Ecosystem Profile

Eastern Himalayas Region

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INTRODUCTION

The Critical Ecosystem Partnership Fund (CEPF) is designed to safeguard the world's threatened biodiversity hotspots in developing countries. It is a joint initiative of Conservation International, the Global Environment Facility, the Government of Japan, the John D. and Catherine T. MacArthur Foundation and the World Bank.

A fundamental purpose of CEPF is to engage civil society, such as community groups, nongovernmental organizations (NGOs), academic institutions and private enterprises, in biodiversity conservation in the hotspots. To guarantee their success, these efforts must complement existing strategies and programs of national governments and multilateral and bilateral donors. CEPF promotes working alliances among diverse groups, combining unique capacities and reducing duplication of efforts for a comprehensive, coordinated approach to conservation. CEPF focuses on biological areas rather than political boundaries and examines conservation threats on a hotspot-level basis. CEPF targets transboundary cooperation, in areas of high importance for biodiversity conservation that straddle national borders, or in areas where a regional approach will be more effective than a national approach. CEPF aims to provide civil society with an agile and flexible funding mechanism complementing funding available to government institutions.

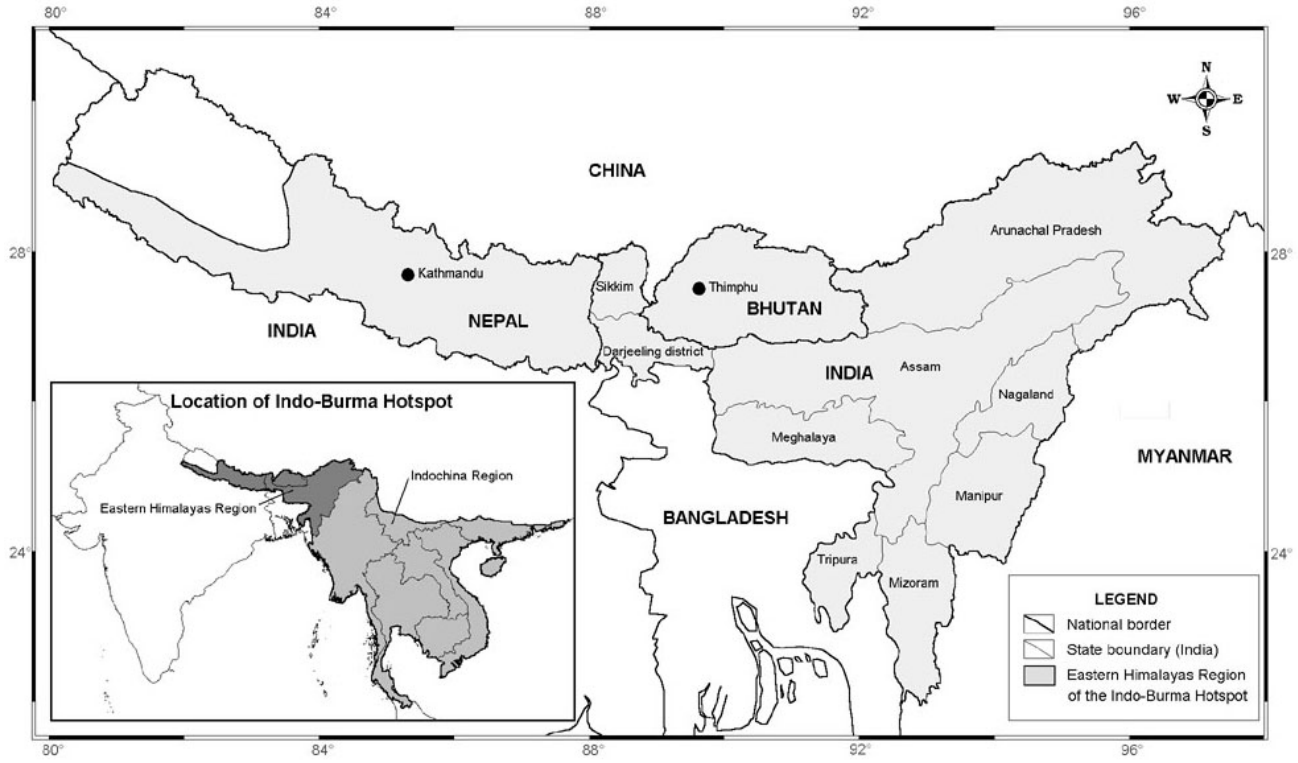
This document represents the ecosystem profile for the Eastern Himalayas Region, which comprises Bhutan, northeastern India and southern, central and eastern Nepal. At the time this document was prepared, the Eastern Himalayas Region was part of the Indo-Burma Hotspot. Subsequently, a new hotspots appraisal released in 2005 now classifies this region as part of two hotspots: Indo-Burma and Himalaya, with the latter being a newly classified hotspot. This profile and subsequent CEPF investments focus strictly on the Eastern Himalayas Region as defined in this document.

THE ECOSYSTEM PROFILE

The Geographical Extent

This profile deals with the region that covers the eastern Himalayas and northeastern India. It comprises the lowlands of western Nepal and the montane regions of central and eastern Nepal; the State of Sikkim, the northern extent of West Bengal in India including Darjeeling District; Bhutan in its entirety; and the northeastern Indian states of Assam, Arunachal Pradesh, Manipur, Mizoram, Tripura, Meghalaya and Nagaland (Figure 1). This area is referred to as the Eastern Himalayas Region throughout the rest of this document.

Figure 1. Eastern Himalayas Region



NB. The map inset above shows the Indo-Burma Hotspot as it was originally defined before the hotspots reappraisal.

The Purpose of the Profile

This ecosystem profile provides an overview of the biodiversity contained within the Eastern Himalayas Region. Based on the distribution and status of biodiversity and conservation opportunities, the profile provides a suite of conservation outcomes, expressed as a hierarchy of species-, site-, and corridor-level targets that must be achieved by the conservation community to prevent biodiversity loss.

The profile also provides an overview of the socioeconomic and political issues that will impinge on and influence biodiversity conservation, with a focus on the major threats to biodiversity and underlying causes. Although the Eastern Himalayas Region spans only three countries, it includes a multitude of ethnic groups and tribes, several religions, languages, and dialects. Because of the extension of ecosystems and protected areas networks across international and state boundaries, close cooperation between countries and state governments will be essential for effective conservation.

Based on these parameters, as well as current investments in conservation and funding gaps, the profile defines an investment niche for CEPF to support biodiversity conservation in this biologically important region. In keeping with CEPF's mandate, the profile includes recommendations on strategic ways to involve civil society in biodiversity conservation and to build partnerships to increase the breadth of conservation effort.

The profile is not intended to provide or propose specific projects and actions. Instead it includes a series of "Strategic Directions" or themes and their related "Investment Priorities." Civil society groups applying for CEPF grants then prepare and submit detailed proposals for specific projects, describing the interventions and performance indicators to measure success, consistent with these funding directions and investment criteria.

Background

This ecosystem profile and five-year investment strategy for the Eastern Himalayas Region is based on a priority-setting analysis of a suite of conservation outcomes for the region developed by BirdLife International. Four regional, expert roundtable consultations and resource documents commissioned from regional civil society organizations (Aaranyak 2003, ATREE 2003, CEE 2003) helped to develop the full set of conservation outcomes.

BirdLife International organized the regional expert roundtables in collaboration with WWF, the Centre for Environmental Education (CEE) and the Ashoka Trust for Research in Ecology and the Environment (ATREE). These roundtables, held in Nepal, Sikkim, Bhutan and Assam, were attended by 147 participants from Nepal, Bhutan, India and outside the region representing various institutions that included a range of local, regional, and international civil society organizations and scientific and government institutions. Consultants were also hired to collect, collate and prepare background reports on socioeconomic factors, the institutional context and conservation efforts in Nepal, Bhutan and northeast India.

WWF used this suite of conservation outcomes in an analysis to identify priorities for CEPF investments, as detailed in this ecosystem profile. The analysis took into account input from additional expert consultations, literature, and donor portfolio reviews, and results from previous conservation priority-setting exercises for the Eastern Himalayas Region (Basnet *et al*. 2000, Dorji 2000, Joshi 2000, Khaling *et al*. 2000, Myint *et al*. 2000, Pradhan and Bhujel 2000, Rastogi 2000, Shrestha and Joshi 1997,UNDP 1998, Wikramanayake *et al.* 1998a, WWF and ICIMOD 2001, Yonzon 2000a).

This ecosystem profile includes a commitment and emphasis on using conservation outcomes—targets against which the success of conservation investments can be measured—as the scientific underpinning for determining CEPF's geographic and thematic focus for investment. CEPF recognizes that it cannot achieve all of the outcomes identified for a region on its own; thus, it places emphasis on forging partnerships for conservation investments to create a synergy when working to prevent biodiversity loss.

BIOLOGICAL IMPORTANCE

By many measures of biodiversity, the Eastern Himalayas Region stands out as being globally important. It has been included among Earth's biodiversity hotspots (Myers *et al*. 2000) and includes several Global 200 ecoregions (Olson and Dinerstein 1998), two Endemic Bird Areas (Stattersfield *et al*. 1998), and several centers for plant diversity (WWF/IUCN 1995). An understanding of why the eastern Himalayas are so

exceptionally rich in biodiversity requires a brief overview and analysis of its geological history and ensuing biogeographic patterns.

The Himalayas are geologically young (Xu 1993). More than 200 million years ago, Proto-India detached from the southeastern margin of Africa and began to drift slowly northward until it was intercepted by Eurasia. The Himalayas mountain range rose out of the geologic faulting during this massive collision, which occurred during the latter part of the Tertiary Period as indicated by the fossil record that shows an invasion of India by Eurasian fauna (Molnar 1986). The energy dissipated by this collision was widespread and accounts for some of Asia's most distinctive geographical features, including the compression of the Tibetan Plateau, the massive distortion of Asia's southern margin and even the Annamite mountain range in Indochina. Because the Deccan Plate is still inexorably moving northward, both Tibet and the Inner Himalayas continue to be pushed upward even today.

The rugged, and largely inaccessible, landscape makes biological surveys in the Himalayas extremely difficult. Vast areas of intact forests are little or entirely unexplored. Thus, many floral and faunal taxonomic groups are understudied and the true extent of the biodiversity is undoubtedly underestimated. Undescribed species, including some from the higher taxonomic groups such as mammals, reptiles and amphibians are very likely to occur in the more remote, heavily forested regions. But, despite the scant knowledge, what we know of the biodiversity indicates that the Eastern Himalayas Region is amongst the biologically richest areas on Earth.

Several factors contribute to the exceptional biological diversity of the eastern Himalayas. First, the eastern Himalayas has multiple biogeographic origins. Its location at the juncture of two continental plates places it in an ecotone represented by flora and fauna from both. The Indo-Malayan Realm of Southeast Asia contributes many tropical taxa to the eastern Himalayas biota, including trees such as *dipterocarpus*, *shorea* and *terminalia*, and climbing figs, epiphytic orchids, and arums. The monsoon forests below 1,000 meters have a close affinity with the monsoon forests of Indochina, and include dominant trees from the Family Dipterocarpaceae, woody climbers, *Phoenix* palms, a closed groundcover of grasses and sedges, and laterized red soils infested with termite colonies. Vertebrates include many Indomalayan species such as Asian elephant (*Elephas maximus*), wild water buffalo (*Bubalus bubalis*), gaur (*Bos gaurus*), hornbills, pittas, cobras, and geckoes.

The Palearctic Realm to the north contributes plant species in the higher elevation forests, including conifers such as spruce (*Piceae*), fir (*Abies*), and larch (*Larix*), as well as deciduous broadleaf taxa such as birch (*Betula*), alder (*Alnus*), willow (*Salix*) and numerous alpine forbs such as *Potentilla* and *Pedicularis*. The temperate and subtropical East Asian or Sino-Japanese region contributes an ancient biota with high endemism and high biodiversity represented by members of the Fagaceae, Theaceae and Ericaceae. Palearctic mammals include the snow leopard (*Uncia uncia*), brown bear (*Ursus arctos*), wolf (*Canis lupus*) and a diverse assemblage of alpine ungulates.

Second, there is considerable climatic variability associated with the topography and vast reach of the mountains. The moisture-laden monsoon winds that originate from the Bay of Bengal and the South China Sea are funneled inland along the Ganges River valley, and forced up the south-facing mountain slopes. As the winds strike and rise upslope, adiabatic cooling condenses the large volumes of water that fall as rain to flow back into the Indian Ocean along the rivers that drain the mountain range. These monsoon rains deluge the eastern extent of the mountain range, which bears the brunt of the wind. The western extent receives little rainfall by comparison. Consequently, the moister eastern extent of the mountain range is more biodiverse than the western reaches.

Third, because of the complex and steep topography there is large-scale climatic variability across the north-south axis. By acting as a barrier to the monsoon, the southern slopes intercept and receive much more moisture—exceeding 2,000 millimeters per year in many areas—than the northern slopes that face Tibet and Central Asia, which are subject to strong rainshadow and *föhn* effects. And the topographic complexity also results in meso-scale climatic variability because of localized pockets of high precipitation. Conversely, dry valleys occur where prevailing air movement is catabatic (i.e., downhill), such as in the Kali Gandaki valley of Central Nepal, and Punaka Valley in Bhutan.

Fourth, the scale and complexity of the mountains in the Eastern Himalayas Region contribute to high biological diversity in several ways. The beta (a comparison of of diversity between ecosystems) and gamma (overall diversity across a large region) diversity across the vast landscape increases overall biodiversity, and the extreme vertical relief enhances biological diversity along the north-south axis. The extreme height and steepness of the Himalayas mountain range confers considerable variation to its ecosystems, which are layered along the longitudinal axis as long, narrow ecoregions (WWF and ICIMOD 2001).

The topographic complexity also isolates islands of habitat. Antecedent rivers and streams separated by mountain massifs may support reproductively isolated populations of low-elevation species. And high ridges separated by valleys may isolate high-elevation species. This can contribute to genetic differences among populations, a step toward the evolution of endemic species. On a shorter time scale, historical vicariant events isolate populations by influencing local immigration and extinction. Because the Himalayas are relatively young, levels of endemism are low. However, the stage has been set for speciation.

Plant Communities

The flora of the region includes elements from tropical Indochina, temperate East Asia, the Palaearctic region and the Deccan Plateau. The low-lying areas along the Brahmaputra River, subject to floods during the monsoon, support mixed evergreen forests. Although most of these semi-evergreen forests have long since been converted into human uses, the vestigial patches—mostly in small protected areas—indicate that these forests were characterized by *Syzygium*, *Cinnamomum*, *Artocarpus*, *Terminalia* spp.

Tetrameles spp. and *Stereospermum* spp. (Champion and Seth 1968). These forests also contain several Deccan elements, indicative of the geological origins of the region.

The alluvial grasslands and savannas along the foothill valleys are among the tallest in the world. Characteristic species in these highly productive grasslands include *Saccharum spontaneum, Phragmitis kharka, Arundo donax, Imperata cylindrica, Erianthus ravennae, Andropogon* spp., and *Aristida ascensionis* (Shrestha and Joshi 1997). Annual silt deposition during monsoon floods rejuvenates these grasslands and promotes rapid regeneration. As the floodwaters recede, grasses such as *Saccharum spontaneum* and pioneer trees such as *Trewia nudiflora* and *Ehretia laevis* begin to colonize the area, and support high densities of a diverse herbivore community.

The grasslands transition into the *sal* forests that flank the hillsides along the lower reaches of the river valleys, below 1,000 m. The lower hill slopes above 1,000 meters are cooler and less drought-stressed during the spring pre-monsoon season. Here, the subtropical evergreen broadleaf forests are dominated by tree taxa such as *Castanopsis* and *Schima* from subtropical East Asia.

The eastern Himalayas temperate forests that grow at elevations where moisture tends to condense and remain in the air during the warm, moist growing season are among the most species-rich temperate forests in the world. They are dominated by evergreen broadleaf trees (e.g. *Quercus*, Lauraceae) in the lower reaches, from about 2,000-2,500 meters, and mixed conifers (e.g. *Tsuga*, *Taxus*) and winter-deciduous broadleaf species (e.g. *Acer*, *Betula*, *Magnolia*) in the upper reaches, from 2,500-3,000 meters. The drier, south-facing slopes support extensive stands of arboreal *Rhododendron* species that may co-occur with oak (*Quercus semecarpifolia*) or other ericaceous species such as *Lyonia ovalifolia*. These temperate forests support a rich epiphytic community, consisting of a variety of dicots, orchids, ferns and mosses. Bamboo (*Arundinaria spp*.) is dominant in the understory in places, especially where it provides early-successional ground cover following fire.

