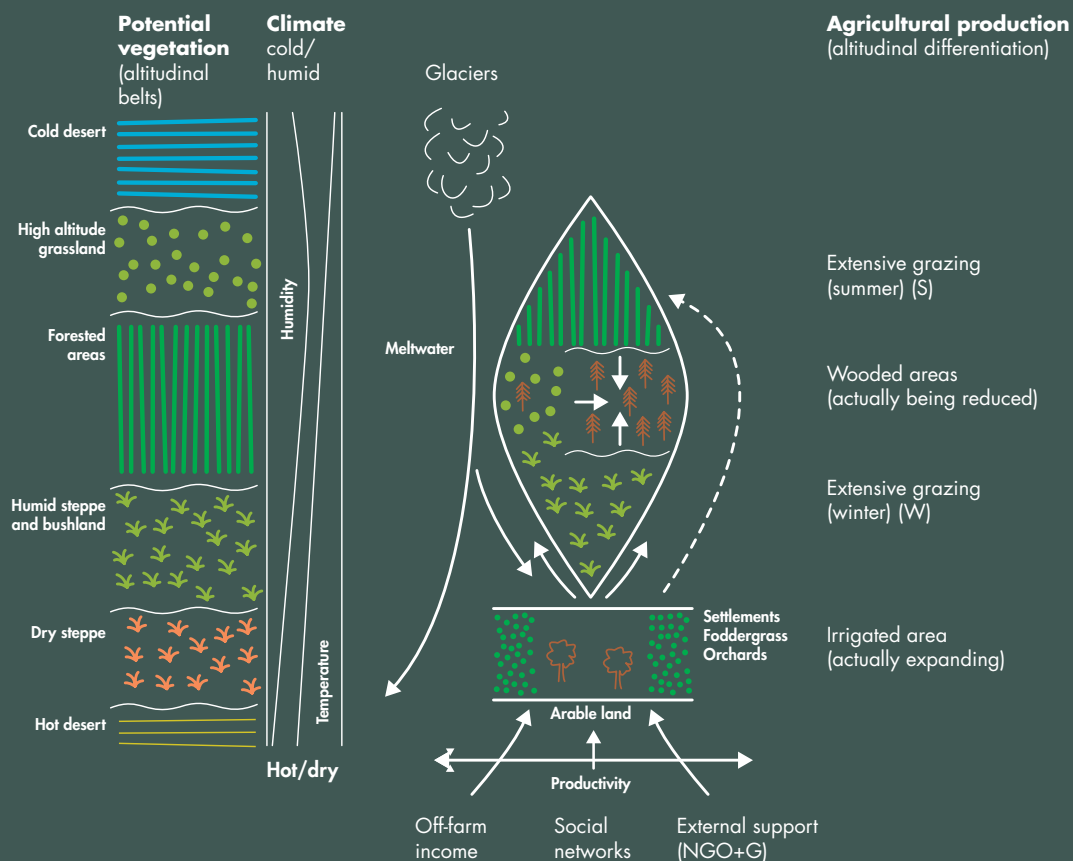
What particular physiographic elements determine biodiversity in the Hindu Kush-Himalayas?



These mountain ranges rise from sea level to more than 8,000 metres within a distance of only a few hundred kilometres, extending from tropical (<500 m) to alpine ice-snow (>5000 m); with a principal vertical vegetation regime comprised of tropical and subtropical rain forest, temperate broadleaf deciduous or mixed forest, and temperate coniferous forest; and including high-altitude cold shrub or steppe and cold desert. From east to west for over 3,500 km, 10 big river systems drain this region which forms an ecological buffer between the Tibetan Plateau and South Asia. The western mountains are dry as they receive an average of less than 500 mm (or 0.5 m) of rain a year. In the east some areas have more than 4 m of rain per year (and up to an extreme of 12 m of rain a year in Cherapunjee in the Meghalaya Hills). Travelling from south to north the summer monsoon of the south gives way to the boreal winter circulation over the Tibetan Plateau. Such disparate physiographic conditions have produced varied natural and cultural landscapes and a diversity of species and mountain ecosystems.

