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CHAPTER 1

THE SACRED HIMALAYAN LANDSCAPE: CONCEPTUALIZING, VISIONING AND PLANNING FOR CONSERVATION OF BIODIVERSITY, CULTURES AND LIVELIHOODS IN THE EASTERN HIMALAYAS

By

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ABSTRACT

Globally, protected areas alone are proving to be inadequate to effectively conserve the Earth's biodiversity, including species, communities, and ecological processes and services. It is increasingly apparent that conservation efforts should also focus on landscapes, to include the surrounding habitat and matrices with attempts to link key protected areas to capture and facilitate ecological processes. These issues are relevant to the Eastern Himalayan Mountains where species are distributed at low densities with high species turnover across the latitudinal and longitudinal axes. Many species also undertake seasonal migrations and dispersal, and the hydrological flows of the numerous river systems sustain the ecological communities and lives and livelihoods of the people throughout the region. The Sacred Himalayan Landscape was conceptualized, designed, and planned to capture the biodiversity and ecological processes and services which are now threatened by the 'human-footprint' which pervades even this remote and inaccessible region. The strategy for conservation in this landscape is unique in that it strives to resurrect, revive, and apply traditional natural resource practices steeped and shaped by spiritual beliefs and cultural practices that have influenced the mountain people in how they interact, view, live, and use the environment. The Sacred Himalayan Landscape thus provides unprecedented opportunities to convert the current vulnerabilities to securities for ensuring biodiversity conservation and sustainable livelihoods through traditional sustainable practices in the Himalayan Mountains. It can also provide a model for conservation in other remote areas where people are heavily dependent on natural resources.

Key words: Conservation landscapes, Himalayas, Nepal, Sacred Himalayan Landscape

INTRODUCTION

More than 102,000 protected areas have now been established worldwide, covering 11.5% of the global land area, against IUCN's global target of 10% of the terrestrial habitat (Chape *et al.* 2003). However, this target still does not include or represent many ecosystems or adequate areas within them (CBD 2004). Due to their isolation in fragmented habitats, poor management, and lack of monitoring, the effectiveness of protected areas for global biodiversity conservation has also been questioned (Rodrigues *et al.* 2004). Therefore, the measures taken to safeguard and ensure long-term persistence of biodiversity are inadequate. With the emphasis on what to conserve and where, rather than also addressing how to conserve biodiversity effectively, most efforts at biodiversity conservation have focused primarily on protected areas. It is only recently, with the isolation of protected areas, that conservationists have become aware of the need to pay attention to the unprotected lands—the matrices—surrounding the reserves. These matrices play crucial roles in maintaining ecological processes and services that help maintain core species populations and ecological communities as ecologically and demographically viable entities.

In the Himalayan mountains, the existing conservation efforts through protected area management are far from adequate to meet the ecological requirements of flagship species such as the snow leopard, takin, red panda, and musk deer. Although several protected areas are large they include a large proportion of rock and ice (Allnutt *et al.* 2005), rather than the important alpine grasslands and temperate forests that provide important habitat and are important conservation targets. Because of the sparse distribution of high altitude species a high proportion of important habitat and migratory pathways lie outside the protected areas.

Situated in the heart of the Himalayan Mountain arc, which runs for over 2,414 kilometers through the centre of the Eurasian continent, are several of the world's tallest mountain peaks, including the highest, Sagarmatha (Mt. Everest), and Kangchenjunga and Jumolhari. The people living around mountains often experience the sacred nature of mountains and revere them as the temples of gods, the centre of the universe, the abodes of the dead and the sources of life, and as places of inspiration (Dudley, Higgins-Zogib and Mansourian 2005). Therefore, the power of these many mountains comes from them being regarded as dwelling places of deities, often regarded as protectors of local communities. The mountains are held 'sacred', in the sense of a connotation of values and belief systems, and cultural, spiritual and inspirational power that mountains along with their vast surrounding landscapes emanate. This sacredness influences how the local people seek to exploit, conserve, and protect natural resources in their environment.