Further upslope, subalpine conifer forests begin from about 3,000 meters and extend to 4,000 meters. In the eastern Himalayas, *Tsuga*, *Picea* or *Larix* dominate these forests between 3,000 meters to 3,500 meters and *Abies* dominates above 3,500 meters. *Juniperus* is widespread along the timberline, and may form dwarf *krummoltz* formations above 4,700 meters. The dry slopes and inner valleys support *Pinus* and *Cupressus* on basic limestone soils.

Above the treeline the vegetation is a moist alpine scrub community of dense juniper and *Rhododendron* shrubberies that extend to about 4,500 meters. Plant richness in these alpine shrub and meadows is very high, especially on the shady north-facing slopes that are protected from extreme winter cold by an insulating layer of snow. South-facing slopes tend to be dominated by *Kobresia* sedge and forbs with scattered shrub species of *Berberis*, *Rosa*, *Lonicera*, and *Cotoneaster* to about 4,500 meters. From 4,500 to 4,700 meters the vegetation consists of alpine meadows with a diverse assemblage of alpine

herbs and smaller-statured woody shrubs, such as a variety of dwarf rhododendrons, and numerous alpine herbs such as *Potentilla*, *Ranunculus* and the alpine *Saussure.*

Periglacial and subnival communities occur in the high alpine areas above 4,700 meters, where the short growing season, high winds, and unstable soils allow only specialized plants to survive. Some of these include *Androsace*, *Arenaria* and *Saxifraga, Meconopsis* and *Primula*. The latter two have their global centers of diversity in the eastern Himalayas. By about 5,500 to 6,000 meters, the nival zone, or permanent ice and bare rock, begins. Even here, at the highest elevations on Earth, microclimates may support small cushion-forming vascular plants, such as *Arenaria bryophylla*, which was recorded at 6,180 meters by A.F.R. Wollaston (Wollaston 1921, in Polunin and Stainton 1997).

Faunal Communities

Knowledge of the fauna of the Eastern Himalayas Region is poor. Most of the information available is on the larger vertebrates that are easily observed and inventoried. The smaller mammals, reptiles, amphibians, and fishes have been neglected and the most abundant taxonomic group, the insects, have been virtually ignored. With the exception of a few studies that have documented the Himalayas lepidoptera (Haribal 1992, Mani 1986, Yonzon 1991), little else is available on the insect fauna of the region.

Overall, more than 175 species of mammals and in excess of 500 species of birds are known from the region (WWF and ICIMOD 2001). The mammalian fauna in the lowlands is typically Indo-Malayan, consisting of langurs (*Semenopithicus* spp.), wild dogs (*Cuon alpinus*), sloth bear (*Melursus ursinus*), gaur, and several species of deer, such as muntjacs (*Muntiacus muntjak*) and sambar (*Cervus unicolor*). Further up the mountains, the Indo-Malayan fauna transitions into a Palearctic fauna, consisting of snow leopards, Asiatic black bear (*Ursus thibetinus*) and a diverse ungulate assemblage that includes the blue sheep (*Pseudois nayur*), takin (*Budorcas taxicolor*) and Himalayas thar (*Hemitragus jemlahicus*). The red panda (*Ailurus fulgens*) is a Himalayan species that lives in old growth subalpine conifer and mixed forests with a bamboo understory.

Because the Himalayas have a relatively recent origin, endemism is low, especially among the better-known higher taxonomic groups. The golden langur (*Trachypithecus geei*) is restricted to the patch of semi-evergreen and temperate forest on the north bank of the Brahmaputra River, between the Sankosh and Manas rivers that flow south from the mountains. The pygmy hog (*Sus salvinus*) and hispid hare (*Caprolagus hispidus*) are restricted to the alluvial grasslands and the Namdapha flying squirrel (*Biswamoyopterus biswasi*) is restricted to the temperate broadleaf forests of the Eastern Himalayas Region.

Endemism among birds in the region is higher than among mammals. Some species restricted to the region include the Manipur bush quail (*Perdicula manipurensis*), chestnut-breasted partridge (*Arborophila mandelli*), Blyth's tragopan (*Tragopan blythii*), Temminck's tragopan (*Tragopan temminckii*), Sclater's monal (*Lophophorus sclateri*), Tibetan eared pheasant (*Crossoptilon harmani*) and rusty-bellied shortwing (*Brachypteryx hyperythra*).

But, despite the low overall endemicity, the region harbors several species that are represented by globally significant populations. The foothill grasslands and broadleaf forests harbor important populations of the largest carnivore and herbivores in Asia, notably the tiger (*Panthera tigris*), Asian elephant, greater one-horned rhinoceros (*Rhinoceros unicornis*), and wild water buffalo. The alluvial grasslands, delineated as the Terai-Duar Savanna and Grassland ecoregion (Wikramanayake *et al*. 2001), support some of the highest densities of tigers in the world (Karanth and Nichols 1998). And the elephant population in the remaining habitat patches along the north bank of the Brahmaputra River in Assam is one of India's largest and most important (Sukumar 1992). The greater one-horned rhinoceros, one of three species found in Asia, is restricted to several small, isolated populations contained within protected areas (Dinerstein 2003). The Eastern Himalayas Region is the last bastion for this charismatic mega-herbivore, which once ranged along the length of the Himalayas foothills, from Pakistan to Myanmar. Many other refuge populations of large herbivores—wild water buffalo, swamp deer (*Cervus duvaucelii*)—restricted to protected areas in southern Nepal and northeastern India—also represent some of the last remaining in the world, and are considered to be of global significance. The Brahmaputra and Ganges rivers that flow along the Himalayas foothills also support globally important populations of the Gangetic dolphin (*Platanista gangetica*).

Although the snow leopard has a wide distribution across the Himalayas range, and into the trans-Himalaya, the populations in the Eastern Himalayas Region are important because this high-altitude predator occues at low densities. The populations of vultures, greater and lesser adjutants—some of Asia's largest birds—in the foothill grasslands and broadleaf forests are globally significant, as are the populations of several of the hornbill species and pheasants, white-winged duck (*Cairina scutulata*), white-bellied heron (*Ardea insignis)*, black-necked stork (*Grus nigricollis*) and the Bengal florican (*Houbaropsis bengalensis*).

Important Ecological Phenomenon

The top predators, large herbivores and frugivores, and specialized pollinators that inhabit the Eastern Himalayas Region play critical ecological roles in maintaining the integrity of the ecosystems. Many birds and fishes, and likely many insects, undertake seasonal migrations up and down the mountains. Juvenile and sub-adult tigers disperse from natal areas to establish territories elsewhere, and elephants exhibit seasonal movements along the length of the mountains. Higher up the mountains, blue sheep and takin undertake seasonal migrations from the alpine meadows in the summer to the mixed conifer forests below in the winter. Such ecological phenomenon is also important components of biodiversity that should be included in a conservation strategy.

Protected Areas

Protected areas are, and have been, the cornerstones of biodiversity conservation. South Asia has a long history of biodiversity conservation in protected areas, dating back several centuries. For instance, India established sanctuaries for wildlife conservation by royal decree more than 2,000 years ago (Singh 1986). In the northeastern region of India, many tribal groups have traditionally recognized and protected sacred groves, which have

been effective refuges for biodiversity for millennia (Gadgil 1985).

In Assam, Manas and Sonai Rupai were first established as wildlife sanctuaries in 1928 and 1934, respectively, and are among the earliest contemporary protected areas in Asia (IUCN 1990). Several other protected areas were established or extended in northeast India in the 1970s and 1980s to create networks that represent the biodiversity in the region, following recommendations from a comprehensive assessment by Rogers and Panwar (1988). There are more than 70 formally protected areas in the seven northeastern Indian states within the Eastern Himalayas Region, covering more than 15,000 square kilometers. Two of these, Manas Tiger Reserve and Kaziranga National Park in Assam, have been declared World Heritage sites. These harbor globally important populations of large flagship mammals and birds that showcase the region's fauna, and can also serve as indicators of conservation success.

The protected areas system in Nepal is more recent. Chitwan was established as a national park in 1973—prior to that it was a hunting preserve for the royal family. The park, located in the highly productive Terai, supports an important tiger population and the second largest greater one-horned rhinoceros population. During the same year, Sagarmatha, which includes the world's tallest mountain, Everest, was established as a national park. Within a decade, the protected areas system had grown from 4,500 square kilometers to more than 13,000 square kilometers with the establishment of three additional reserves along the south and two that covered the northern, montane habitats. By the year 2000, 10 more protected areas had been added to the network, doubling the total area within the protected areas system. Two of these are large conservation areas—Annapurna and Makalu Barun—which have become models for community-based biodiversity management. Both Sagarmatha National Park and Chitwan National Park have since been declared World Heritage sites.

Until 1995, Bhutan's protected areas system was dominated by the vast Jigme Dorji National Park that effectively protected rock, ice and snow along the inaccessible northern border with China, but did not contribute much to biodiversity conservation. In 1995, a radical revamping of the protected areas system added three protected areas that include the biologically rich temperate forests in the mid-hills. The large Jigme Dorji National Park was also reduced in size and extended southwards to capture biologically important alpine meadows. This new system, which covers about 26 percent of Bhutan, is more representative of the county's ecosystems and the biodiversity contained in them. In 1999, another significant addition occurred, when a system of corridors that linked the protected areas was recognized to create a conservation landscape that extends across the length and breadth of the country. This landscape, now known as the Bhutan Biological Conservation Complex (B2C2), covers almost 35 percent of the country and consists of five national parks, two wildlife sanctuaries, one strict nature reserve and 12 corridors that cover almost 16,000 square kilometers. In 1999, the system was bequeathed as a Gift to the Earth from the People of Bhutan.

A notable feature of the protected areas systems of Bhutan, Nepal and northeastern India is that several lie adjacent to each other across the national borders and provide

opportunities for transboundary conservation. The Kanchandzonga National Park in Sikkim and Kangchenjunga Conservation Area in eastern Nepal, and Manas National Park in Bhutan and Manas Tiger Reserve in Assam are two such complexes. However, there are other opportunities to link protected areas across international boundaries by creating corridors and habitat linkages. Examples of these include Bardia in Nepal and Katerniaghat in India; Sukla Phanta in Nepal and Dudwa in India; and Sakteng in Bhutan and Eagle's Nest and Sessa Orchid Reserve in India. Some of the priority sites such as Namdapha in Arunachal Pradesh provide opportunities for transboundary conservation with Myanmar and China. These transboundary conservation options are compatible with CEPF goals of partnerships and corridor outcomes.

CONSERVATION OUTCOMES

Conservation outcomes are the full set of quantitative and justifiable conservation targets in a hotspot that should be achieved to prevent biodiversity loss. These targets are defined at three hierarchical levels: species (extinctions avoided); sites (areas protected); and landscapes (corridors created), corresponding to recognizeable units of biodiversity along an ecological continuum. As conservation in the field succeeds in achieving the targets, they become demonstrable results or outcomes. Thus, outcomes are the biological underpinning of CEPF's investment strategy in the eastern Himalayas, enabling CEPF to target its limited resources to species, sites and landscapes of global conservation concern. Given that these outcomes are quantifiable targets, CEPF will be able to monitor the success of its investments.

The three levels of targets for achieving conservation outcomes interlock geographically through the presence of species in sites and of sites within landscapes. They are also linked ecologically; if species are to be conserved the sites in which they live must be protected, and the landscapes provide for ecological linkages between sites, so that ecological processes and dynamics associated with the species, and the natural communities of which they are a part, are maintained.

This process of defining conservation outcomes requires knowledge on the global conservation status of individual species and accurate data on the distribution of threatened species across sites and landscapes in the region. Because of its focus on the global biodiversity hotspots, it is crucial that the process used to derive conservation targets for CEPF is based on a global standard. Thus, the principal basis for defining species outcomes is the global threat assessments contained within *The 2002 IUCN Red List of Threatened Species* (IUCN 2002), which is based on quantitative, globally applicable criteria under which the probability of extinction is estimated for each species. The species outcomes for the eastern Himalayas consist of those species that are globally threatened (i.e. Critically Endangered, Endangered and Vulnerable). Avoiding extinctions means conserving globally threatened species to make sure that their Red List status improves or at least stabilizes.

One of the shortcomings of this selection process is that global threat assessments and reliable population trend data are incomplete or unavailable for most species, especially the taxonomic groups that comprise the small, yet abundant species. However, the

majority of the species outcomes are still represented by the larger vertebrates. Since these species are more easily monitored, and because many act as umbrella species for overall biodiversity, use of the prominent, larger vertebrates as conservation outcomes, especially as measures of conservation successes, is justifiable.

Given that many species are best conserved through the protection of a network of sites at which they occur, sites holding populations of globally threatened species were identified. These sites are considered "key biodiversity areas" or site outcomes. Thus, the site outcomes represent discrete land areas that harbor populations of at least one globally threatened species and should be protected from ecological transformation to conserve the target species that live within them. Sites are scale-independent, and the defining characteristic is that it is an area that can be managed as a single unit. Otherwise, a site can be any category of protected area, governmental land or privately owned property. The main objective of defining important sites for conservation of threatened species is to identify areas where investments can be made to prevent species extinctions and biodiversity loss.

In the Eastern Himalayas Region, the starting point for defining key biodiversity areas, or site-scale conservation outcomes, was the suite of protected areas and Important Bird Areas (IBAs). IBAs are by definition key biodiversity areas because they have been identified for bird species of global conservation concern. A second data source of information on sites was obtained from the World Conservation Monitoring Centre protected areas database. BirdLife International and its affiliates, the Bombay Natural History Society, and Bird Conservation Nepal, identified the IBAs (Baral and Inskipp 2001, M. Crosby *in litt.* 2003, Z. ul-Islam *in litt.* 2003). Each globally threatened species in the other taxonomic groups was evaluated as to the sites in which it occurs, which included both the IBAs (many of which are protected areas) but also required identification of additional sites. Much of this work was done during the expert consultations.

Corridor outcomes focus on the need for conservation at a landscape-scale to capture ecological and evolutionary processes that maintain biodiversity, especially over the long term. Corridors preserve ecological and evolutionary processes, and species that cannot be conserved at the site scale alone, by maintaining connectivity between important sites. Corridor outcomes are particularly important to conserve the large vertebrate species that occur at naturally low densities, have large home ranges or territories, or exhibit dispersal or migratory behavior as part of their natural history that make their effective and long-term conservation unlikely in sites alone. These species were considered to be "landscape species" (*sensu* Sanderson *et al.* 2001). Corridor outcomes were also selected on the need to maintain ecological processes, such as the need to maintain habitat connectivity to allow for seasonal altitudinal migrations and hydrology that are not directly associated with species outcomes.

In the Eastern Himalayas Region, several large vertebrate species qualify for landscape species status. Notable among these are the tiger, snow leopard, Asian elephant, clouded leopard and some of the larger birds, such as the vultures, adjutants and hornbills. The

ecological processes critical to the Eastern Himalayas Region that have to be captured by corridor outcomes include the altitudinal seasonal migrations by several birds and mammals (and presumably by fishes), and maintenance of hydrological processes along the steep Himalayas watersheds.

Anchored on key biodiversity areas, corridor outcomes were defined on the basis of existing linkages of natural habitat across environmental gradients and between site outcomes. These habitat linkages provide for area and movement requirements of wide-ranging species that cannot be conserved at the site scale alone. The definition was assisted by consultations with and opinions of local experts in each country, complemented by analysis of spatial data on land-cover, elevation and human population distribution. The results of ecoregion-based conservation assessments conducted in the region by WWF (Wikramanayake *et al.* 1998a, Dorjee 2000, Myint *et al.* 2000) were also included in the analysis of corridor outcomes.

Species Outcomes

BirdLife International compiled the list of species outcomes for the Eastern Himalayas Region by extracting the globally threatened species that occur in the region from the *2002 Red List of Threatened Species* (IUCN 2002). For amphibians, the results of the Global Amphibian Assessment (IUCN-SSC and CI-CABS 2003), which has completed threat assessments and prepared distribution maps for most Old World amphibian species, were used, since this assessment will update the IUCN Red List for amphibians in 2004. Information on threats, distribution and needed conservation actions for each of the globally threatened species was augmented and revised with information from other databases, consultations with experts and with input from Aaranyak; ATREE; Bird Conservation, Nepal; CEE; and WWF.

The species outcomes for the eastern Himalayas consists of 163 species, comprising 45 mammals, 50 birds, 17 reptiles, 12 amphibians, 3 invertebrates, and 36 plant species (Appendix 1). Since there are no globally threatened fish species listed from the Eastern Himalayas Region, outcomes for this taxon were not defined. Comprehensive global threat assessments of invertebrates, fish and, to a lesser extent, plants, are needed and should be considered a high priority to compile a complete list of species outcomes.