Vertical arrangement of natural vegetation and agricultural productivity

(Redrawn from Winiger and Börst, 2003, in Jeanneret et al. Welt der Alpen - Gebirge der Welt 54, Berne: Haupt Verlag)



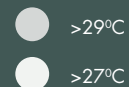
Global biodiversity: Species numbers of vascular plants



Diversity Zones (DZ): Number of species per 10,000 km²

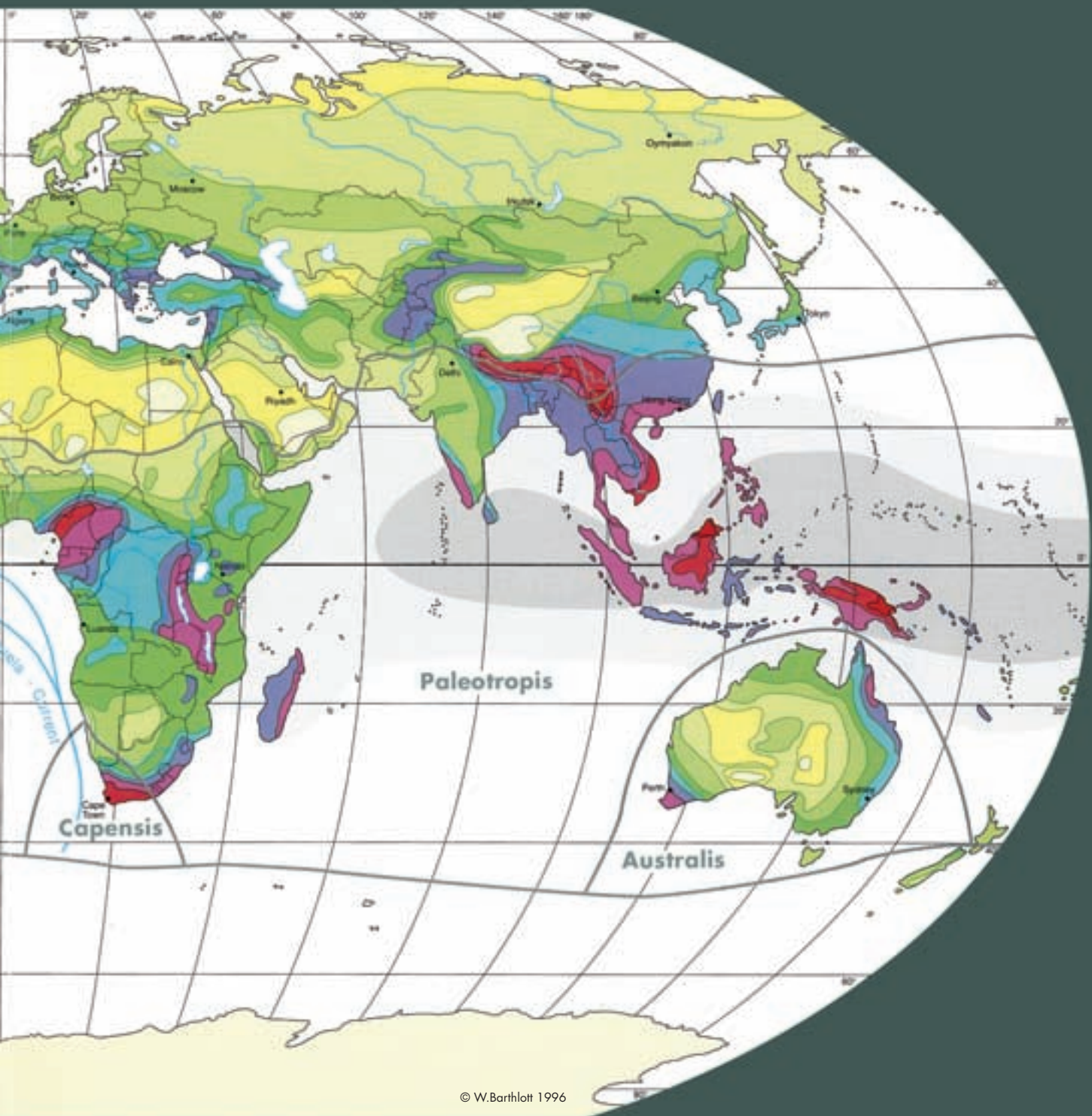


Sea surface temperature



cold current

Capensis floristic region



Robinson projection

Standard parallels 38°N und 38°S

Scale 1:100 000 000

W.Barthlott, W.Lauer, A.Placke

Departments of Botany and Geography

University of Bonn

Cartography: M.Gref

Department of Geography

University of Bonn

What biodiversity is present in the Hindu Kush-Himalayas?