It is within this context that the Sacred Himalayan Landscape (SHL) was conceptualized. Its objective is to conserve a landscape that will preserve the ecological integrity of the high Himalayan biodiversity by conserving and channeling the traditional spiritual beliefs and practices of the local people to achieve conservation goals for biodiversity and cultures.

THE SACRED HIMALAYAN LANDSCAPE

The Sacred Himalayan Landscape (SHL) is a vision for a transboundary landscape that captures the alpine meadows and grasslands and the temperate broadleaf and conifer forests of the eastern Himalayas. It includes two WWF Global 200 ecoregions (Olson & Dinerstein 2002) and lies within the Eastern Himalayan Hotspot (Sherpa *et al.* 2005), a testament to the global significance of its biodiversity.

The SHL covers an area of 39,021 square kilometers, of which about 73.5% falls in Nepal, 24.4% falls in Sikkim of India and the remaining 2.1% falls in Bhutan. It extends from Langtang National Park in central Nepal through the Kangchenjunga region in Sikkim and Darjeeling in India to Toorsa Strict Nature Reserve in western Bhutan (Fig. 1). The transboundary nature of the landscape presents an excellent opportunity for cooperation among the countries in the region for effective conservation and also to meet obligations under international agreements such as the Convention on Biological Diversity and the Convention on Migratory Species (Shengji & Sharma 1998).

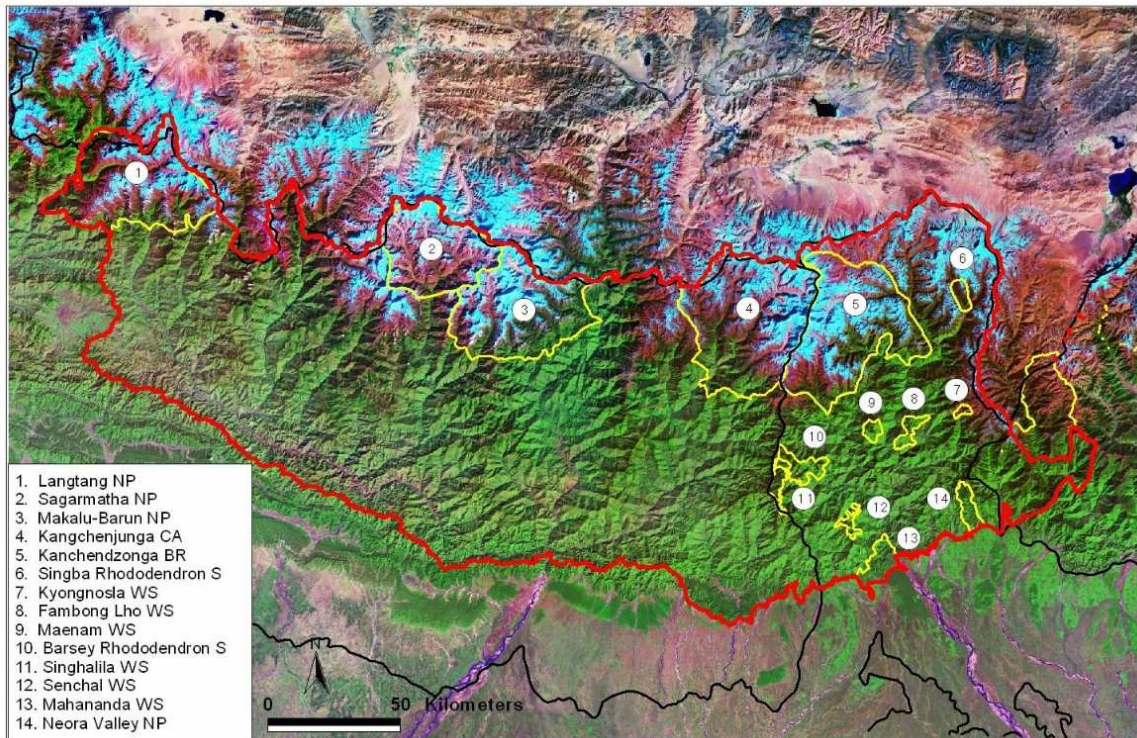


Figure 1. The Sacred Himalayan Landscape. The landscape boundary is shown by the red outline, with protected areas in yellow.