Fourteen of the species outcomes are Critically Endangered, 46 are Endangered and 102 are Vulnerable (Table 1). One species, the black softshell turtle (*Aspideretes nigricans*) is considered to be extinct in the wild by IUCN (2002), but a population was recently rediscovered in Assam Valley, northeastern India (Praschag and Gamel 2002), and should occur in several sites, including Kaziranga National Park, D'Ering Wildlife Sanctuary, Pakke Wildlife Sanctuary, Namdapha National Park, Dibru Saikhowa National Park, Manas Tiger Reserve, Orang National Park, Nameri National Park and Majuli (F. Ahmed, Aaranyak, pers. comm.).

Table 1. Summary of Globally Threatened Species in the Eastern Himalayas Region

Taxonomic Group	Global Threat Status				Distribution by Country		
	Critically Endangered	Endangered	Vulnerable	Total	Bhutan	Nepal	NE India
Mammals	2	14	29	45	27	32	42
Birds	2	6	42	50	12	25	46
Reptiles	1	7	8	17*	0	8	16
Amphibians	3	6	3	12	1	3	10
Invertebrates†	1	0	2	3	2	1	1
Plants	5	13	18	36	7	6	31
Total	**14**	**46**	**102**	**163**	**49**	**75**	**146**

* An additional species outcome, the black softshell turtle (*Aspideretes nigricans*) was listed as extinct in the wild, but a population was discovered recently and is expected to occur in several sites in the Assam Valley.
† Only a few invertebrate species have been assessed for inclusion in the Red List. A comprehensive conservation assessment of the less-studied taxonomic groups in the eastern Himalayas, notably the invertebrates, freshwater fish, and plants, is a priority.

Of the 163 species outcomes: 146 (90 percent) occur in northeastern India, including 70 species that are endemic to the Eastern Himalayas Region; 75 (46 percent) occur in Nepal; and 49 (29 percent) occur in Bhutan.

Among the important globally threatened mammals are Asia's three largest herbivores—the Asian elephant, the greater one-horned rhinoceros and the wild water buffalo—and its largest carnivore, the tiger, as well as several large birds such as vultures, adjutant storks, and hornbills. All these species have extensive habitat requirements and cannot be conserved within small, protected areas without compromising their ecology, behavior, and demographics. A full list of all globally threatened species is provided in Appendix 1.

Site Outcomes

To define key biodiversity areas, or site outcomes, BirdLife International finalized the list of globally threatened species for the region. A list of sites, which included all protected areas and IBAs in Bhutan, Nepal, and the northeastern Indian states, was also generated. A matrix was generated documenting the occurrence of globally threatened species per site. The matrices were presented at the expert roundtables and participants were asked to provide information on: a) verification of the species recorded for that site, b) the importance of that site for conservation of globally threatened species; c) the level of threat to the site; d) any ongoing and planned conservation investments at that site; and e) the potential role for civil society in conservation at that site.

A total of 175 key biodiversity areas were identified for the Eastern Himalayas Region

(Table 2, Figure 2a,b and c). Of these, 101 sites (58 percent) harbor populations of globally threatened mammal species, 164 (94 percent) have globally threatened, restricted-range or congregatory bird species, 45 (26 percent) have globally threatened reptile species, and 17 (10 percent) support populations of threatened amphibian species (Appendix 2).

Detailed data on the distribution of globally threatened plant species in sites are unavailable, and a comprehensive global threat assessment reflecting true global conservation priorities within most plant groups is lacking. Eight sites (Singalila, Neora Valley, Mahananda, Senchal, Maenum, Kyongnosla Alpine Sanctuary, Barsey Rhododendron Sanctuary, Pangolokha Wildlife Sanctuary) and one conservation corridor (Kangchenjunga-Singalila, including the connection to Mahananda) were identified as being important for plants during the Gangtok roundtable based on IUCN Red-Listed plants. Another 52 sites across the region were assessed as being important for conservation of nationally threatened plant species, especially those endemic to the Eastern Himalayas Region. The full list of site outcomes in the Eastern Himalayas Region is presented in Appendix 2.

Table 2. Summary of Site Outcomes (Key Biodiversity Areas) for the Eastern Himalayas Region

Taxonomic Group	Bhutan	Nepal	NE India	Total
Mammals	11	20	70	**101**
Birds	24	21	119	**164**
Reptiles	0	10	35	**45**
Amphibians	0	2	15	**17**
Plants	11	9	29	**49**
All Site Outcomes	**25**	**25**	**125**	**175**

Site outcomes could not be identified for several species. These are listed as follows:

- Rusty-throated wren babbler (*Spelaeomis badeigularis*) — No confirmed records of this species from anywhere since the type series were collected in 1947 from Dreyi in the Mishmi Hills, but it is probably widespread in the eastern Himalayas and northern Myanmar (BirdLife International 2001).
- The crowned river turtle *(Hardella thurjii*) was identified from Kosi Tappu Wildlife Sanctuary in Nepal during the expert roundtable, but its range distribution includes the Indus and Ganges-Brahmaputra river systems in Pakistan, northern India, Nepal and Bangladesh; thus it should also be found in the Terai Arc, North Bank and Kaziranga-Karbi Anlong landscapes.
- No sites were identified for the Narayanghat whipping frog (*Polypedates zed*).
- The Himalayas dragonfly (*Epiophlebia laidlawi*) inhabits wetlands along the foothills, especially in Nepal, and can likely be captured within the Terai-Arc Landscape.

- The range of Ludlow's Bhutan swallowtail (*Bhutanitis ludlowi*) overlaps with the sites within the Bhutan Biological Conservation Complex.
- Since the pygmy hog is the sole host for the pygmy hog sucking louse (*Haematopinus oliveri*), it is reasonable to assume that conservation of the Critically Endangered host will help to conserve the Critically Endangered louse.

The Indian eyed turtle *(Morenia petersi)* was only assigned to Gainda Tal in Nepal, but its known distribution is also widespread, across the Ganges river basin in eastern India and Bangladesh (http://emys.geo.orst.edu/collection/species/Moreniapetersi/Moreniapetersi.html), and should be included within the Terai Arc, North Bank and Kaziranga-Karbi Anlong landscapes.

Of the 175 site outcomes in the Eastern Himalayas Region, only 84 (48 percent) are completely or partly included within nationally gazetted protected areas.

Many site outcomes support numerous globally threatened species. In particular, Koshi Tappu, Bardia, Chitwan and Sukla Phanta in Nepal and Dibru-Saikhowa, Kaziranga, Nameri and Buxa in northeastern India support at least 20 globally threatened vertebrate species each.

Some site outcomes are considered irreplaceable because they support globally threatened species that only occur in those sites, or are one of few sites that are *known* to contain globally important populations of globally threatened species. These include Namdapha National Park in Arunachal Pradesh, which is the only site in the world known to support Namdapha flying squirrel and one of only two sites known to support the snowy-throated babbler (*Stachyris oglei*). Orang Wildlife Sanctuary in Assam is the only site known to have the Orang sticky frog (*Kalophrynus orangensis*). Rongrengiri Wildlife Sanctuary and Siju Caves in Meghalaya are the only sites in the region known to harbor the Kashmir Cave bat (*Myotis longipes*). The irreplaceability of various sites informed the prioritization of outcomes for CEPF investment.

Because survey effort in the region is uneven—there are large areas that are still biologically unexplored—the available data on the distribution of globally threatened species in the Eastern Himalayas Region vary substantially across the region and among taxonomic groups in terms of comprehensiveness. Consequently, site outcomes identified as being important for conservation based on one taxonomic group, or even a species, may also be important for other groups for which data are not yet available. On the other hand, there could also be other sites that harbor globally threatened species, or even unidentified species that should qualify for globally threatened status but have been missed in this analysis.

Figure 2a. Site and Corridor Outcomes for Nepal

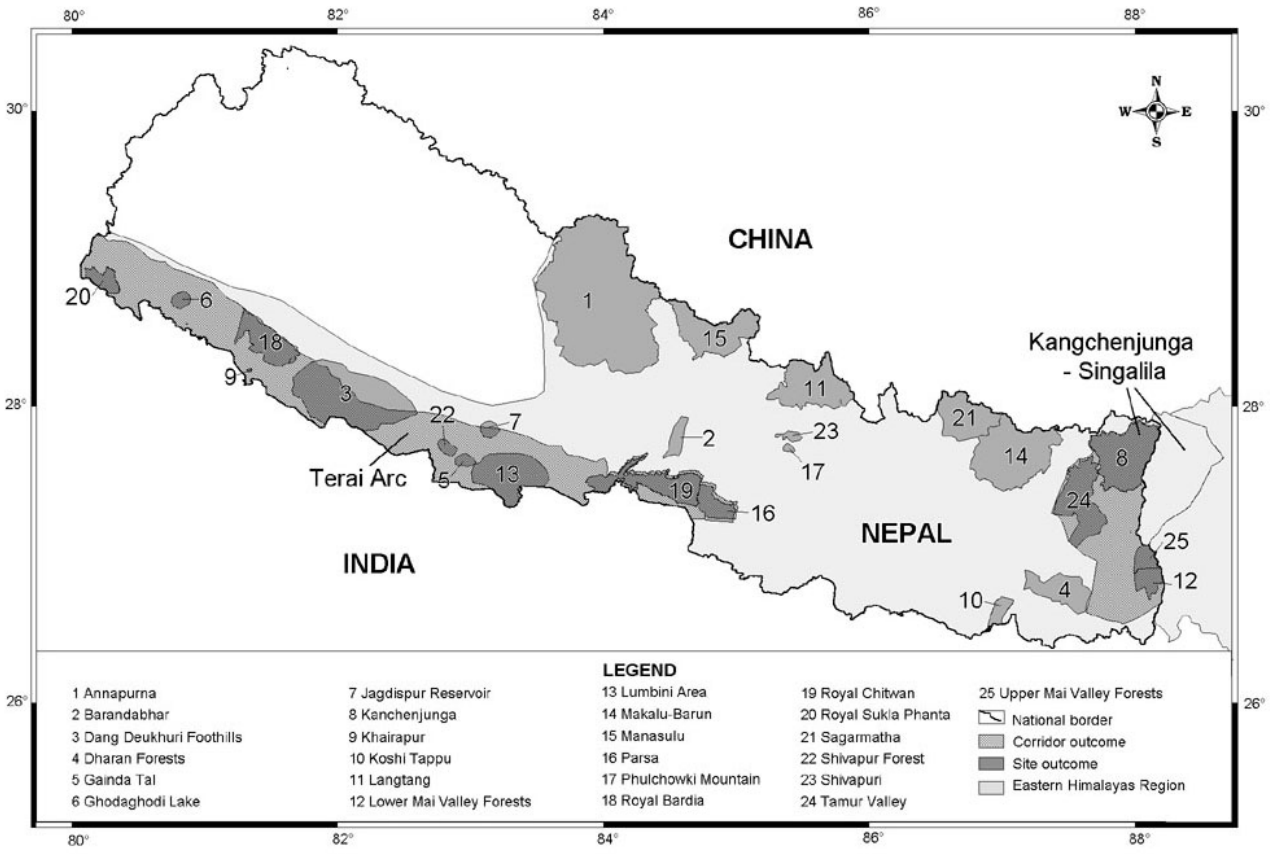


Figure 2b. Site and Corridor Outcomes for Bhutan

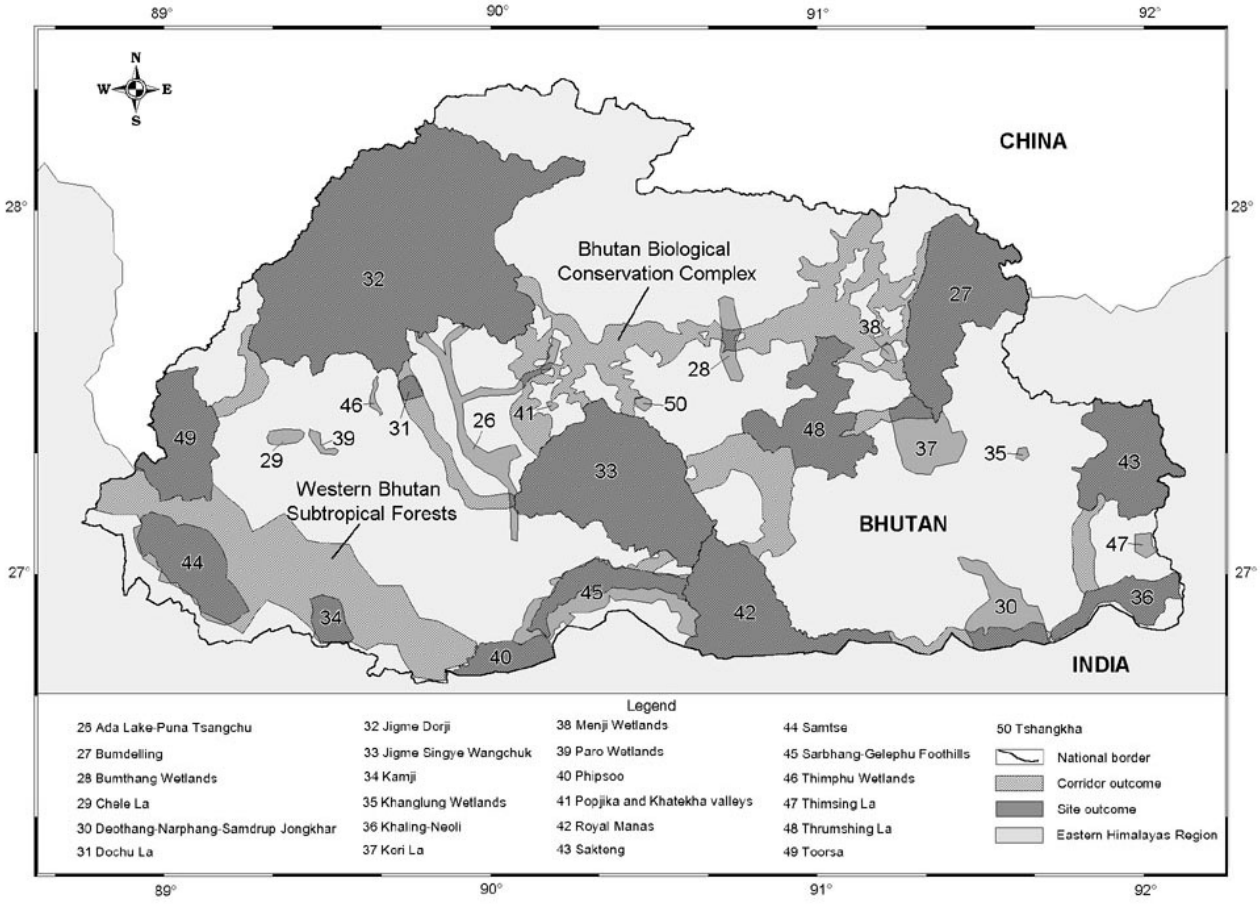
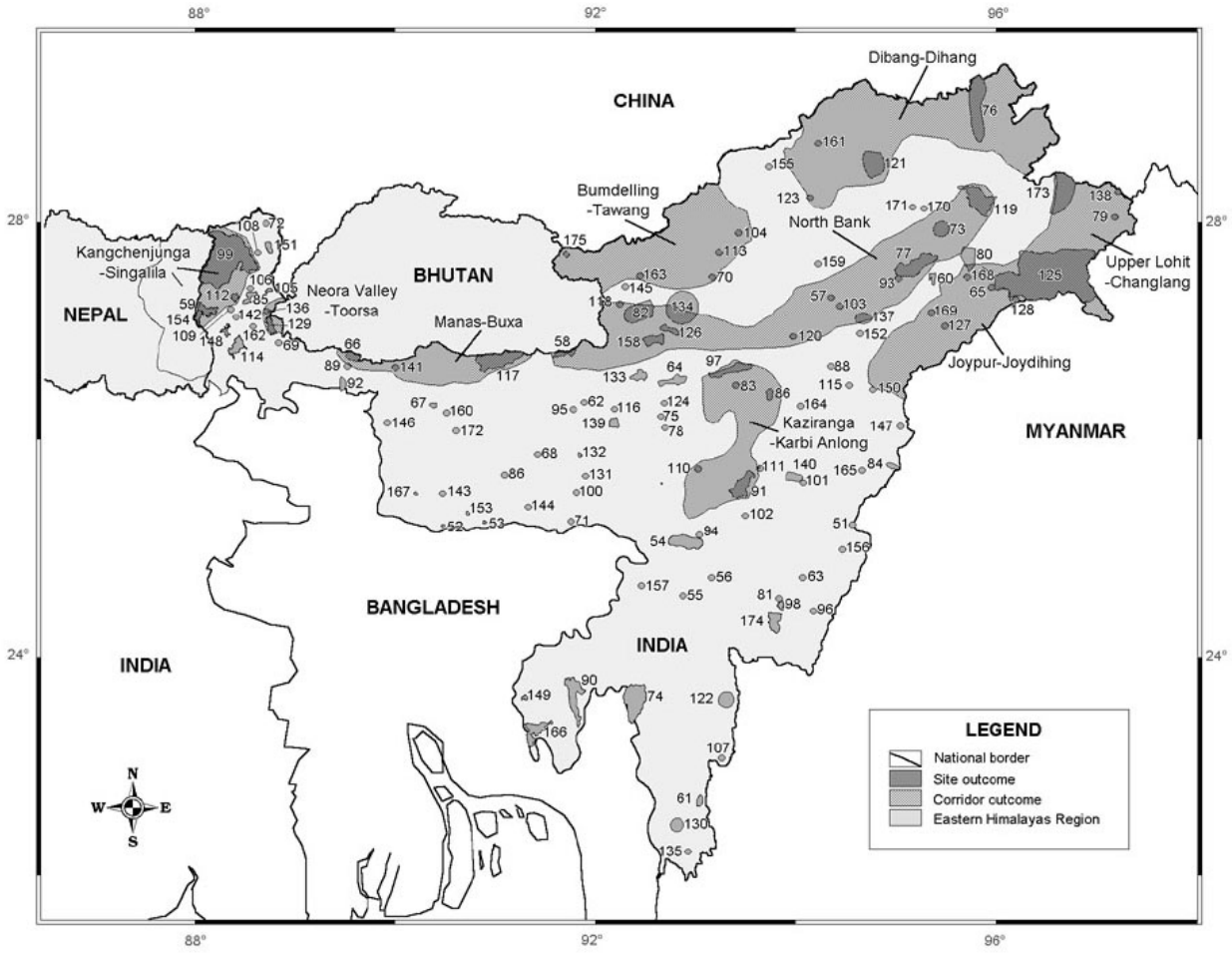