The high degree of endemism means there are numerous critical eco-regions of global importance. The Hindu Kush-Himalayan region as covered by ICIMOD includes parts of 4 global biodiversity hotspots as well as 6 UNESCO Natural World Heritage Sites, 60 eco-region types (including 30 critical eco-regions and 12 Global 200 eco-regions), 30 Ramsar sites, 488 protected areas, 330 Important Bird Areas (IBAs), and 53 Important Plant Areas (IPAs) for medicinal plants.

This awesome range of landscapes contain 25,000 species of angiosperms (10% of the global total), 75,000 species of insects (10% of the global total), 1,200 bird species (13% of the global total), and the wild relatives of many modern-day crops. However, little is known about the biological wealth in the region in detail or about the distribution and composition of communities and ecosystems.

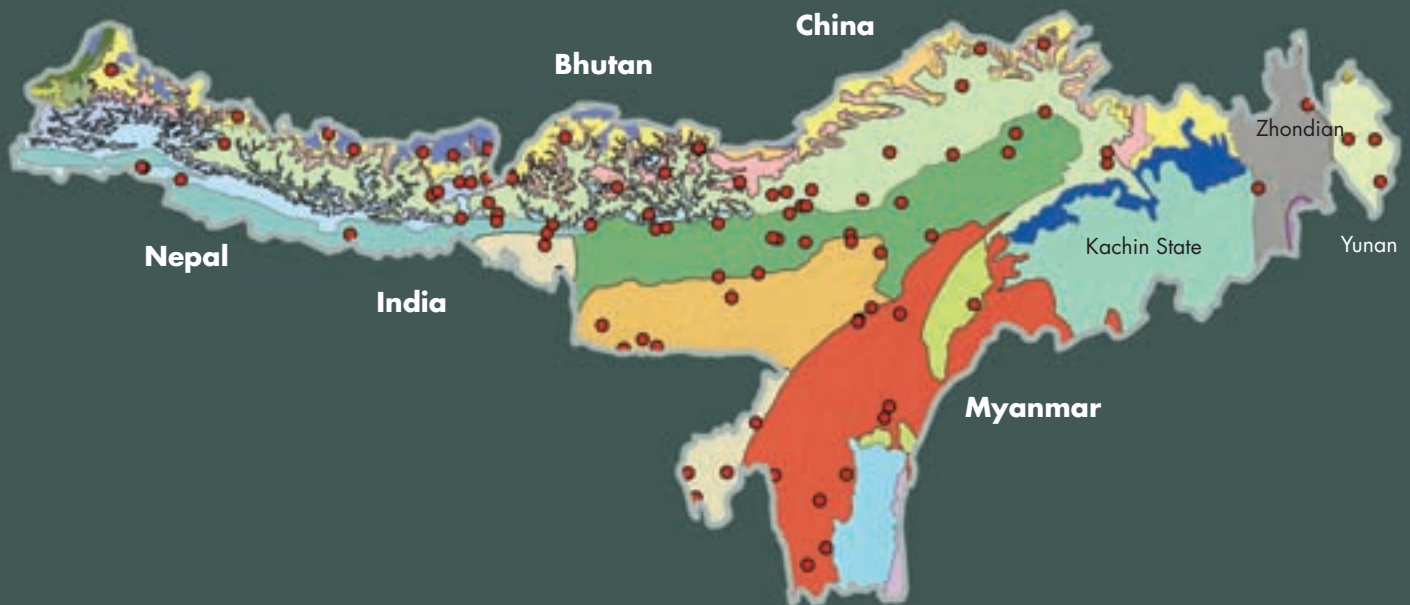


"These awesome landscapes contain 10% of the global total of angiosperms and insects, and 13% of the global total of birds."