CONSERVATION SIGNIFICANCE OF THE SACRED HIMALAYAN LANDSCAPE

The SHL includes five of the 19 ecoregions that comprise the Eastern Himalayan Conservation Complex (EHEC), and the high topographical relief, climatic variation, and its position at the ecotone of several biogeographic regions confer the area, and the landscape, with a high level of biological diversity (WWF & ICOMOD 2001).

Floral diversity

The moist conditions and the complex topography create localized microclimates that support floral diversity and endemism. The highest altitudinal nival zone includes four mountain peaks that exceed 8,000m in elevation. Although these high altitude ecosystems are not as species-rich as the ecosystems lower down, they support a unique flora and fauna representing the ecological communities in the highest ecosystems in the world. The herbs in alpine ecosystems comprise an

assemblage dominated by genera such as *Alchemilla*, *Androsace*, *Primula*, *Diapensia*, *Impatiens*, *Draba*, *Anemone*, *Gentiana*, *Leontopodium*, *Meconopsis*, *Saxifraga*, *Sedum*, *Saussurea*, *Rhododendron*, *Potentilla*, *Pedicularis*, and *Viola*. Several of these are prized as medicinal herbs.

The sub-alpine conifer forests are dominated by Fir (*Abies spectabilis*), Larch (*Larix griffithii*), Hemlock (*Tsuga dumosa*), Yew (*Taxus baccata*), and Junipers (*Juniperus spp.*). Several rhododendrons grow in the understory, along with *Viburnum grandiflorum*, *Lonicera angustifolia*, *Betula utilis*, *Acer spp.*, *Sorbus spp.* (WWF & ICIMOD 2001).

The temperate forests exhibit two distinct ecological formations. In the moist regions grow temperate evergreen forests dominated by oaks (*Quercus spp.*) In drier slopes the forests are deciduous, and are dominated by *Acer campbellii*, *Juglans regia*, *Alnus nepalensis*, *Betula alnoides*, *Betula utilis*, and *Echinocarpus dasycarpus*. The subtropical broadleaf forests of the mid-hills are dominated by associations of *Schima wallichii*, *Castanopsis tribuloides*, *Castanopsis indica*, *Terminalia crenulata*, *Terminalia bellerica*, *Engelhardtia spicata*, *Betula spp.*, and *Anogeissus spp.*, with some oaks, maples, and subtropical conifers as well as *Engelhardtia spicata*, *Erythrina spp.*, and *Albizia spp.* *Alnus nepalensis* is an early-successional species that invades landslide areas and forms monospecific stands (WWF & ICIMOD 2001).

Faunal diversity

Over 80 mammal species are known to occur in the SHL. These include several large, charismatic and focal species for conservation, notably the Snow Leopard (*Uncia uncia*), Red Panda (*Ailurus fulgens*), Musk Deer (*Moschus chrysogaster*), Tibetan Wolf (*Canis lupus chanco*), Blue Sheep (*Pseudois nayaur*), Himalayan Thar (*Hemitragus jemlahicus*) and Clouded Leopard (*Neofelis nebulosa*). Indo-Malayan species such as the Tiger (*Panthera tigris*) and Asian Elephants (*Elephas maximus*) occur in the Mahananda Wildlife Sanctuary, in Darjeeling, West Bengal, but the SHL landscape does not support a significant population of these species. Unlike in Bhutan, tigers are not known to roam the high elevation habitats of this landscape. Instead, the mystical Snow Leopard, the top predator in the alpine and nival habitats of the eastern Himalayas, is seen as the flagship predator and a primary focal species for conservation planning, along with habitat specialists such as the Red Panda, Musk Deer, and the assemblage of 13 species of pheasants. All these species are now endangered or vulnerable due to hunting and habitat loss. Of the over 440 species of birds recorded from the SHL, six are Himalayan endemics (WWF & ICIMOD 2001).