Figure 2c. Site and Corridor Outcomes for Northeast India



Extended Legend for Figure 2c

No.	Site Outcome	No.	Site Outcome
51	Ango Hills	114	Mahananda
52	Baghmara Pitcher Plant	115	Majuli
53	Balaphakram	116	Manaha Complex
54	Barail and North Cachar	117	Manas
55	Barak, Inner Line and Kathakal	118	Mandla Phudung
56	Barak River	119	Mehao
57	Bardoibam-Bilmukh	120	Misamari Beel-Kokliamukh-Laojan-Dalani-Kawimari Complex
58	Barnadi	121	Mouling
59	Barsey	122	Murlen
60	Bherajan-Borajan-Podumoni	123	Nacho, Limeking, Taksing and Majha
61	Blue Mountain (Phawngpui)	124	Nagaon Township
62	Botha Beel	125	Namdapha and Kamlang
63	Bunning	126	Nameri
64	Burachapori and Laokhowa	127	Namsang Mukh and Vodoria
65	Burhi-Dihing	128	Namtok, Namheik, Nampong and Manmao
66	Buxa	129	Neora Valley (incl. Lava)

67	Chakrasila and Diplai-Dakra-Dhir Beel Complex	130	Ngengpui
68	Chand Dubi beel	131	Nongkhlaw
69	Chapramari	132	Nongkhyllem
70	Chayang Tajo and Khenewa Lada	133	Orang National Park
71	Cherapunjee Cliffs, Gorges and Sacred Groves (incl. Mawsmai)	134	Pakke
72	Chholhamo Plateau	135	Palak Lake
73	D'Ering	136	Pangolakha
74	Dampa	137	Pani-Dihing
75	Deobali Jalah	138	Para-Changlagaum
76	Dibang Valley	139	Pobitora
77	Dibru-Saikhowa	140	Puliebadze
78	Dipor Beel	141	Ripu-Chirang
79	Ditchu	142	Rongli
80	Dum Duma-Dangori-Kumsong	143	Rongrengiri
81	Dzuko	144	Saipung and Narpuh
82	Eagle's Nest and Sessa	145	Sangti Valley
83	East and North Karbi Anlong	146	Sareswar Beel
84	Fakim and Sharamati	147	Satoi Range
85	Fambong Lho	148	Senchel
86	Garampani	149	Sepahijala
87	Garampani and Nambor	150	Shiloi
88	Gibbon (Hollongapar)	151	Shingba
89	Gorumara	152	Sibsagar Township
90	Gumti	153	Siju
91	Intanki, Maratlongri and Dhansiri	154	Singalila
92	Jaldapara	155	Sirkum Pahar
93	Jamjing and Sengagan	156	Siroi
94	Jatinga	157	Son Beel
95	Jengdia Beel and Satgaon	158	Sonai Rupai
96	Kailam	159	Tally Valley
97	Kaziranga	160	Tamarang-Konora-Paropota-Doloni Complex
98	Keibul Lamjao (incl. Loktak, Phumlen, Kharung and Ikop Lakes)	161	Tato, Machuka, Moni Gong and Gasheng
99	Khanchendzonga	162	Teesta-Rangit Valley
100	Khasi Hills (incl. Shillong Peak)	163	Thungri Changlang Poshingla, Maji, Basti and Liak
101	Khonoma	164	Tirap-Paktai and Namphai
102	Kisa	165	Tiyi Peak
103	Koabari Doloni	166	Trishna
104	Kolo Riang, Sarli and Damin	167	Tura-Nokrek Range
105	Kyongnosla	168	Upper Dihing (East) and Kakojan
106	Lachung, Lema and Dombang Valleys	169	Upper Dihing (West), Joypur and Dirak
107	Lengteng	170	Upper Renging
108	Lhonak Valley	171	Upper Rottung
109	Lowland Forest of South Sikkim	172	Urpod beel
110	Lumding	173	Walong
111	Macaque sanctuary	174	Yangoupokpi Lokchao
112	Maenam	175	Zamithang, Nelya and Sageshwar Lake
113	Mago-Thingbu and Luguthang		

Corridor Outcomes

To achieve corridor outcomes, habitat linkages connecting sites within a landscape need to be maintained or restored to support species and processes that require larger spatial scales than sites can provide. Landscapes also capture more biodiversity than the sites because of the "beta-diversity effect,"[1] especially since landscapes include more ecosystem, habitat and land-management variability. The corridor outcomes were defined based on the ecological requirements of landscape species they support, as well as key ecological processes such as migrations, dispersal and other ecological linkages such as hydrology. In the Eastern Himalayas Region, the landscape species include the following:

- The Asian elephant, which requires extensive home ranges and spatial areas that include its seasonal migrations.
- The tiger, Asia's largest carnivore, maintains large territories. Subadults disperse from natal areas to establish territories elsewhere. Thus, effective conservation of tigers will require maintaining conservation landscapes where dispersal corridors link core areas that harbor breeding populations.
- The snow leopard is a high altitude predator that has large home ranges and occurs at low densities.
- The clouded leopard, which is an elusive predator that occurs at low densities in lowland forests.
- Takin is a montane ungulate that ranges over wide areas, and undertakes seasonal migrations.
- The large bird species such as the vultures, adjutants, and hornbills, which require large spatial areas with specific habitats and habitat structures for roosting and nesting. These large birds range over wide areas and can be considered landscape species since their movements can transcend single sites.
- The greater one-horned rhinoceros can be managed within sites with intensive habitat management that will increase the carrying capacity of the site. This is being done now in Kaziranga, Chitwan, Bardia and Suklaphanta. But, such management compromises the natural ecology of the site and survival of other specialist species, such as the grassland birds, hispid hare and pygmy hog. Thus, a more effective way to conserve the rhinoceros is to treat it as a landscape species, where it is conserved at lower, more natural densities, over larger spatial areas. Such management will qualify the rhinoceros as a landscape species because of the larger spatial requirements to conserve a population at lower densities.

Thirteen landscapes were defined where corridor outcomes need to be achieved in the Eastern Himalayas Region (Table 3; Figure 3), covering 132,482 square kilometers, equivalent to more than 32 percent of the total area of the region. These landscapes range in size from 492 square kilometers (Neora Valley-Toorsa corridor) to in excess of 19,000 square kilometers (Dibang-Dihang Landscape).

Overall, the landscapes include 97 (76 percent) of the faunal species outcomes and 89 (51 percent) of the site outcomes. The faunal outcomes included in the landscapes comprise of 36 (80 percent) mammals, 42 (84 percent) birds, 16 (94 percent) reptiles, 3 (25

[1] The change in species diversity along a habitat gradient

percent) amphibians, and all three invertebrates. The number of sites contained in the landscapes range from 2 to 17 (Table 3).

Table 3. Summary of Corridor Outcomes Identified for the Eastern Himalayas

Landscape	Country/Territory	Area (km^2)	# of site outcomes represented in the corridor
Bhutan Biological Conservation Complex	Bhutan	14,880	17
West Bhutan Subtropical Forests	Bhutan	2,704	4
Terai Arc	Nepal/India	17,440	11
Kangchenjunga-Singalila	Nepal/NE India	12,685	13
Neora Valley-Toorsa	Bhutan/NE India	492	2
Manas-Buxa	Bhutan/NE India	4,018	3
Bumdelling-Tawang	Bhutan/NE India	10,757	5
North Bank	NE India	18,535	11
Kaziranga-Karbi Anlong	NE India	8,032	5
Dibang-Dihang	NE India	19,705	5
Bariel	NE India	5,047	6
Joypur-Joydihing	NE India	8,162	4
Upper Lohit-Changlang	NE India	10,026	5
Total		**132,482**	**89**

The Eastern Himalayas Region contains 17 Tiger Conservation Units (TCUs), landscapes that have been identified to conserve metapopulations of tigers. Four of these are Level 1 TCUs or high priority tiger conservation landscapes (Wikramanayake *et al.* 1998b). All four of these Level 1 TCUs overlap with the landscapes; thus the tiger conservation priorities in the region are captured within the landscapes identified during this exercise, especially within the Terai Arc Landscape, Bhutan Biological Conservation Complex and the North Bank Landscape.

Several corridor outcomes were also identified to ensure that important ecological and evolutionary processes in the region are maintained. In this region, altitudinal migration, especially by birds, is an important process that depends on altitudinal continuums of natural habitat. Hydrologic processes are also significant ecological targets.

PRIORITY OUTCOMES FOR CEPF INVESTMENT

Since the funds available from CEPF cannot support conservation in all 175 sites and 13 landscapes, the overall lists of outcomes were prioritized to obtain a portfolio of select species, sites, and landscapes. A major criterion for prioritizing the species outcomes was the importance of the population within the Eastern Himalayas Region, relative to the global population. The premise is that species with marginal ranges and rare, non-breeding visitors or vagrants in the region are more effectively conserved elsewhere in their ranges.

Priority Species Outcomes

The experts prioritized the species outcomes at the regional roundtables. Criteria for selecting priority species outcomes were: a) species that are represented by globally important populations in the region; b) important focal species for conservation (such as endemic species, keystone species, umbrella species, landscape species) or c) need for species-specific action. A globally important population was considered to be an approximated or estimated presence of 10 percent or more of the global population within the region. If the population status of a species, relative to the global population, was unknown, but it had a range distribution where at least an estimated 30 percent lay within the eastern Himalayas—as in the case of several reptiles—it was considered to be a priority species outcome. Of the 163 species outcomes, 19 mammals, 28 birds, 17 reptiles and 12 amphibians were selected as priorities for CEPF investment (Table 4). The plant species were not included as priority species because of lack of information about their needed conservation actions; however, re-assessing the conservation status of the region's plants is a priority. There are inconsistencies between the global IUCN Red List and national Red Lists that should be resolved; for example, the national Red Lists are much more extensive.

Table 4. Priority Species Outcomes for CEPF Investment in the Eastern Himalayas Region

	Species	Scientific Name	Estimated Population as % of Global Population	IUCN Status
MAMMALS				
	Greater One-horned Rhinoceros	*Rhinoceros unicornis*	>90	EN
	Asian Elephant	*Elephas maximus*	>10	EN
	Takin	*Budorcas taxicolor*	>10	VU
	Wild Water Buffalo	*Bubalus bubalis*	>90	EN
	Swamp Deer	*Cervus duvaucelii*	>10	VU
	Tiger	*Panthera tigris*	>10	EN
	Snow Leopard	*Uncia uncia*	>10	EN
	Clouded Leopard	*Neofelis nebulosa*	>10	VU
	Golden Langur	*Trachypithecus geei*	100	EN
	Capped Langur	*Trachypithecus pileatus*	>50	EN
	Hoolock Gibbon	*Bunipithecus hoolock*	>10	EN
	Red Panda	*Ailurus fulgens*	>10	EN
	Ganges Dolphin	*Platanista gangetica*	>10	EN
	Hispid Hare	*Caprolagus hispidus*	>90	EN
	Pygmy Hog	*Sus salvanius*	100	CR
	Namdapha Flying Squirrel	*Biswamoyopterus biswasi*	100	CR
	Woolly Flying Squirrel	*Eupetaurus cinereus*		EN
	Kashmir Cave Bat	*Myotis longipes*	>10	VU
	Mandelli's Mouse-eared Bat	*Myotis sicarius*		VU
BIRDS				
	Rufous-necked Hornbill	*Aceros nipalensis*	c.65	VU
	Dark-rumped Swift	*Apus acuticauda*	>90	VU
	Chestnut-breasted Partridge	*Arborophila mandellii*	100	VU
	White-bellied Heron	*Ardea insignis*	>60	EN
	White-winged Duck	*Cairina scutulata*	40-50	EN
	Bristled Grass-warbler	*Chaetornis striatus*	>50	VU
	Jerdon's Babbler	*Chrysomma altirostre*	>10	VU
	Swamp Francolin	*Francolinus gularis*	>80	VU
	Wood Snipe	*Gallinago nemoricola*	>20	VU
	Black-necked Crane	*Grus nigricollis*	>10	VU
	White-rumped Vulture	*Gyps bengalensis*	>15	CR
	Slender-billed Vulture	*Gyps tenuirostris*	>70	CR
	Pallas's Fish Eagle	*Haliaeetus leucoryphus*	c.10	VU
	Bengal Florican	*Houbaropsis bengalensis*	>20	EN
	Greater Adjutant	*Leptoptilos dubius*	c.75	EN
	Lesser Adjutant	*Leptoptilos javanicus*	>40	VU
	Black-breasted Parrotbill	*Paradoxornis flavirostris*	c.90	VU
	Spot-billed Pelican	*Pelecanus philippensis*	c.25	VU
	Marsh Babbler	*Pellorneum palustre*	90	VU
	Finn's weaver	*Ploceus megarhynchus*	>35	VU
	Grey-crowned Prinia	*Prinia cinereocapilla*	>50	VU
	White-throated Bushchat	*Saxicola insignis*	>20	VU
	Blyth's Tragopan	*Tragopan blythii*	c. 50	VU
	Slender-billed Babbler	*Turdoides longirostris*	100	VU
	Manipur Bush Quail	*Perdicula manipurensis*	100	VU
	Sclater's Monal	*Lophophorus sclateri*	60	VU

	Rusty-throated Wren Babbler	*Spelaeornis badeigularis*	<100	VU
	Hume's Pheasant	*Syrmaticus humiae*	10	VU
REPTILES				
	Asian Giant Tortoise	*Manouria emys*	Unknown	EN
	Assam Roof Turtle	*Kachuga sylhetensis*	Unknown	EN
	Black Pond Turtle	*Geoclemys hamiltonii*	Unknown	VU
	Black Softshell Turtle	*Aspideretes nigricans*	Unknown	EW
	Crown River Turtle	*Hardella thurjii*	Unknown	VU
	Elongated Tortoise	*Indotestudo elongata*	Unknown	EN
	Indian Eyed Turtle	*Morenia petersi*	Unknown	VU
	Indian Softshell Turtle	*Aspideretes gangeticus*	Unknown	VU
	Keeled Box Turtle	*Pyxidea mouhotii*	Unknown	EN
	Malayan Box Turtle	*Cuora amboinensis*	Unknown	VU
	Narrow-headed Softshell Turtle	*Chitra indica*	Unknown	EN
	Peacock Softshell Turtle	*Aspideretes hurum*	Unknown	VU
	Red-crowned Roof Turtle	*Kachuga kachuga*	Unknown	CR
	Three-keeled Land Tortoise	*Melanochelys tricarinata*	Unknown	VU
	Three-striped Roof Turtle	*Kachuga dhongoka*	Unknown	EN
	Marsh Crocodile	*Crocodylus palustris*	Unknown	VU
	Gharial	*Gavialis gangeticus*	Unknown	EN
AMPHIBIANS				
	Indian Flying Frog	*Rana khare*	Unknown	CR
	Blanford's Spiny Frog	*Paa blanfordii*	Unknown	VU
	Dubois' Paa Frog	*Paa rostandi*	Unknown	VU
	Eerie Tree Frog	*Theloderma moloch*	Unknown	EN
	Garo Hills Bush Frog	*Philautus garo*	Unknown	EN
	Khasi Hills Toad	*Bufoides meghalayana*	Unknown	EN
	Namdapha Tree Frog	*Rhacophorus namdaphaensis*	Unknown	EN
	Narayanghat Whipping Frog	*Polypedates zed*	Unknown	EN
	Northern Frog	*Occidozyga borealis*	Unknown	VU
	Orang Sticky Frog	*Kalophrynus orangensis*	Unknown	CR
	Tuberculate Tree Frog	*Rhacophorus tuberculatus*	Unknown	EN
	Xmas Bush Frog	*Philautus shillongensis*	Unknown	CR

Several species that can usually be conserved at site level but require special management regimes were also identified. These include species such as the globally threatened bat colonies in caves, which require strict protection. The red panda requires a specific habitat type consisting of mature mixed and subalpine conifer forests with *Arundinaria* bamboo undergrowth, which has to be included and managed within protected areas. The assemblage of Terai grassland birds and the endemic hispid hare and pygmy hog require specific management regimes to maintain suitable grassland conditions.