Biodiversity in the Eastern Himalayas (EH)

The Eastern Himalayan (EH) region showing the 25 eco-regions and the distribution of protected areas. The climate of the EH region is diverse and its topography complex. Forests and vegetation types are broadly tropical, sub-tropical, warm temperate, cool temperate, sub-alpine, and alpine, and these are further classified into layers based on other bioclimatic attributes. There are several globally significant mammals (45 species); birds (50 species); reptiles (16 species); amphibians (12 species); invertebrates (2 species); and plants (36 species); most of which (about 144 species) are found in the northeastern states of India. About one-third of the total flora are endemic to the region. The people belong to many different ethnic groups and speak a rich array of languages. It is their traditional knowledge that has kept this location and its ecosystem services as the heritage of future generations.



- | | | |
|---|---|--|
| ● Protected area | ● Nujang Langtang Gorge alpine conifer and mixed forest | ● Chin Hills-Arakan-Yoma montane forest |
| — ICIMOD Eastern Himalayan boundary | ● Rock and ice | ● Eastern Himalayan alpine shrub and meadow |
| ● Meghalaya subtropical forests | ● Southeast Tibet shrubland and meadow | ● Eastern Himalayan broadleaf forest |
| ● Mizoram-Manipur-Kachin rain forest | ● Terai-Duar savanna and grassland | ● Eastern Himalayan subalpine conifer forest |
| ● Northeast India-Myanmar pine forest | ● Western Himalayan alpine shrub and meadow | ● Hengduan Mountains subalpine conifer forest |
| ● Northeastern Himalayan subalpine conifer forest | ● Western Himalayan broadleaf forest | ● Himalayan subtropical broadleaf forest |
| ● Northern Indochina subtropical forest | ● Western Himalayan subalpine conifer forest | ● Himalayan subtropical pine forest |
| ● Northern Triangle subtropical forest | ● Yarlung Tsangpo arid steppe | ● Irrawaddy moist deciduous forest |
| ● Northern Triangle temperate forest | ● Brahmaputra Valley semi-evergreen forest | ● Lower Gangetic Plains moist deciduous forest |

What special challenges does biodiversity face in the Hindu Kush-Himalayas?

Challenges to biodiversity come on a number of fronts and are both global and local. Human activities threaten mountain species. Modern methods can be used in conjunction with traditional knowledge to keep pace and adapt to use resources sustainably. Genetic resources offer opportunities for livelihoods but only if used wisely. Tourism can benefit people and the

environment if sufficient revenue is retained locally. Rangeland conditions present special challenges, and conflicts between people and wildlife are problems concentrated in protected areas where people live.

The region's organisational challenges include inadequate policies and strategies; weak institutional, administrative, planning, and management capacities; inadequate data and information management; and poverty. These challenges cannot be met without regional coordination to achieve transboundary conservation and promote the sustainable use of resources. Biodiversity conservation is especially challenging in ecosystems that cross national borders such as transboundary landscapes.

Namche in the Khumbu region of Nepal



"The loss of biological diversity in these ecologically sensitive areas poses a threat to the security of the Himalayan region and endangers the world's global genetic heritage. Himalayan biodiversity is disappearing at an alarming rate and the time to act is now."

Andreas Schild, ICIMOD Director General

Why is it important to study mountain biodiversity?

Difficult as mountain environments are, they are also rich repositories of biodiversity and ecosystem services. Their impact extends far beyond the immediate mountain hinterland and, in some instances in the past 15 years, this fact has been recognised, especially on two important occasions: at the Earth Summit in Rio de Janeiro in 1992 and since then during the International Year of Mountains (2002).

How do global changes adversely affect the conservation of mountain biodiversity?

Despite international recognition, mountain areas continue to face enormous pressures as a result of changes taking place globally. Direct drivers of environmental changes include climate change, changes in land use and land cover, and introduction or removal of species; indirect drivers include demographic, economic, and sociopolitical changes. Such changes have negative impacts on biodiversity conservation, ecosystem services, and the well-being of people living in the mountains. Land-use, land cover, and climate change have already led to a contraction in species' range as well as extinctions. Human-induced climate change is expected to threaten the existence of some species. People's ability to cope with the changes in mountain areas will also be threatened, with ramifications downstream and beyond.