Agrobiodiversity

Agriculture that includes production of cereals, grain legumes, oilseeds, fruits, vegetables and spices; management of cattle, poultry, goats, sheep and pigs; and production of agro-forestry along with mixed cropping, mixed farming systems and shifting cultivation significantly contributes to food security in the SHL. The SHL has numerous important cultivated and domesticated plant and animal species that are relatives of wild species. Several varieties of rice, wheat, millet, buckwheat, barely and amaranth are grown in the mountains. Of many advantages, these crops can tolerate extreme variations in temperature, precipitation, and soil conditions and have high nutrition value. However, many of these local crop varieties are now threatened with extinction. For example, local people in Kangchenjunga Conservation Area report that the *Bhadaiya* variety of local rice is on the verge of local extinction because of the wider cultivation practice of using high yielding varieties and increasing use of chemical pesticides (CEMP Consult 2001). The high mountain areas in the SHL also have several indigenous breeds of animals, some of which are now threatened. For instance, *Chwanche* and *Hurrah* are indigenous pig breeds that are threatened by introduction of exotic varieties. The yak population is also decreasing, as is its hybrid *Uran* which has more milk yielding capacity and sturdiness to porter bulky goods.

Ecological and Evolutionary Processes

Several important ecological and evolutionary processes in the mountain ecosystems maintain and sustain biological diversity. For instance, the Snow Leopard, Tibetan Wolf, and the large birds of prey (Lammergeier, eagles) are the top predators in these mountains. While the large mammalian predators prey on the larger species, especially the montane ungulates, the birds of prey depend on the smaller and mid-sized animals such as the marmots, which live in colonies in the alpine areas, and other rodents and birds. These predator-prey relationships are important conservation targets.

Many Himalayan birds are known to migrate from the foothills to the mid-hill temperate broadleaf forests and others from the mid-hills to the alpine habitats. The large ungulates also make short-distance altitudinal migrations from the alpine areas where they spend the summer months to the forested sub-alpine areas during winter. It is also likely that other taxonomic groups such as insects and fishes could also make similar migrations for reproduction. The large predators, especially the snow leopard, very likely disperse from natal areas to establish territories elsewhere like other large felids do. Conservation in the eastern Himalayas should take these movements into consideration and provide adequate spatial areas and linkages to maintain these ecological and behavioral phenomena.

The Himalayan river systems with their myriad streams cascade down the mountains to become confluent with the Ganges and Brahmaputra rivers that flow along the base of the mountain range before eventually flowing into the Indian Ocean at the Bay of Bengal. These rivers and streams, and the montane lakes and wetlands, support fishes, insects, birds, mammals, and plants that require conservation attention. The high mountain regions of the SHL also contain several water towers which represent the sources of sustained freshwater for consumption both locally and across the region. These river systems are thus conservation targets of significance locally as well as regionally because their disruption can affect biological and human communities in the mountains as well as in the vast delta of the Ganges River thousands of kilometers away.

Despite the relatively recent origin of the Himalayan range, there is considerable endemism in these mountains. The extreme elevations and complex topography that isolate species create a microclimatic and microhabitat mosaic where plants have evolved into species and assemblages that are adapted to specific bio-physical conditions. For instance, several cushion and rosette-forming plants such as *Androsace*, *Arenaria*, *Saxifraga*, *Corydalis*, and *Ermania* have evolved strategies that enable them to grow and survive in extreme conditions such as high winds, large temperature fluctuations, and unstable substrates in the alpine and nival zones. Genera such as *Meconopsis* and *Primula* have their global centers of diversity in the alpine areas of the Eastern Himalayas and *Rhododendron* and other herbs such as *Potentilla*, *Ranunculus*, *Pedicularis*, *Saxifraga*, *Aconitum*, and *Saussurea* have evolved into a rich species diversity that cover the alpine meadows with a spectacular carpet of colorful flowers in the spring and summer, with several species being endemic to the Himalayas. Areas of high endemism and richness in the SHL, include the Milke Jaljale, Singhalila, Tamur Valley, Barsey, Meanum, and Shingba Rhododendron Sanctuary.