Priority Site Outcomes

The presence of species identified as outcomes within key biodiversity areas were used to prioritize the site outcomes at the four regional expert roundtable consultations. Where possible at least two sites, representing two discrete populations or metapopulations[2], were identified for each species outcome. Where information about the status of the site-

[2] A collection of genetically linked subpopulations.

or corridor-level population was available, this was used as a criterion to identify the most suitable site or corridor outcomes for the species. Exceptions were the species for which only a single site was identified or the few species for which no sites were identified.

A total of 60 sites (from the overall 175) were identified as priority site outcomes (Table 5, Figure 3). These included 12 from Bhutan, 38 from northeastern India and 10 from Nepal. Seven sites—Mouling National Park, Namdapha National Park and Kamlang Wildlife Sanctuary, Upper Renging, Upper Rottung, Cherapunjee cliffs, gorges and sacred groves [including Mawsmai], Khasi Hills [including Shillong Peak National Park], Tura-Nokrek range—were identified to include known populations of amphibian species considered threatened by the Global Amphibian Assessment (IUCN-SSC and CI-CABS 2003). Since the amphibians are a poorly surveyed and studied group, it is strongly suggested that dedicated amphibian surveys be supported in the region since the taxon represents a good bioindicator of ecosystem integrity. The sites that harbor amphibians should then be updated on the basis of survey results.

Similarly, several priority sites were identified for globally threatened turtles. Almost all these sites are protected areas (the exception being Gainda Tal in Nepal which was identified as the only site for the Indian eyed turtle). Although many of these turtles are killed for food, their status and current distribution of populations is also poorly known. Given their wide distribution across the region, surveys of these species are recommended to ascertain whether they can be conserved in other sites.

The eight sites identified as being important for plants during the Gantok expert roundtable were considered in prioritizing of site and corridor outcomes. Because sites were not identified for globally threatened plants in the other expert workshops, these could not be factored into the prioritization of the sites.

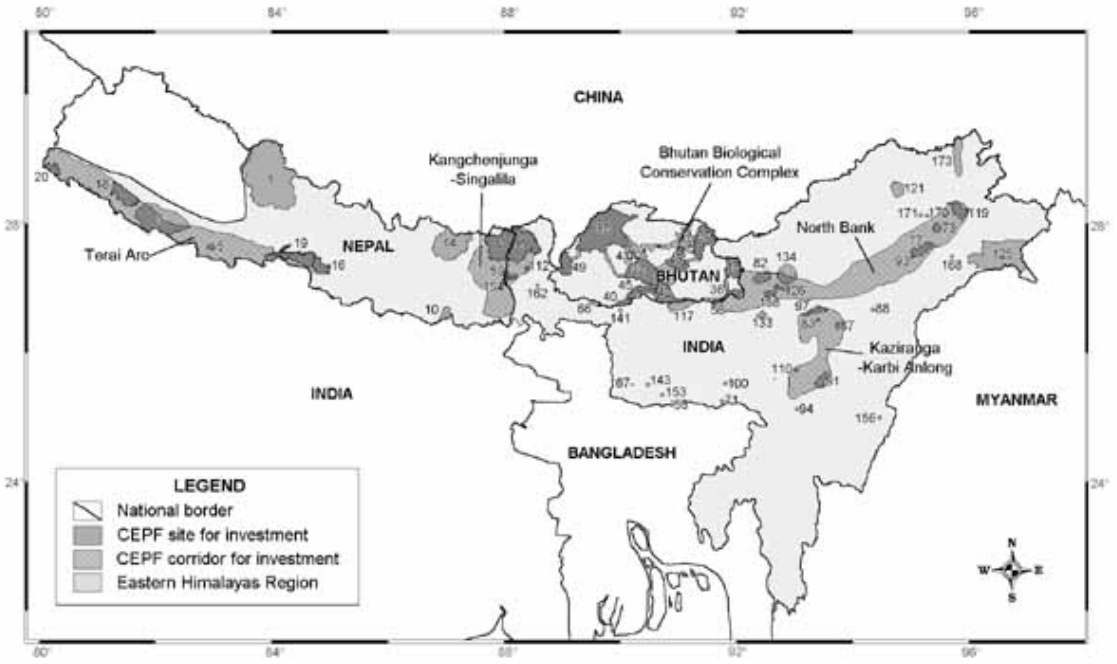
Appendix 3 provides a separate listing of the priority site outcomes, including the criteria by which they were selected.

Table 5. Priority Site and Corridor Outcomes to Conserve Globally Threatened Landscape Species and Large-Scale Ecological Processes in the Eastern Himalayas Region

Corridor Outcome	Priority Sites Within Corridor Outcome	Area of corridor (km2)	Countries	Landscape Species
Bhutan Biological Conservation Complex	Bumdelling; Jigme Dorji; Jigme Singye Wangchuk; Khaling/Neoli; Manas Tiger Reserve[3]; Phipsoo; Royal Manas; Sakteng; Sarbhang - Gelephu foothills; Thrumshing La; Toorsa	14,880	Bhutan	Tiger, Asian Elephant, Clouded Leopard, Takin, Snow Leopard, Rufous-necked Hornbill, Black Necked Crane
Kaziranga-Karbi Anlong Landscape	East Karbi Anlong & North Karbi Anlong; Garampani and Nambor; Intan ki; Maratlongri and Dhansiri; Kaziranga; Lumding.	8,032	Northeast India	Tiger, Asian Elephant, Greater One-horned Rhinoceros, Greater Adjutant, Lesser Adjutant, White-rumped Vulture, Slender-billed Vulture
North Bank Landscape	Barnadi; D'Ering Wildlife Sanctuary; Dibru-Saikhowa; Eagles Nest and Sessa; Jamjing and Sengagan; Mehao; Nameri; Pakke; Sonai Rupai	20,692	Northeast India	Tiger, Asian Elephant, Snow Leopard, Takin, Greater Adjutant, Lesser Adjutant, Rufous-necked Hornbill, White-rumped Vulture, Slender-billed Vulture
Kangchenjunga-Singalila-Kanchenjunga Complex	Khanchendzonga NP; Kanchenjunga CA; Singalila; Barsey; Maenam	3,676	Northeast India, Nepal	Snow Leopard, Takin, Clouded Leopard
Terai Arc Landscape	Royal Bardia; Royal Chitwan; Royal Sukla Phanta; Dang Deukhuri foothills; Parsa; Gainda Tal	17,440	Nepal	Tiger, Asian Elephant, Greater One-horned Rhinoceros, White-rumped Vulture, Slender-billed Vulture, Lesser Adjutant
Priority sites outside priority corridors*				
	Ada Lake; Pobjika and Khatekha valleys CA		Bhutan	
	Annapurna CA; Koshi Tappu WR; Makalu-Barun NP		Nepal	
	Balaphakram NP; Buxa; Cherapunjee cliffs, gorges and sacred groves (incl. Mawsmai); Dibang Valley; Dzuko; Jatinga; Khasi Hills (including Shillong Peak NP); Mouling; Namdapha and Kamlang; Orang National Park; Ripu-Chirang; Rongrengiri; Siju Caves; Siroi; Teesta-Rangit Valley; Tura-Nokrek range (includes NP); Upper Dihing (East) and Kakojan; Upper Renging; Upper Rottung		Northeast India	

[3] Although Manas Tiger Reserve was included as part of the Manas-Buxa corridor outcome, it is contiguous with the Royal Manas National Park in Bhutan and is considered to be ecologically part of the Bhutan Biological Conservation Complex corridor outcome. The linkages between Royal Manas National Park and Manas Tiger Reserve are stronger than the tenuous links with Buxa and other sites in the Manas-Buxa corridor outcome.

Figure 3. Priority Site and Corridor Outcomes for CEPF Investment in the Eastern Himalayas



Extended Legend for Figure 3

No.	Site Outcome	No.	Site Outcome
1	Annapurna	81	Dzuko
3	Dang Deukhuri Foothills	82	Eagle's Nest and Sessa
5	Gainda Tal	83	East and North Karbi Anlong
8	Kanchenjunga	87	Garampani and Nambor
10	Koshi Tappu	91	Intanki, Maratlongri and Dhansiri
14	Makalu-Barun	93	Jamjing and Sengagan
16	Parsa	94	Jatinga
18	Royal Bardia	97	Kaziranga
19	Royal Chitwan	99	Khanchendzonga
26	Ada Lake-Puna Tsangchu	100	Khasi Hills (incl. Shillong Peak)
20	Royal Sukla Phanta	110	Lumding
27	Bumdelling	112	Maenam
32	Jigme Dorji	117	Manas
33	Jigme Singye Wangchuk	119	Mehao
35	Khaling/Neoli	121	Mouling
40	Phipsoo	125	Namdapha and Kamlang
41	Pobjika and Khatekha Valleys	126	Nameri
42	Royal Manas	133	Orang
43	Sakteng	134	Pakke
44	Sarbhang-Gelephu Foothills	141	Ripu-Chirang

48	Thrumshing La	143	Rongrengiri
49	Toorsa	153	Siju
53	Balaphakram	154	Singalila
58	Barnadi	156	Siroi
59	Barsey	158	Sonai Rupai
66	Buxa	162	Teesta-Rangit Valley
71	Cherapunjee Cliffs, Gorges and Sacred Groves (incl. Mawsmai)	167	Tura-Nokrek Range
73	D'Ering	168	Upper Dihing (East) and Kakojan
76	Dibang Valley	170	Upper Renging
77	Dibru-Saikhowa	171	Upper Rottung

Forty-three of the 60 priority site outcomes are formally protected areas, the exceptions being Popjika and Khatekha valleys, Ada Lake, and the Sarbhang-Gelephu foothills in Bhutan; Upper Renging, Upper Rottung, East Karbi Anlong & North Karbi Anlong, Jatinga, Lumding, Ripu-Chirang, Upper Dihing (East) and Kakojan, Jamjing and Sengagan, Dzuko, Siroi, Cherapunjee cliffs, and Teesta-Rangit Valley in northeastern India; and the Gainda Tal, and Dang Deukhuri foothills in southern Nepal. Fifty-six of the sites are IBAs. Very few sites other than protected areas or IBAs were identified because of a lack of knowledge about most taxonomic groups and the distribution of biodiversity of the region in general, even among the regional scientists and conservationists.

Priority Corridor Outcomes

The Eastern Himalayas Region has globally significant populations of landscape species. Because the populations are being confined to and isolated within sites (many of which are too small to support large, viable populations) due to habitat fragmentation, it is important to link the sites with habitat corridors to manage metapopulations of these species for long term persistence. These linkages will also help to conserve the natural ecology and behavior of these species, an important conservation target.

Five of the 13 landscapes were chosen as priorities for corridor outcomes. These five landscapes were prioritized because: a) each of these harbors the highest number of representative landscape species from the respective ecosystems; b) together, these landscapes contain all the landscape species in the Eastern Himalayas Region; c) each also includes the most number of other species outcomes; and d) as a suite, these five landscapes contain the most number of species outcomes from the region (Appendix 4). These are the Terai Arc Landscape, the Bhutan Biological Conservation Complex, the Kangchenjunga-Singalila Complex, the Kaziranga-Karbi Anlong Landscape and the North Bank Landscape (Figure 4, Table 5). Habitat linkages forming biological corridors between the sites are important outcomes in these five landscapes. While habitat linkages for the Terai Arc Landscape have been identified, based on field surveys and GIS analyses, biological corridors for the other landscapes have not yet been defined.

The five priority corridors—Terai Arc Landscape, the Bhutan Biological Conservation Complex, the Kangchenjunga-Singalila Complex, the Kaziranga-Karbi Anlong Landscape, and the North Bank Landscape—are described in detail below. It is worth highlighting why a couple of corridors were not selected as priorities. The Manas-Buxa Landscape was identified as extremely important during the regional roundtables because it contains a large number of landscape and other species outcomes. However, this long, narrow landscape also represents a tenuous link between the Bhutan Biological Conservation Complex and the North Bank Landscape. An analysis of the existing habitat connectivity indicates that the Manas Tiger Reserve, which is the western anchor of the Manas-Buxa Landscape has better, more intact links with Royal Manas National Park, whereas the eastern extent of the Manas-Buxa Landscape has better habitat links with the North-Bank Landscape (Figure 4), and has been considered as part of the latter in WWF India's conservation portfolio. Delineation of the Manas Buxa Landscape as distinct from the Bhutan Biological Conservation Comlex is more an artifact of national boundaries, than ecological boundaries. Secondly, the Upper Lohit-Changlang Landscape was identified as important for its populations of snow leopard, clouded leopard and takin. This region, which is contiguous with the Northern Forest Complex corridor in Myanmar, was also identified as a priority in previous WWF analyses. However, the area is unstable politically and it was considered that CEPF could not make an impact there in the next five years. However, as the area is poorly known biologically, it should be considered an important landscape for additional surveys and its status reassessed based on the surveys.

Thirty-six[4] of the 60 priority site outcomes (from the overall 175) are in the five priority landscapes, and harbor important populations of all the landscape species amongst them (Table 5; Figure 4). Overall, the sites within the five landscapes include 34 of the 45 mammal species outcomes, 37 of 50 bird species outcomes, 14 of the 16 species of reptile species outcomes, one amphibian. It is also likely that several sites within the Terai Arc Landscape and the Bhutan Biological Conservation Complex harbor the Himalaya dragonfly and Ludlow's Bhutan swallowtail butterfly, respectively. The lowland sites in the Bhutan Biological Conservation Complex and North Bank Landscape that harbor the pygmy hog will, of course, be suitable areas to protect the pygmy hog sucking louse.

There were a few species outcomes that were not represented in priority landscapes because they do not have globally significant populations in the Eastern Himalayas Region. These include:

- Back-striped weasel (*Mustela strigidorsa*)— Known from across the region and into Myanmar, it should occur in the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, North Bank Landscape and in Namdapha.
- Mandelli's mouse-eared bat (*Myotis sicarius*)— Known from Bumthang in the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex and in Teesta-Rangit Valley.
- *Rattus sikkimensis* — Widespread across the Eastern Himalayas Region and extends into Myanmar, with isolated populations known from Thailand and possibly in

[4] Includes Manas Tiger Reserve, which has been included together with the Bhutan Biological Conservation Complex

Indochina, it should occur in the Kangchenjunga-Singalila Complex, Kaziranga-Karbi Anlong and Namdapha.

- Baikal teal (*Anas formosa*) is a winter visitor to the region's large rivers and can be conserved in the North Bank and Kaziranga-Karbi Anlong landscapes. But its main winter range is outside the Eastern Himalayas Region, being in China and Korea.
- Oriental stork (*Ciconia boyciana*) is a winter visitor that uses wetlands in the North Bank and Kaziranga-Karbi Anlong landscapes, but its main winter range extends into China and onto Taiwan, Korea and Japan.
- Spoon-billed sandpiper (*Eurynorhynchus pygmeus*) is a winter visitor to the region and is likely included in the North Bank and Kaziranga-Karbi Anlong landscapes, but the winter range extends south to Sri Lanka and east to Vietnam and Singapore.
- Cheer pheasant (*Catreus wallichii*) is a western Himalayas species and the populations in the Eastern Himalayas Region are not significant.

In addition to the five priority landscapes overlapping with the Level 1 TCUs in the region, two of the landscapes—the Terai Arc Landscape and the Kaziranga-Karbi Anlong Landscape—include four World Heritage sites amongst them, namely Chitwan National Park, Lumbini and Corbett National Park[5] in the Terai Arc and Kaziranga National Park in the Kaziranga-Karbi Anlong Landscape.