“Direct drivers of environmental changes include climate change, changes in land use and land cover, and introduction or removal of species”

What steps are being taken to protect biodiversity in the region?

In 1992, the Convention on Biological Diversity (CBD) produced global objectives for the conservation of biological diversity, for the sustainable use of its components, and for fair and equitable sharing of the benefits arising from genetic resources. All eight Hindu Kush-Himalayan countries are signatories to the CBD and are committed to conservation as a measure towards the immediate protection of globally significant landscapes.

In 2004, the Conference of Parties adopted an 'ecosystem approach' to biodiversity conservation and management which included a programme of work on 'Mountain Biodiversity' to reduce the loss of mountain biological diversity significantly at global, regional, and national levels by 2010. These programmes try to strike a balance between protection of biodiversity and local development.

"The Convention on Biological Diversity (CBD) has produced global objectives for the conservation of biological diversity"

Snow leopard in the Himalayas



The Convention on Biological Diversity - A treaty to sustain the diversity of life on Earth

The Convention on Biological Diversity (CBD) was conceived as a practical tool for translating the principles of Agenda 21 into reality. The Convention recognises that biological diversity is about more than plants, animals, and micro organisms and their ecosystems – it is about people and the need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. The three objectives of the CBD: are conservation, sustainable use, and equitable sharing of the benefits arising from the use of genetic resources. These objectives closely link socioeconomic and cultural elements with conservation and are an expression of the most fundamental values that any government would wish for its people. The Convention on Biological Diversity was signed by 150 government leaders at the 1992 Rio Earth Summit and this had grown to 191 parties by 2008. (See <http://www.cbd.int>)

In 2004 the Conference of Parties of the CBD adopted a Programme of Work (PoW) on Mountain Biodiversity. The objectives of this PoW are to contribute to poverty alleviation in mountain ecosystems and in lowland areas dependent on mountain ecosystem services. Its overall purpose is to reduce the loss of mountain biological diversity significantly at global, regional, and national levels by

- reducing the rate of loss of the components of biodiversity;
- promoting sustainable use of biodiversity;
- addressing the major threats to biodiversity;
- maintaining ecosystem integrity;
- protecting traditional knowledge, innovations, and practices;
- ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources; and
- mobilising financial and technical resources.

The countries of the Himalayan region have already started to fulfil their role as signatories to the CBD by setting aside considerable biodiversity rich areas for different forms of protection. A notable second step would be to participate in data collection at transect sites and to collaborate on transboundary landscapes and corridors.

What is the role of protected areas?

Protected areas in the mountains house some of the world's most threatened species; they are also home to some of the world's poorest people who are dependent upon the biological resources that the mountain ecosystems offer. Over the past few years the rationale for establishing these protected areas has evolved as the understanding of the role they play has deepened.

Initially the focus was on conserving wilderness and uniqueness, but now the focus has shifted to their ability to preserve biodiversity, maintain cultural landscapes, and deliver ecological services. As of 2007, the Hindu Kush-Himalayan region had 488 protected areas, covering more than 1.6 million sq km, representing 39% of the region's terrestrial area.

"We have the moral responsibility to bequeath to our children a world which is safe, clean and productive, a world which should continue to inspire the human imagination with the immensity of the blue ocean, the loftiness of snow-covered mountains, the green expanse of extensive forests and the silver streams of ancient rivers. This is a world which we hold in trust, a world which has created and nurtured life for countless generations. Today, climate change threatens our planet. There is a real possibility of catastrophic disruption of the fragile life-sustaining ecological system that holds this world together. Science is now unequivocal on this assessment."

Man Mohan Singh, Prime Minister of India, June 2008, on announcing India's National Action Plan on Climate Change

"We have now moved from protection of charismatic species to habitat conservation and finally to people-managed conservation areas."

Eklabya Sharma, ICIMOD, at the IMBC conference