THE SOCIO-CULTURAL ATTRIBUTES OF THE SACRED HIMALAYAN LANDSCAPE

The rich biodiversity of this landscape is matched by an equally rich tradition of cultures, religious and spiritual beliefs. These cultural attributes strongly influence how the people interact with the environment and provide a basis for managing and harvesting natural resources. As a

result the people possess a vast ecological knowledge that can be channeled and integrated with modern approaches to biodiversity conservation for a suitable model in the mountains. Because the local people also rely heavily on natural resources, there is concern for the consequences of overexploitation and eventual local extinctions that will make these resources unavailable to them. For example, traditional medical doctors, known as *amchis*, are able to identify several hundred species of medicinal plants and employ sustainable harvesting practices. Many of these plant species, however, are being illegally harvested for commercial trade, with minimum benefits derived by local users (Lama *et al.* 2001). Thus, communities, policy makers and other stakeholders are increasingly concerned about the intense harvesting pressure and the gaps in policy which impede sustainable commercialization. In Nepal, a non-timber forest products development policy has recently been formulated to address constraints to conservation and sustainable production of non-timber forest products. This would enable value addition and marketing of high value biodiversity products and opportunities to increase income for local communities.

Spread across the length of the SHL is a diverse array of ethnic groups and human cultures, such as the Limbu, Bhotia/Sherpa, Gurung, Tibetan, Rai, Lepcha, Sikkimese Bhutia, Tamang, Sarki, Damai, Kami and Brahmins. Beliefs in Buddhism, Hinduism, and a varying blend of both combined with animism cuts across all these groups, imparting a sense of compassion and awareness for all forms of life and the surrounding natural environment. Buddhist beliefs in 'hidden lands' or '*beyuls*', and 'hidden treasures' or *ters* are often linked to the idea of conservation areas for humans and nature, and provide a strong organizing principle on how people relate to vast natural spaces and the biodiversity therein. Usually *beyuls* are rich in biodiversity and often are named for dominant flora and fauna; examples include '*Beyul Khenpalung*' or the 'Hidden Land of *Artemisia*' in Makalu Barun National Park in Nepal, and *Demajong*, or 'Valley of Rice' in Sikkim. These areas are traditionally marked by strict observances such as bans on hunting, mining, polluting rivers and streams, and harvesting of timber and plant resources. Transgressors are often punished through fines and other disciplinary actions. Thus, conservation is culturally enforced within many of these indigenous groups.

CONSERVATION OPPORTUNITIES IN THE SACRED HIMALAYAN LANDSCAPE

Linking protected areas

Embedded within the SHL are 14 protected areas; four in Nepal and 10 in India (Sikkim and Darjeeling) (Fig. 1). The SHL is also contiguous with one of the largest protected areas in Asia, the vast Qomolangma Nature Preserve in Tibet (China). In the east, the Sacred Himalayan Landscape maintains continuity with another important conservation landscape, the Bhutan Biological Conservation Complex through the Toorsa Strict Nature Reserve in eastern Bhutan. Thus, the SHL provides a large expanse of habitat for wide ranging species such as the snow leopard, which can best be conserved through such landscape approaches to conservation (Villarubia & Jackson 1994; Jackson & Ahlborn 1990).

Zooming out from the SHL level reveals a bigger vision for the Eastern Himalaya. The SHL is contiguous with the Bhutan Biological Conservation Complex to the east, which is in turn contiguous with two other conservation landscapes in northeastern India (Fig. 2). Therefore, the SHL contributes to a regional effort to conserve the biodiversity, provide sustainable livelihoods to the people, and maintain the ecological services provided by the numerous rivers that flow down along the length and breadth of the Himalayan Mountains, the latter being critical for the lives and livelihoods of people and ecosystems far downriver in the Gangetic Plains.