Although the Bhutan Biological Conservation Complex, as defined by the roundtable participants, excludes Manas Tiger Reserve in India, the two are ecologically linked because the Tiger Reserve is contiguous with Bhutan's Royal Manas National Park. Thus, ecologically and functionally the Manas Tiger Reserve can be considered to be part of the Bhutan Biological Conservation Complex. Manas Tiger Reserve is also a World Heritage Site.

The priority landscapes are described in detail below.

1. Terai Arc Landscape

The Terai Arc Landscape includes five priority sites, within the Eastern Himalayas Region, that harbor landscape species (Table 5). But the entire landscape extends further west to Corbett National Park. Thus, it is anchored in the east and west by two World Heritage sites: Chitwan National Park in Nepal and Corbett National Park and Tiger Reserve in Uttaranchal Pradesh, India. Between these two are 11 protected areas—including a third World Heritage Site, Lumbini—that provide nodes of core protection for important species and create transboundary links between Nepal and India. Although the list of site outcomes compiled by BirdLife did not consider important sites in India, such as Dudhwa and Katerniaghat, these protected areas nevertheless represent important sites for the focal landscape species of the Terai Arc landscape. The important corridors that link the site outcomes in this landscape are those between; Chitwan and Bardia, Bardia and Katerniaghat, Bardia and Suklaphanta, and Suklaphanta and Dudwa.

[5] Corbett National Park is a protected area that anchors the western part of the Terai Arc Landscape, and is outside the region of analysis for this assessment.

The 14 mammal, 20 bird and seven reptile species outcomes in this landscape include a globally significant tiger metapopulation (Wikramanayake et al. 1999) and four important populations of the greater one-horned rhinoceros. The rhinoceros population in Chitwan National Park is the second largest in the world. The two populations in Bardia National Park and Sukla Phanta Wildlife Reserve are being augmented through successful translocations of rhinoceros from Chitwan. Although the rhinoceros is now more-or-less confined to protected areas across its range, in the Terai Arc Landscape, some animals have begun to wander out of the confines of these core refuges and live in buffer zones — the emergence of conservation program of the rhinoceros as a landscape species.

The Terai Arc Landscape also harbors several elephant populations that still seem to undertake seasonal migrations. The elephant population in the western extent of the landscape was identified as a rangewide conservation priority (WWF 1998). The Terai Arc overlaps with Level 1 TCUs and its tiger population is globally important.

Other priority species outcomes include the swamp deer in Sukla Phanta Wildlife Reserve in Nepal and in Kishanpur Wildlife Sanctuary, India (which lies outside of the region of analysis for this assessment, but has habitat linkages with Sukla Phanta). Several sites within the landscape have populations of hispid hare, and the rivers that flow within Chitwan and Bardia National Parks in Nepal harbor populations of the Gangetic dolphin.

Among the priority bird species in this landscape are several grassland specialist birds, including the globally threatened Bengal florican and the smaller bristled grass warbler, Finn's weaver (*Ploceus megarhynchus*), slender-billed babbler (*Turdoides longirostris*), Jerdon's babbler (*Chrysomma altirostre*) and white-throated bushchat (*Saxicola insignis*). Wetlands, especially near the Lumbini World Heritage Site—the birthplace of Lord Buddha— support a population of saurus crane (*Grus antigone*). There are also several priority reptile species—three-striped roof turtle (*Kachuga dhongoka)*, red-crowned roof turtle (*Kachuga dhongoka*), Indian eyed turtle, three-keeled land tortoise (*Melanochelys tricarinata*), elongated tortoise, gharial (*Gavialis gangeticus*), marsh crocodile (*Crocodylus palustris)*—in the landscape, with the gharial being an aquatic flagship species.

2. Kangchenjunga-Singalila Complex

This landscape includes five priority sites and represents a complex of transboundary reserves in eastern Nepal and Sikkim and Darjeeling in India. The landscape extends from Kangchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Illam, Panchthar (continuous with Singhalila National park, India) and Jhapa districts (continuous with the forests of Bengal Terai). The landscape has the potential to extend south and eastward in India to include Senchal, Neora and Mahananda in Darjeeling district (Yonzon 2000a). Although the approximate bounds of the landscape have been identified, the corridor outcomes in the landscape have to be defined through a combination of GIS analyses and ground surveys.

The landscape in Nepal provides both north-south and east-west connectivity and includes some of the last remaining areas of relatively intact subtropical and temperate forests that have become highly fragmented and degraded throughout the Himalaya. One of the most outstanding features of this landscape in Nepal is the altitudinal gradient, from the tropical broadleaf forests of Jhapa district to the eastern subtropical and lower temperate forests of Illam and Panchthar districts and the diverse forest types of KCA. These subtropical and temperate forests and the small patches of tropical evergreen forests are important for bird conservation (Yonzon 2000a). There are also several floral hotspots, (especially in Kangchenjunga), in this landscape, which also contains large expanses of Endangered Himalayas larch forest.

The 17 mammal species outcomes in the landscape include red panda, tiger, clouded leopard and snow leopard. Elephants migrate into the southern forests in Jhapa from West Bengal, but with forest fragmentation the numbers have dwindled and human-elephant conflicts have increased as the remaining animals are pocketed in small patches of habitat (Yonzon 2000a). Recently takin has been documented from this region (reported during the expert roundtable in Gangtok). The Mandelli's short-eared bat is probably found in this landscape.

Thirteen bird species outcomes are present in this landscape. The birds include the chestnut-breasted partridge and the rusty-bellied shortwing. In addition, to these species, in the Nepal portion of the landscape, there is a high diversity of birds which includes 34-35 species of birds considered at risk in Nepal including 14 categorized as Endangered (Yonzon 2000a)

3. Bhutan Biological Conservation Complex

This large landscape extends as a network of corridors that link the protected areas system of Bhutan, which consists of nine national parks and wildlife sanctuaries and have been identified as priority site outcomes. The corridors that link these sites are priority outcomes.

The southernmost protected area in the landscape, Royal Manas National Park, is directly linked with the Manas Tiger Reserve in Assam, India, which is immediately across the international border between India and Bhutan. Thus, Manas Tiger Reserve is included within this landscape.

The landscape supports 17 mammal, 10 bird, 4 reptile, and likely one globally threatened invertebrate species. Recent surveys have shown that tigers occur in this landscape at elevations over 3,000 m (Yonzon 2000b) Thus, the habitat linkages between the protected areas were designed to allow an important landscape species, the tiger to disperse between, and even reside outside the core protected areas, in temperate broadleaf forests.

The temperate forests also support several priority bird species outcomes, including important populations of the globally threatened rufous-necked hornbill (*Aceros nipalensis*), white-bellied heron, dark-rumped swift (*Apus acuticauda*), chestnut-breasted partridge (*Arborophila mandellii*), grey-crowned prinia (P*rinia cinereocapilla*) and the

beautiful nuthatch (*Sitta formosa*). It also includes two wintering sites for the globally threatened black-necked crane.

The corridors also provide altitudinal habitat connectivity between the range of ecoregions represented in Bhutan (WWF and ICIMOD 2001), from the lowland grassland and savannas to the alpine meadows, and the subtropical and temperate broadleaf forests, mixed conifer and subalpine conifer forests in-between. The mid-montane temperate broadleaf forests that have been cleared throughout the eastern Himalayas are still relatively intact in Bhutan. Many of the birds in these forests are not found at comparable elevations in Nepal, where the broadleaf forests are highly fragmented; most likely a result of fragmentation that prevents movements and distribution (Carol Inskipp, pers comm).

The Manas reserve complex—Royal Manas National Park and Manas Tiger Reserve/World Heritage Site—also harbors elephants. It used to support an important population of the greater one-horned rhinoceros, which has now been extirpated by poachers who have taken advantage of an ongoing, two-decade insurgency. But there is good potential to re-establish the species if poaching can be brought under control. Manas also harbor important populations of the pygmy hog and hispid hare, and a small, nevertheless important population of wild water buffalo. The Manas reserve complex and the surrounding forests harbor important populations of capped langurs (*Trachypithecus pileatus*) and the endemic golden langur.

In the north, Jigme Dorji National Park and Bumdaling provide large areas of snow leopard habitat. These northern reserves also support takin and the charismatic Himalayas endemic, the red panda, both of which are priority species outcomes. The Mandelli's short-eared bat may occur in the middle areas of this landscape.

4. Kaziranga-Karbi Anlong Landscape

The landscape includes six priority site outcomes that support landscape species. Kaziranga National Park is a World Heritage Site. The landscape was defined and designed to allow seasonal migrations of an important population of elephants that move from Kaziranga to Karbi Anlong. However, these corridors have to be defined on the basis of field research on seasonal elephant movements, GIS analyses of current land use and land cover, and field surveys.

The sites within the landscape harbor several other priority species outcomes, comprising nine mammal, 26 bird and seven reptile species outcomes. Notable among these is the world's largest population of greater one-horned rhinoceros, secured in Kaziranga National Park. The park also harbors globally important populations of wild water buffalo, swamp deer and tiger.

Among the bird species outcomes represented in this landscape are the white-rumped vulture (*Gyps bengalensis*), slender-billed vulture (*Gyps tenuirostris*) and the greater and lesser adjutant storks. The large spatial areas associated with landscapes are more conducive to conservation of these big birds than the smaller site outcomes. Another

landscape bird species in this landscape is the rufous-necked hornbill, which inhabits the forested areas, especially in Intanki, Maratlongi and Dhansiri. Important populations of the white-winged duck are known to occur in several site outcomes—Garampani, Nambor, Intanki, Maratlongi and Dhansiri—within the landscape, although its distribution may be more widespread across the landscape. Kaziranga itself is rich in globally threatened bird species, with several grassland specialists such as the bristled grass warbler (*Chaetomis striatus*), slender-billed babbler, Jerdon's babbler, Bengal florican, Finn's weaver and white-throated bush chat, and several birds associated with wetlands, especially the white-bellied heron, swamp francolin (*Francolinus gularis*) and Marsh babbler (*Pellomeum palustre*).

5. North Bank Landscape

This landscape harbors one of the world's most important Asian elephant populations (Sukumar 1992). It also overlaps with a Level 1 TCU and supports an important tiger population. With nine priority sites, the landscape extends along the northern bank of the Brahmaputra River in Assam, and up into Arunachal Pradesh to include forest and alpine habitats in the Himalayas mountains. The habitat linkages within the landscape have to be defined on the basis of field research on seasonal elephant movements, tiger distribution, GIS analyses of current land use and land cover, and field surveys.

Because the landscape includes a variety of ecosystems, from the wetlands and riverine habitat along the Brahmaputra River, and alluvial grasslands and subtropical broadleaf forests in Assam, to temperate broadleaf forests, mixed conifer forests, and even alpine habitats in Arunachal Pradesh, species diversity is high. The landscape species include elephants and tigers in the lowlands to snow leopards and takin in the montane areas. Overall, the landscape includes 22 mammal species outcomes. Bird species diversity is also high. The low elevation species include the grassland and wetland birds, such as the Bengal florican, slender-billed babbler, Finn's weaver, bristled grass-warbler, grey-crowned prinia, Jerdon's babbler and Sarus crane (*Grus antigone*), white-bellied heron, marsh babbler, black-breasted parrotbill (*Paradoxomis flavirostris*), swamp francolin, spot-billed pelican (*Pelecanus philippensis*), white-winged duck and Pallas's fish eagle (*Haliaeetus leucoryphus*). The lowlands also harbor wide-ranging large birds such as the slender-billed vulture, white-rumped vulture, and greater and lesser adjutants. In the forested submontane areas, birds such as the rufous-necked hornbill, wood snipe (*Gallinago nemoricola*), rusty-bellied shortwing, Blyth's tragopan, chestnut-breasted partridge, beautiful nuthatch are identified as important conservation outcomes. The landscape also includes sites with 10 reptile species outcomes and one amphibian species outcome.

SOCIOECONOMIC FEATURES

Humans have lived in the eastern Himalayas for several millennia, over the course of which they have adapted their customs, lifestyles and livelihoods to the local environments. The rugged terrain has precluded convenient movements and mixing of communities, as reflected by the diversity of ethnic and religious groups across the Eastern Himalayas Region. But, from about the last half-century or so, exposure to external circumstances has changed these sustainable lifestyles. Now, land tenure issues,

increasing influence of both global and regional market economies, and a rapidly increasing population have combined to create and intensify socioecological conflicts.

People use most of the corridors and even some of the smaller sites that are identified as outcomes; thus the anthropogenic changes also impact and influence the region's biological richness at intensities never before experienced in the region. These threats to biodiversity are issues that have to be addressed to achieve the conservation targets in the region. Since many areas within the corridor outcomes will never become fully protected areas the solutions will have to involve a wide range of civil society.

Institutional Framework for Conservation

The region includes three countries, each with subtle or conspicuously different political and governance structures. Even within a country, differences in state government regulations and policies have to be considered in a conservation strategy.

Bhutan's Institutional Framework: In Bhutan, all conservation and related activities are mandated with the Department of Forestry Services in the Ministry of Agriculture, better known as the RNR sector (Renewable Natural Resources Sector), and encompasses agriculture, animal husbandry, and forestry. The Department of Forestry Services fulfills its responsibilities through four functional divisions: the Forest Protection and Utilization Division, Nature Conservation Division, Forest Resources Development Division, and the Social Forestry Division. Field activities are implemented at the regional level through 11 Territorial Divisions and five national park/sanctuary offices.

The Nature Conservation Division is responsible for all management and other activities within the protected areas. Although its focus is the protected areas system, its ambit extends to biodiversity conservation issues outside the protected areas, especially in the buffer zones and corridors. The Forest Protection and Utilization Division is responsible for protecting and managing all government forests outside the protected areas system, and the Forest Resources Development Division for developing management plans for sustainable utilization of governmental Forest Management Units.

The National Environmental Commission (NEC) is an independent institution that is the national focal point for environmental policies and responsibilities outlined in the Convention on Biodiversity. Together with a Biodiversity Management Board (BMB) comprising of a 13 member cross-sectoral panel, the NEC oversees the implementation of the National Biodiversity Action Plan. The BMB is also responsible for advising, reviewing or reforming national policies, projects, and actions that pertain to the nation's biological resources, including conservation and sustainable use. The Natural Resources Training Institute trains mid-level civil servants in forest, livestock, and agricultural extension services.

The nongovernmental conservation sector in Bhutan is represented by two major conservation NGOs operating in Bhutan—WWF Bhutan Program and the Royal Society for Protection of Nature (RSPN). Other relevant institutions include the National Women's Association of Bhutan, the Youth Development Fund, and gewogs (village

level development agencies). WWF has been active in Bhutan since 1977, engaged in training and capacity building, biological surveys, assisting with protected area management, helping to develop forestry legislation, and supporting conservation monitoring. WWF was also closely involved with the revision of Bhutan's protected areas system and in designing the system of corridors that now constitute the Bhutan Biological Conservation Complex.

RSPN was founded in 1987, and remains Bhutan's only national conservation NGO. Its focus is to promote conservation through environmental education in schools, integrated conservation and development programs, and advocacy. RSPN is now in the process of developing an endowment fund to ensure sustainable funds for financial security.
The Bhutan Trust Fund for Environmental Conservation (BTEF) is another parastatal conservation organization that was established in 1991 as one of the world's first conservation trust funds to provide a sustainable source of revenue for conservation. This innovative program now contributes more than $1 million annually toward conservation, funding projects such as graduate training for conservation biologists, providing seed money for the RSPN endowment, support for protected areas management and development, and capacity building by providing scholarships.

Nepal's Insitutional Framework: In Nepal, the Ministry of Forest and Soil Conservation (MFSC), its departments and parastatals are the main policy-making agencies for forest and wildlife management. The MFSC is organized into three policy divisions and four implementing departments, the latter being the Department of Forests, Department of National Parks and Wildlife Conservation, Department of Watershed Management and Soil Conservation, Department of Forest Survey and Research.

The Department of National Parks and Wildlife Conservation (DNPWC) is mandated with conserving the country's major representative ecosystems, unique natural and cultural heritage, wildlife protection, and research. While the earlier emphasis was on species protection, the DNPWC now stresses a participatory approach to biodiversity conservation and management. The Department of Forests (DoF) is responsible for managing, demarcating, controlling, and conserving all national forests outside the protected areas. The Community and Private Forestry Division of the DoF carries out forest development and management, and oversees utilization programs in community and private forests, while the Planning and Training Division formulates management plans and programs for the conservation and promotion of Nepal's forests and its rational use.

Under the 1990 Constitution of the Kingdom of Nepal, there is provision to establish a Natural Resources and Environment Committee in the House of Representatives. This committee has the powers and functions to evaluate the policies and programs pertaining to conservation and natural resource management, in collaboration with the Ministries of Forest and Soil Conservation; Water Resources; Land Reform and Management; and Population and Environment, and relevant departments and agencies under these ministries. Therefore, these other ministries are also relevant to conservation activities in Nepal. For instance, the scope of the Ministry of Population and Environment extends to

oversight of the National Conservation Strategy and the Nepal Environmental Policy and Action Plan. This ministry is also responsible to ensure compliance of various international conventions.

The Environment Protection Council, established in 1992, provided the guidance and impetus for the government to ratify the Convention on Biological Diversity, the Convention on Climate Change, the Vienna Convention on the Protection of the Ozone Layer, and the Montreal Protocol on Substances that Deplete the Ozone Layer. Nepal has also developed its institutional capacity for biodiversity protection and conservation management through national and overseas training, and recently produced the National Biodiversity Strategy.

The nongovernmental conservation community in Nepal is much larger than in Bhutan. Some of the major institutions include WWF Nepal Program, the King Mahendra Trust for Nature Conservation, UNDP, IUCN-Nepal and The Mountain Institute. The International Centre for Integrated Mountain Development (ICIMOD) is a regional organization based in Kathmandu.

IUCN began work in Nepal in the 1960s, assisting early government efforts to protect environmentally sensitive areas and wildlife. Nepal became a State Member of IUCN in 1973 with the Department of National Parks and Wildlife Conservation (DNPWC) as the active link. In the 1980s, IUCN supported the Nepal government in formulating a National Conservation Strategy (NCS). IUCN's current focus in Nepal is wetland conservation and environmental education.

WWF has been involved in conservation efforts in Nepal since 1967, and is considered one of the key organizations involved in conservation in Nepal. Over the years, WWF's initial focus of species conservation has expanded to involve local communities in natural resource management, capacity building within nongovernmental and governmental institutions, conservation education and institutional support for a landscape approach to conservation based on ecoregional scale planning. WWF Nepal has also played an important role in imparting technical support to the government in biodiversity-related policymaking, planning and implementation issues, and issues related to transboundary conservation. Currently, WWF Nepal supports four major projects: Terai Arc Landscape (TAL) Program, Kangchenjunga Conservation Area Project, Sagarmatha Community Agro-Forestry Project (SCAFP) and Northern Mountains Conservation Project (NMCP) on medicinal plants.

The King Mahendra Trust for Nature Conservation (KMTNC) was established in 1982. For nearly two decades now, KMTNC has successfully undertaken over 100 small and large projects on nature conservation, from Chitwan and Bardia in the lowlands to the Annapurna and Manaslu regions of the high Himalayas and Trans-Himalayas regions of Upper Mustang and Manang.

The International Centre for Integrated Mountain Development (ICMOD) is a regional program based in Katmandu with the mandate to promote the development of an

economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations in the Hindu Kush Himalayas Region. ICIMOD works mainly at the interface between research and development and acts as a facilitator to generate new mountain-specific knowledge to further conservation and development in the mountains. ICIMOD also facilitates sharing of new knowledge among relevant institutions, organizations, and individuals in the region, and thus functions as a multidisciplinary documentation and information center on integrated mountain development. It is also a focal point for mobilizing and coordinating applied and problem-solving research activities, and for training in integrated mountain development.

In addition to the above NGOs, there are more than 100 local and national level NGOs and community-based organizations (CBOs). Nepal Forum of Environmental Journalists, Bird Conservation Nepal, Environmental Camp for Conservation Action, The Mountain Institute, and Mountain Spirit among others are active in raising awareness of conservation issues in Nepal.

Northeastern India's Institutional Framework: In India, the forests and wildlife are constitutionally vested as state subjects. Thus, the respective state Forest Departments are primarily accountable for managing forests and the Wildlife Wings of the Forest Departments manage the protected areas. The Chief Wildlife Warden is responsible for the implementation of Wildlife Act, and has to report to the central Ministry on select wildlife matters. The Ministry of Environment and Forests has overall responsibility for forests and protected areas in India.

But, unlike in the rest of India, about 54 percent of the forests in the northeast hill states are categorized as unclassed state forests. These are largely under the control of private individuals, clans, village councils, district councils and other traditional community institutions. In Assam, two district councils manage 3,589 square kilometers (1 percent) of Reserve Forests and Proposed Reserve Forests, the rest being under the state Forest Department. In comparison, the neighboring hill states Meghalaya (97 percent), Nagaland (97 percent) and Tripura (84 percent) have much greater proportions of their forests managed by autonomous district councils as well as clans, village councils and individual families. Manipur, Arunachal Pradesh and Mizoram have about 63 percent, 52 percent and 46 percent, respectively of community managed and controlled forests (Down to Earth 2002). Utilization of unclassed state forests includes traditional usufruct rights.

Thus, in these hill states the District Councils are an important part of the governance structure, and forest management comes under the purview of the Council Forest Departments. Despite the devolution of management rights to the states and districts, the central Ministry of Environment and Forests, in Delhi, retains responsibility for sourcing funds to the state departments, formulating legislation and amendments, and providing direction to state Forest Departments on major policy decisions in forest and biodiversity protection. Acceptance of central-level directives by the state departments is, however, discretionary.

Even at the village level, there are institutions such as the *village durbars* and Village Development Councils that play a very important role in conservation of biodiversity and ecological services. These councils run the day-to-day village administration, including the management of village or community forests where fuelwood extraction, thatch grass collection, and gathering materials for house construction are permitted and regulated. Certain village durbars are also the custodians of sacred groves and community forests.

Like the rest of the country, Assam, Tripura and Arunachal Pradesh in northeast follow the Panchayati Raj system, which governs a substantial portion of the common property resources, and is also an important decentralized institution in biodiversity conservation. In Arunachal Pradesh, the *Anchal Samitis* are the panchayat equivalents, and comprise of village clusters. A substantial portion of undisturbed natural community forests in Arunachal Pradesh is under the control of Anchal Samitis, which makes them important stakeholders of biodiversity conservation and management.

There are more than 150 conservation-related nongovernmental organizations in northeast India. Most are organized at local and grassroots level, but several are regional, national, and international NGOs that have been working in the region for more than two decades. The activities of the grassroots NGOs vary from poverty alleviation through community development, education and awareness, community mobilization, advocacy and action projects, to *ex situ* and *in situ* conservation and biological inventory and surveys. Many were established by dedicated groups of individuals motivated to conserve species, biodiversity, or the environment where they live. For example, the Green Guards and Green Manas are two local NGOs based in Assam engaged in small-scale *ex situ* conservation projects; the former rescues, rehabilitates, and releases greater and lesser adjutant storks, and the latter has a captive breeding program for Pygmy hogs. In Sikkim, the local NGO, Ecotourism & Conservation Society of Sikkim (ECOSS) is involved in developing and promoting good ecotourism practices. In Assam, Nature's Beckon is a small activist group striving to save the last few patches diverse rainforest in the remote Jaipur, Upper Dihing and Dirak districts of eastern Assam from industrialization.

Some of the regional and national NGOs active in northeast India include ATREE, a NGO that promotes biodiversity conservation and sustainable resource use in the eastern Himalayas and the Western Ghats. Aaranyak is a regional NGO dedicated to biodiversity conservation and other environmental issues in Northeast India and coordinates activities of smaller, grassroots NGOS such as Nature's Foster, Green Heart Nature Club, Green Forest Conservation, New Horizon, Green Manas, and Green Guard. Because many of these grassroots NGOs are unable to receive and convert foreign-currency grants from international donors, the larger NGOs function as "nodal agencies" to receive, disburse and coordinate activities of the former.

CEE is a national NGO active in northeastern India. CEE is primarily engaged in environmental education programs, and is also the National Host Institution for the UNDP Small Grant Programme in India. The northeast regional cell of CEE in Guwahati (CEE NE) facilitates the program in the eight northeastern states where it implements 11 ongoing projects, of which five are in Assam, three in Manipur, and one each in one in

Meghalaya, Mizoram, Sikkim. Other national NGOs active in the region include Wildlife Trust, India and the Bombay Natural History Society. Another major, national NGO active in the region is, WWF India, which has a regional office in West Bengal with sub-regional offices in Kolkotta, Sikkim, Darjeeling, Assam and Arunachal Pradesh. WWF undertakes diverse activities from helping to protect sacred groves, environmental education and tiger conservation to large, landscape-level projects, such as the ambitious North Bank Landscape project. Other NGOs include Inner Asia Foundation in Arunachal Pradesh, which is striving to create a reserve to the north of, and contiguous to, Kamlamg Wildlife Sanctuary and Namdapha National Park, and the World Pheasant Association which is active in Sikkim, Darjeeling, Arunachal Pradesh, Nagaland and Mizoram.

The 'NGO Landscape' in context: As evident, the civil society groups active in conservation vary widely in the different countries. For instance, in Nepal the national and international conservation NGOs as well as CBOs can undertake conservation activities with relatively few constraints. In Bhutan, the civil society groups in conservation are more limited, with one international NGO and one national NGO that is incorporated under the Companies Act. However, the village-level government authorities (gewogs) are essentially quasi-NGOs, since they have a certain amount of independence and authority from the central government. Northeastern India has hundreds of grassroots-level conservation NGOs and CBOs, but most cannot receive foreign exchange grants due to exchange control regulations. However, funds can be disbursed through local or regional "nodal" NGOs that have exchange control permits. NGOs, such as CEE and Aaranyak are already perfoming this role.

Because many of the grants are expected to be in small amounts, it is best to identify a recognized NGO, or consortia of NGOs in each country to help the smaller NGOs, CBOs and other civil society groups develop and submit proposals. These "nodal" agencies would also be tasked with project monitoring and ensuring that reports and other outputs are submitted in time.

Nature Conservation Legislation and Agreements

All three countries have ratified the Convention on Biological Diversity and prepared National Biodiversity Conservation Strategies and Biodiversity Action Plans. All three are members of IUCN, and have also acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

The Forest Act, 1969 governs Bhutan's forestry and conservation sector. This Act guides development of forestry operations, and establishes central control over use of forest resources. The 1995 Forest and Nature Conservation Act provides the legal basis for protection and sustainable use of forests, wildlife, and other natural resources in the country, including protected areas management, wildlife conservation, social and community forestry, trade of forest produce, and soil and water conservation (from DoF 2002).

Other relevant legislative instruments, especially with regard to landscape conservation include: the 1974 National Forest Policy which sets the policy for maintaining at least 60

percent forest cover; the Land Act of 1988 which deals with procedures of land registration and allotment to reduce forest encroachment, and land use regulations in forest lands; and the Environmental Assessment Act of 2000 which establishes the procedures for assessing and mitigating potential environmental threats from projects.

In Nepal the National Parks and Wildlife Conservation (NPWC) Act (amended 1974) establishes regulations for protected areas, and recognizes species for protection. The Himalayas National Park Regulations (1979) provide for people living in national parks to collect natural resources for subsistence. The Buffer Zone Management Regulations (1996) and Buffer Zone Management Guidelines (1999) are meant to design programs compatible with National Park management and facilitate public participation in conservation, design and management of buffer zones. These regulations, under the NPWC Act provide for 30-50 percent of the park revenues to be retained for community development activities in the buffer zone. The Master Plan for the Forestry Sector (1988) recognizes ecosystem and genetic resource conservation as a long-term objective, and states that a pre-requisite to reduce park people conflict is meeting the basic needs of the people through the forestry sector. Significantly for landscape conservation, it also emphasizes the need for a policy of wildlife conservation outside the protected areas through an ecosystem-based approach. This policy is reiterated in the government's Tenth Five Year Plan (2059/60 – 2063/64). The Forest Act (1993) provides the government with the power to delineate any part of a national forest that has a 'special environmental, scientific or cultural importance' as a protected forest, which is relevant to landscape conservation.

In India, the forested areas are governed under the National Forest Policy of 1988. Central legislation such as the Indian Forest Act, 1927, the Wild Life (Protection) Act, 1972, the Forest (Conservation) Act, 1980, and the Environment (Protection) Act, 1972 apply in the northeastern region. But several state-based legislation, District Council Acts, and community customary laws also apply in each state to regulate forest management and extraction from forests broadly classified as Unclassed State Forests. These forests, under private and community ownership and management, are mostly unsurveyed (both in terms of area, biodiversity value) in the hill states. With 80 percent of the northeast region's forests under private and community control, the customary laws are widely applicable. But the District Council Acts are too weakly enforced; thus, with the concurrent weakening of the influence of the traditional institutions over the land and people, access to these forests is now almost unrestricted.

Many of the existing laws and policies require amendments to make them compatible with current biodiversity conservation goals. Traditional and customary laws also have to be documented and analyzed so adequate legal back up to appropriate customary and traditional laws could be extended. Biodiversity could be integrated into development sectors, making biodiversity conservation an integral part of all the development activities and to ensure that ecosystem services are valued.

Economic Situation

Bhutan's economy is based on agriculture, export of hydropower to India and nature-based, high-end tourism. Bhutanese societies are primarily agrarian or pastoral; today, 79 percent of Bhutanese depend on agriculture, and most of the arable lands are already cultivated. Most Bhutanese still rely on natural resources such as fuelwood, fodder, building material, food, and traditional medicines from forests and other natural habitats. It is therefore clear that Bhutan and its people will have to depend heavily on the continued maintenance of environmental integrity for cultural, social, and economic well-being and growth.

Cognizant of the economic dependence of an intact environment, Bhutan has persisted with a cautious approach to development. The government's economic policy is underlain with an emphasis and need for conservation of its natural resources (MoA 1998). Thus, there is a deliberate attempt to control the pace of the transition from subsistence to a modern economy to ensure sustainability.

The economy of Nepal is also closely bound to its natural resources—arable land, water, forested areas, and protected areas. Agriculture is the mainstay of the economy, providing a livelihood for over 80 percent of the population and accounting for 41 percent of Gross Domestic Product (GDP). In general, agriculture contributes more than 50 percent of household income (HMGN/MFSC 2002). Tourism is the second most important source of foreign exchange for Nepal, after agriculture. About 45 percent of tourists coming to Nepal visit protected areas, generating substantial revenue. Tourism revenues from Chitwan and Annapurna contribute substantially to the national and local economies. But there is more scope for increasing tourism revenue further, and nature-based tourism will be a significant component.

The economy in northeastern India is primarily forestry and agrarian-based. The plains are dominated by settled cultivation, whereas *jhum* (slash and burn) is practiced in the hills. Forestry contributes between 40-55 percent to local economies (Rahul Kaul World Pheasant Association, pers comm). Development in the region has not been commensurate with its rich resource base. The CMIE (Centre for Monitoring India's Economy) index of relative development of infrastructure (1966-67 to 1992-93) position shows that, with the exception of Assam (ranked 13), the remaining seven states rank below 15 among the 25 states of the country.

However, the conventional parameters of development are not the best measures for understanding the social and economic status of the Hill communities. The prevalence of traditional lifestyles, barter trade, and common property dissociates tend to hide the level of poverty or prosperity of the highland people. The spread of market economy and policy interventions, and accompanying infrastructure, have impacted the socio-economic dynamics of the hill communities and the rate of exploitation of natural resources in the region. During the past few decades, economic development has been characterized by forest clearing, increased exports of medicinal plants, development of hydro power projects, construction of water resource works, increased tourism, exploration and extraction of minerals, conversion of forested lands to orchards and tea gardens,

commercial horticulture, and establishment of cantonments and hill stations. The growth of industrial activity has been largely limited to the foothills. To this is added large scale of migration of people in search of better job opportunities. Overall, these developments are detrimental to the agrarian economic base of the region.

Infrastructure and Regional Development

Bhutan is one of the least urbanized countries in the world, but with the 6.7 percent annual increase in migration from rural to urban areas, this situation is changing at a rapid pace (UNEP 2001; NEC 2002). With urbanization there comes a need to secure more land to accommodate urban expansion and to provide infrastructure and services (UNEP 2001). Developing this infrastructure for urban areas, as well as for the population living in scattered and sparsely populated areas, is likely to have significant impacts on the environment and biodiversity in Bhutan. Roads will fragment currently continuous swathes of habitats and corridors. Provision of irrigation and hydropower, while enhancing the lives of the people, can have serious negative impacts on the environment, especially on aquatic biodiversity. Urbanization and infrastructure development also impacts negatively on forest cover on valley slopes as forests are cleared to make room for urban settlement, increasing the risks of soil erosion and disturbances in watercourses. It also increases the probability of landslides and flash floods, which have economic and human life-related consequences.