The strategy to create habitat links between protected areas in the SHL builds upon existing priorities of national and regional governments for landscape level conservation in the Eastern Himalaya. The Nepal Biodiversity Strategy (2002) clearly emphasizes the need to establish conservation linkages between the Kangchenjunga Conservation Area and Makalu Barun National Park.

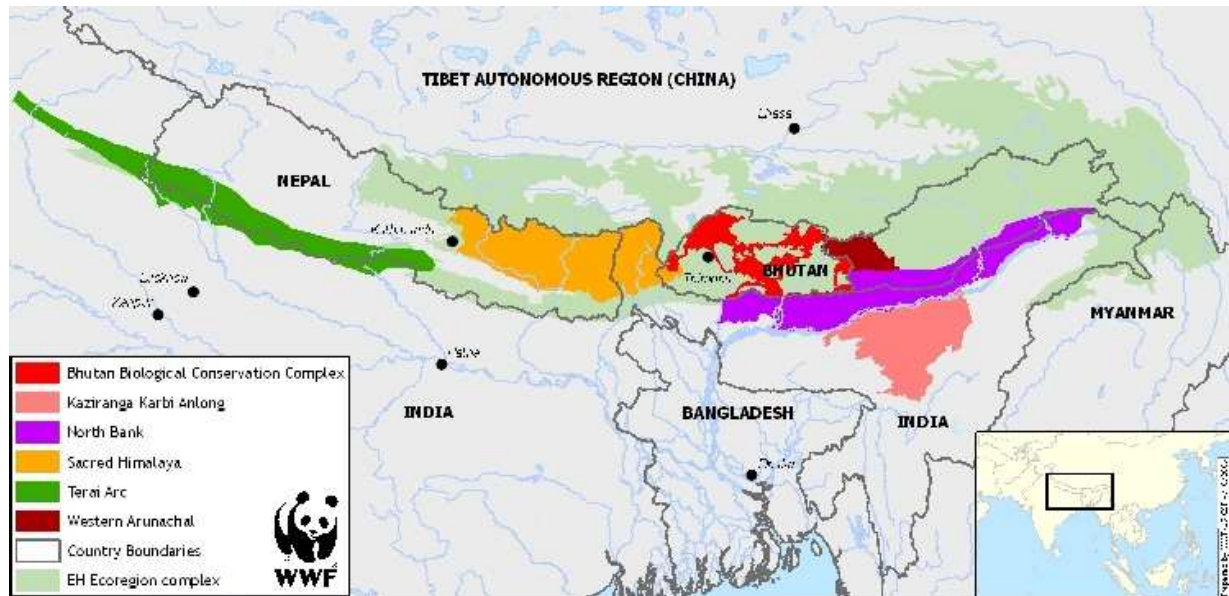


Figure 2. Conservation landscapes of the Eastern Himalaya. The contiguity of the landscapes helps to capture and sustain ecological processes and services over a wide area across the mountain range.

Learning from experience

Much of the conceptualization and planning for the SHL has been obtained from the experience in implementation of the Terai Arc Landscape (TAL) initiative, which was jointly undertaken by India and Nepal in 2000 (HMGN/MFSC 2005). In Nepal the TAL program has successfully instilled landscape-scale conservation thinking into natural resource management. As a result, and in line with the TAL, the SHL was conceptualized to merge natural resource management and biodiversity conservation within a multi-stakeholder governance framework.

Forging wider partnerships

Currently, several organizations, the International Centre for Integrated Mountain Development (ICIMOD), The Mountain Institute (TMI), WWF Nepal, EcoHimal, and the IUCN have formed a working partnership with each other and with the government departments to complement and synergize conservation efforts in the landscape. ICIMOD is currently developing corridor linkages between protected areas in the landscape; TMI is building capacity for joint forest management and enterprise-based conservation initiatives in Sikkim's protected areas and other areas outside the Kangchenjunga Conservation Area in eastern Nepal; WWF is strengthening protected area management through capacity building of the Conservation Area Management Council for community management in the Kangchenjunga Conservation Area of Nepal and in Sagarmatha, and intends initiating activities in Langtang in the future; IUCN is working with communities in the Milke Jaljale Area, which links Kangchenjunga Conservation Area and Makalu Barun National Park to address deforestation of sensitive habitats; and EcoHimal is

working with communities in Sagarmatha, the Rolwaling area, and in Makalu Barun National Park Buffer Zone and surrounding areas to promote sustainable development and conservation with intentions to expand into the linkage between Langtang National Park and Sagarmatha National Park. WWF's species work, especially with snow leopards, will extend its activities across the landscape.

This partnership, under the auspices of the SHL, will enable all these current and future activities conducted by multiple organizations and involving multiple stakeholders to be harmonized in order to work towards a common vision, rather than be implemented haphazardly across the landscape with no reference to the large conservation goals. In addition to these projects within the landscape, the SHL will encourage the governments to develop close transboundary relationships.

Converting vulnerability of mountain communities into security

Despite the ecological and socio-cultural importance of the region and its relative isolation and inaccessibility, the Himalaya has not been spared the stresses and threats that accompany the 'human-footprint', which pervades most of the Earth's natural ecosystems today (Brooks *et al.* 2002). Habitat loss and fragmentation through land-use changes, degradation due to unsustainable resource extraction, and over-grazing by increasingly larger herds of livestock are some of the major threats that seem to impinge on the landscape's ecological integrity. The high mountains have also attracted a steady stream of visitors which, despite the opportunities for diversification and enhancement of local incomes, can also bring many ills, such as increased pressures on biotic resources, and environmental pollution if left unregulated.

A growing economic liberalization on the Tibetan Plateau has taken advantage of the weak enforcement of laws across the porous borders, creating increased pressures on natural resources. Conflicts between traditional, customary, and statutory laws impede sustainable land use practices throughout the landscape. Slash and burn practices are widespread, taking advantage of weak tenure. Poverty is also widespread in the region. Much of the landscape falls on national borderlands and is largely left out of development initiatives. Remoteness, poor communications and infrastructure also impede the development of market linkages for biodiversity and agricultural products. Governance is largely weak and benefit sharing from natural resources is marked by conflict and inequities.

A possible strategy to mitigate these threats lies in the roles that the traditional cultures have played in shaping and nurturing this landscape over the centuries. The age-old natural resource management systems, steeped in a reverence for nature, is therefore seen as the basis upon which to approach landscape level conservation in the SHL. But it is the present local communities who would have to undertake the stewardship of such conservation and management. Therefore, the SHL conservation strategy would entail revival and wider application of some of these traditional systems which are being cast aside in favor of modern market economy-based drivers. For instance, the local Sherpa communities in Sagarmatha National Park have managed their forest on a sustainable manner through the *Shinginawa* system for centuries. Similarly, the *Dzumsa* system of land-use practices in Sikkim had been very effective and sustainable. Drawing upon and utilizing these indigenous knowledge bases and practices of local communities and involving them in biodiversity conservation will promote local cultures, practices and livelihoods that are also under intense pressures from market and socio-political forces. Thus, there are unprecedented opportunities to convert the current vulnerabilities to securities for ensuring biodiversity conservation and sustainable livelihoods by resurrecting, supporting, and promoting the traditions and cultural diversity in this sacred landscape.

REFERENCES

- Alnutt, T. F., E. D. Wikramanayake, E. Dinerstein, C. Loucks, R. Jackson, and C. Carpenter. 2005. Protected areas in the Himalaya. Pages 112-117 in U. R. Sharma and P. B. Yonzon (eds.). **People and protected areas in South Asia**. IUCN World Commission on Protected Areas, South Asia and Resources Himalaya Foundation. Kathmandu, Nepal
- Brooks, T. M., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, A. B. Rylands, W. R. Konstant, P. Flick, J. Pilgrim, S. Oldfield, G. Magin, and C. Hilton-Taylor. 2002. Habitat Lost and Extinction in the Hotspots of Biodiversity. **Conservation Biology** 16(4): 909-923.
- CBD. 2004. Biodiversity Issues for Consideration in Planning, Establishment and Management of Protected Area Sites and Networks. Montreal, SCBD. **CBD Technical Series** No 15. 164pp.
- CEMP Consult. 2001. Kanchanjunga Landscape Complex Biodiversity Assessment, Final Report submitted to Nepal Biodiversity Landscape Project, WWF Nepal, Kathmandu.
- Chape, S., S. Blyth, L. Fish, P. Fox, and M. Spalding. 2003. **United Nations List of Protected Area**. IUCN, Gland, Switzerland and Cambridge UK and UNEP-WCMC Cambridge UK 1x-44pp.
- Dudley N., L. Higgins-Zogib and S. Mansourian S. 2005. **Beyond belief: Linking faiths and protected areas to support biodiversity conservation**. WWF International and Equilibrium and Alliance of Religions and Conservation (ARC), UK.
- HMG/N/MFSC. 2005. Proceedings of the National Stakeholders' Consultation on the Sacred Himalayan Landscape in Nepal. Ministry of Forest and Soil Conservation. Kathmandu, Nepal.
- Jackson, R. and G. Ahlborn. 1990. The role of protected areas in Nepal in maintaining viable populations of snow leopards. In L. Blomqvist (ed.) **International pedigree book of snow leopards**. Vol 6. Helsinki, Finland.
- Lama, Y.C., S. K. Ghimere, and Y. Aumeeruddy-Thomas. 2001. Medicinal plants of Dolpo: Amchis' knowledge and conservation. WWF Nepal Program. Kathmandu.
- Nepal Biodiversity Strategy. 2002. Ministry of Forests and Soil Conservation, HMG, Nepal. Global Environment Facility and UNDP,
- Olson, D. M., and E. Dinerstein. 2002. The Global 200: Priority ecoregions for global conservation. **Annal Missouri Botanical Gardens** 89: 199-224.
- Rodrigues, A. S. L., S. J. Andelman, M. I. Bakarr, L. Boltani, T. M. Brooks, R. M. Cowling, L. D. C. Fishpool, G. A. B. da Fonseca, K. J. Gaston, M. Hoffman, J. S. Long, P. A. Marquet, J. D. Pilgrim, R. L. Pressey, J. Schipper, W. Sechrest, S. N. Stuart, L. G. Underhill, R. W. Waller, M. E. J. Watta, and X. Yan. 2004. Effectiveness of global protected area network in representing species diversity. **Nature** 428:640-643.

- Shengji, P. and U. R. Sharma. 1998. Transboundary Biodiversity Conservation in the Himalayas. In: **Ecoregional Cooperation for Biodiversity Conservation in the Himalayas**. United Nations Development Programme, New York, USA.
- Sherpa, M., E. Wikramanayake, and G. Rawat. 2004. Himalaya. Pages 309-321 in R. A. Mittermeier, P. R. Gils, M. Hoffman, J. Pilgrim, T. Brooks, C.G. Mittermeier, J. Lamoreaux, and G.A.B. da Fonseca (eds.). **Hotspots revisited. Earth's biologically richest and most endangered terrestrial ecoregions**. CEMEX. USA
- Villarubia, C. and R. Jackson. 1994. Snow leopard conservation on a regional basis: Elements in planning protected areas. In J. L. Fox and D. Jizeng (eds.). **Proceedings of the seventh international snow leopard symposium**. International Snow Leopard Trust in cooperation with the Chicago Zoological Society.
- WWF and ICIMOD. 2001. **Ecoregion-based conservation in the Eastern Himalaya. Identifying important areas for biodiversity conservation**. World Wildlife Fund and International Centre for Mountain Development.