Nepal offers its citizens one of the poorest levels of infrastructure services in the world (Nepal Country Paper 2001). Only 45 percent of the population has access to safe drinking water, 6 percent to sanitation (39 percent in urban areas) and about 21 percent of households have electricity. Road density is low, with coverage of about 6 kilometers per 100 square kilometers. Most of the existing and planned infrastructure is concentrated in the Kathmandu Valley and in the Terai—a response to the migration of people from the mountains to the Terai zones and to cities, Kathmandu in particular. However, providing infrastructure to the more remote areas is also a government priority.

Several large hydropower projects are underway, which will substantially increase power generation. Road networks are seen as an urgent need, especially to connect villages with market and administration centers. All these projects will have environmental and biodiversity related consequences, in terms of habitat loss, fragmentation, improved access and settlement, human-wildlife conflicts.

Most of the development in northeast India is urban-centric, with the regional governments lacking proper policy on developing villages and suburban areas. The rapid and unplanned urbanization leading to loss of forest cover, unsustainable resource utilization, lack of drinking water (underground as well as run off), poverty and slums in and around the urban areas. The population increased in the region is about 6.94 million between 1991 and 2001[6].

Roads are a necessity to connect interior villages and to improve communications, but roads also result in forest fragmentation, and lead to anthropogenic activities that are

[6] Basic Statistics of Northeastern Region, 2002, North Eastern Council, Shillong.

detrimental to the ecosystem. The Government of India has a priority to establish road communication to all the villages by 2020. Being a long border with China, Myanmar and Bangladesh the Department of Defense also has a priority to develop the roads along the border areas, most of which are fragile ecosystems and wildlife habitat, leading further fragmentation of habitat. Environmental impact assessments are not necessary for defense-related projects.

Large numbers of hydroelectric dams have been proposed in the region, and some are being implemented. The hydroelectricity generating potential in the region is 34,920 MW, or 41.50 percent of all the hydropower in India, according to an assessment by the Central Electric Authority (CEA)[2]. The dams will inundate important ecosystem areas and increase settlement in forest areas. Further, installing transmission cables will destroy more forest areas.

Agroforestry has a tremendous potential in the region, and may succeed in replacing the traditional slash and burn cultivation (*jhum*) practiced by the hill tribes. Input of resources from governments and international agencies like World Bank for development of this sector is increasing. However, unplanned and unscientific agroforestry may lead to potential threat to the existing ecosystems as well as monoculture.

The tea industry in Assam is very old, and was started in 1837. Until 1997 there were 947 tea gardens covering over 230,000 hectares in northeast India. Since 1998-99, however, the tea industry has grown sharply, and now covers almost 280,000 hectares. This records a rapid growth of tea gardens in the region and corresponds to the loss of forest cover in the foothills and uplands in the valleys.

There are an estimated 864 million tons of coal reserve in the region. Meghalaya State has the largest reserve of coal in the region particularly in ecologically sensitive area like Garo Hills. Several open cast and rat-hole mining operations extract these deposits, with scant heed for environmental impacts.

Demography and Social Trends

With only about 650,000 people, Bhutan has one of the lowest population densities in Asia, which is an opportunity for conservation. However, with the introduction of better health conditions and living standards, the population has begun to grow rapidly with the current level of increase at 2.5 percent per annum. Already, more than 42 percent of the population is under 14 years of age. As this cohort grows up, with increasing economic aspirations and resource needs, the pressure on the environment can be expected to increase tremendously. Although most of the population is still rural, there is an increasing migration into urban centers. Thus the government will be challenged to create more employment opportunities for these growing urban populations.

Nepal's human population is estimated at 23.2 million people and growing at 2.4 percent annually. At these rates, the population will double in 25 years. The distribution of the population is biased toward the lowlands. Since the eradication of malaria in the fertile

Terai lowlands in the 1960s, hundreds of thousands of immigrants moved from the hills of Nepal (and also into Nepal from India) into the Terai. Between 1981 and 1991, the average net gain in the human population in the Terai due to immigration was 94.3 percent in eight out of 14 districts in the Terai (Khatri-Chhetri and Devkota 2001). The consequence of this high population growth rate is unsustainable forest resource use in the Terai. Approximately 80 percent of the households now hold less than 2 hectares of land, which is inadequate to support a family (Khatri-Chhetri & Devkota 2001). Therefore, the people have to depend on forests for their daily requirements of firewood and supplement their food with forest products. If the current trends continue, the Terai forests will be unable to support the resource demands from the increasing human population unless sustainable natural resource use and management regimes are instituted—quickly.

In the mountains, the population as a whole is culturally and ethnically diverse, but the demographics in the mountains reflect the consequences of migration to the lowlands. In the Kanchenjunga Conservation Area, for instance, the population density is only about 3 persons per square kilometer. Emigration to the lowlands and to nearby towns has depleted the population.

Because of its location in the geographic periphery of India, the northeastern region has evolved its own distinct cultural and socioeconomic identities. Covering 255,083 square kilometers—7.7 percent of India's total area (NEC 2000) —the region supports a population of just over 38 million people, or just about 4 percent of the country's population that exceeds a billion people (2001 Census). The population density of 151 persons per square kilometer is one of the lowest in the country. More than 85 percent of the northeast region's population lives in rural areas (Census of India 2001). However, there is a marked difference in the spatial distribution of the population among the constituent states; the more hospitable plains and valleys are much more populous than the difficult mountain regions.

The mountain areas are dominated by a number of indigenous tribal communities who have evolved their economic activities and resource management strategies to exist and exploit the steep topographies, and contend with the inaccessibility and isolation. The indigenous knowledge and practices generally emphasized low intensity resource use, compared to modern commercial lifestyles. But in recent years, increased accessibility and political and economic integration of the mountain communities have impacted the traditional lifestyles and cultures. Economic amalgamation has reduced the autonomy of the local communities, with the risk of marginalization because of their inability to compete with the formal markets and modernized economics of the rest of the country. Socially, the migrant-urban encounters, tourism and exposure to urban life have raised economic aspirations of the local hill communities, and new values and modes of behavior have penetrated traditional norms (ATREE 2003). These changing values, resource-use patterns and demographies will be of consequence to biodiversity conservation in the region. As the traditional sustainable resource-use practices and protectionist values—such as sacred forests—give way to market economy-influenced values, the threats to biodiversity will surely increase.

SYNOPSIS OF CURRENT THREATS

The world's highest mountain range has not been spared from the anthropogenic threats to biodiversity loss that pervade this planet. Historically, the human population densities in the region were relatively low, suppressed by disease, low productivity of the land, and inaccessibility. But in recent years, successful disease control programs, improved road access and other development have been followed by in-migrations that have increased the human populations and overwhelmed the traditional cultures and lifestyles by market economies and increased material aspirations. Since development and access is still variable across the region, the severity of threats and consequent rates of biodiversity loss is also variable, which has to be considered when assessing conservation opportunities and actions.

For instance, until the 1960s the highly productive Terai ecosystem in Nepal was rife with malaria and thus sparsely settled, except by the indigenous Tharu people. But since eradication programs significantly reduced the prevalence of malaria, there has been a massive influx of people into the Terai from the less productive hills, resulting in extensive clearing of forests and grasslands along the foothills and low valleys.

But in northeast India, the migration patterns are reversed. Since political and economic integration of the resource-rich northeastern hill states, there has been an in-migration of people from other parts of India into the natural resource-rich hills, with consequent marginalization of the tribal groups.

Other threats, such as grazing by domestic livestock are common across the different ecosystems. The lowland ecosystems are heavily grazed by large herds of cattle. In the Nepal Terai, free-grazed, "unproductive" cattle have essentially reduced forests to lawns with a few standing trees. The less productive and more inaccessible alpine meadows are becoming degraded because of intense grazing by increasingly larger herds of domestic yak. Although yaks have been grazed in these montane grasslands for centuries, the herds, usually owned by absentee owners, have increased in size. These sensitive ecosystems are placed under added stress by unsustainable harvesting of alpine plants for a lucrative traditional medicine trade. Chronic threats from non-timber forest product collection, cutting and lopping of trees in natural forests for fuel, fodder and timber for house building and agricultural implements also contribute to ecosystem degradation throughout the Himalayas, especially where the human population density is high. Thus, in places like the mid-hills of Nepal and the lowland forests across the Himalayas foothills, the biologically rich subtropical and temperate broadleaf forests have been widely cleared or, at the very least, highly fragmented. Large extents of intact subtropical and temperate forests still remain in Bhutan and northeastern India where human population densities are relatively lower, but changes in shifting cultivation regimes have resulted in more forests being cleared with inadequate fallow periods for regeneration, especially in the latter region.

Timber is widely sought for building. With the depletion of forests elsewhere in the region, the remaining forests in the mid-hills have become attractive commodities. The

demand, and economic rewards, has fuelled illegal logging practices in these forests. Because the majority of the remaining forests are on slopes too steep for well-managed, sanctioned forestry practices, the illegal timber harvest—or in some cases legal, but unsuitable practices—pose serious threats to the forests, environment and biodiversity, as well as the socioeconomic dimensions.

Unsustainable and illegal wildlife trade is another major threat in this region. The great demand for wildlife products, especially from the large charismatic species such as tigers, rhinoceros, snow leopards and elephants has driven these populations to the brink of extinction and they now require considerable protection to ensure long-term survival.

The unplanned growth of tourism in this exotic reach of the world has led to environmental and ecosystem deterioration. Despite the socioeconomic returns from tourism as an industry, unless regulated it can affect the ecological integrity and by extension, the industry itself which depends on a sound and attractive environment.

The unstable Himalayas slopes have always been prone to erosion. But the exposure of bare soil and reduced compactness because the ground cover is removed through logging, unsustainable non-timber forest product harvest, intense grazing by domestic livestock, and badly planned infrastructure, has resulted in erosion being more widespread. Consequently landslides are becoming more common with accompanying environmental degradation and economic, livelihood, and human losses.

A consequence of the widespread habitat loss and fragmentation is that the large, wide-ranging species are now virtually confined to remaining scattered habitat patches, mostly within the protected areas. But most of these refuges are small and unable to support ecologically and demographically viable populations over the long term. Therefore, the species are considered to be globally threatened and have been recognized as priority conservation outcomes.

While there is a tendency to be preoccupied with conservation of the larger, charismatic species and threats to these species, many other smaller species go unnoticed. Because large areas of the region are biologically unexplored, it is very likely that there are many species that are as yet unknown and unrecorded. Therefore, a focus on the ecological parameters for conservation of the larger species that require corridor outcomes for effective conservation can serve as umbrellas for many of the smaller species, including those that are, as yet undocumented.

The participants at the expert roundtables identified several of these major sources of threats and underlying causes of these threats across the region (Table 6). The resource documents that were commissioned provide additional information on the regional and local threats to biodiversity. Several of these threats are overarching, but there are others that are specific to certain areas. A more detailed exposition of the overarching threats with underlying causes based on the expert roundtables and resource documents is presented below.

Table 6. Major Threat Categories, Priority Outcomes Affected and Underlying Causes

Threat Category	Outcomes Affected	Underlying Causes
Habitat Loss, Degradation, and Fragmentation		
• Unsustainable fuelwood collection	Widespread in all corridor and most site outcomes. Significant issue in TAL, B2C2, KSL, NBL, KKA.	Lack of alternative energy sources for cooking and heating; high demand by large and increasing population; open borders encourage unregulated trade.
• Unsustainable NTFP extraction	Widespread in all corridor and several site outcomes. Significant issue in TAL, KSL, NBL, KKA.	Open borders encourage unregulated commercial trade for medicinal plants, plants of horticultural value; demand from large and increasing population; a form of livelihood for poor.
• Overgrazing by domestic livestock	Significant issue in TAL, KSL, B2C2, NBL, KKA, where yak are grazed in alpine meadows, and cattle and goats in lowland and mid-hill forests.	In Bhutan, the yak herds have exceeded the carrying capacity of the alpine meadows, even though grazing rights are customary; in Nepal and India large herds of unproductive cattle are free-grazed with little tending; cultural and traditional rights make regulation difficult; open borders make enforcement difficult; grazing lands limited because of demand for agricultural expansion.
• Encroachment	Significant in TAL, KSL, NBL, KKA corridor outcomes and in all isolated sites.	Poverty and in-migration drives encroachment into forest lands; in KSL unsanctioned tourism infrastructure development; in TAL and NBL people settled in forests for political gain (build vote banks), and insurgency prevents enforcement and encourages settlement in forest lands; in Namdapha forests converted to tea plantations and to settle refugees; in TAL land-grabbing by rich; in KKA encroachment for commercial and livelihood opportunities.
• Shifting cultivation	Widespread in northeast Indian States, and significant issue in KSL, NBL, KKA, corridor outcomes in the sites of northeastern India.	Traditional practice, now unsustainable because of increasing numbers practicing; lack of livelihood options; no clear land tenure policy; lack of technological awareness and resources for alternative practices; in Namdapha is practice for commercial opium cultivation.
Wildlife Killing		
• Commercial trade	A significant issue throughout the region. Is important for all corridor outcomes. Several species outcomes are particular targets—tiger, greater one-horned rhinoceros, elephant, snow leopard.	Open and porous borders; high demand of parts in traditional Chinese medicine and as trophies; poor enforcement, especially due to insurgencies in region; hunting driven by poverty and lucrative dividends; lack of awareness of global status and need for conservation.
• Customary, tradition, and subsistence	Especially relevant in northeastern India amongst the tribals. Identified as threats in NBL (especially in Arunachal Pradesh), KKA, and TAL corridor outcomes, and in sites in northeastern India and northern Nepal.	Traditions and customs among the indigenous tribals; food and medicine for local consumption; lack of awareness of global status of populations.
• Conflict and retaliation	All landscape outcomes and isolated site outcomes.	*Ad hoc* land clearing of intact habitat for settlement and agriculture; restricted and obstructed migration routes (as in NBL elephants) and access to food and water; intolerant attitudes by people (new

		settlers and migrants) unfamiliar with wildlife; accidental deaths of animals by vehicles and infrastructure.
Illegal Logging	Several corridor outcomes, including KSL, KKA, NBL, TAL, and larger forested sites.	Demand exists for construction etc., but legal markets fail to supply; open borders constrain regulation and enforcement; lack of alternative livelihoods.
Floods	Significant threats in NBL and KKA, especially for priority conservation outcomes such as the rhinoceros, tiger, elephant, and water buffalo that have to seek refuge on high grounds.	Loss of forest cover in catchment areas.
Pollution	Identified as significant threats in TAL, KKA, NBL	Wide use of agrochemicals; sewage and industry waste from improper discharge and disposal; tourism.
Infrastructure	Significant in TAL, NBL, and priority sites	Rapid population growth resulting in settlements, roads, and other infrastructure; large dams; no adherence to EIA guidelines and regulations.
Mining	Namdapha	Open cast mining.
Forest and Grassland Fires	Considered significant threats in montane and lowlands of TAL, B2C2.	Poor forest and fire management; fires set by herders and hunters to provide grazing; lack of awareness of consequences.
Insurgency	TAL, NBL, KKA, parts of B2C2, and several sites in northeast India.	Political and social unrest and dissatisfaction.
Lack of Information	Throughout the region	Lack of scientific exploration; lack of capacity; lack of data management and sharing.

Habitat Loss, Degradation, and Fragmentation

This emerged as a broad, overarching causal factor resulting in biodiversity loss. The underlying causes were identified as unsustainable levels of fuelwood and other non-timber forest product extraction; intense grazing by large herds of domestic livestock in forests, lowland grasslands, and alpine meadows; encroachment into forest lands by landless, migrants, and even 'land-grabbing' by rich people; and slash and burn agricultural practices, especially in hill areas.

Conversion of forests and grasslands to agriculture and settlements is most intense in Nepal, and in the Indian States of Sikkim, Darjeeling and Assam. The mountain areas of Bhutan, Arunachal Pradesh, Megalaya, and the other northeastern Indian states have not experienced as much conversion although, in general, shifting cultivation has been a widespread practice in northeast Indian hill states. The Bhutan Biological Conservation Complex is the least impacted by forest conversion from among the corridor outcomes, whereas the foothill landscapes, notably the Terai Arc and North Bank, are highly fragmented.

The northeastern Indian states have the highest forest cover in the country, but are also experiencing losses as high as 31,700 hectares of dense forests annually (Down to Earth 2002). Here, shifting cultivation was, and still remains, the main source of livelihood for most hill tribal communities. On average, 3,869 square kilometers is put under shifting

cultivation annually, and an estimated 443,336 households earn their livelihood from this practice. But, while in the past, a 10-30 year fallow period allowed for forest regeneration, the fallow period has now reduced to two years in some areas, making the practice unsustainable. As a result, the landscape has undergone tremendous changes, with extensive bamboo brakes that prevent succession to broadleaf forest. Because of uncertain land-tenure issues and usufruct rights, the incentives for maintaining the traditional sustainable practices are also disappearing.

Extensive grazing by domestic livestock is another pervasive source of biodiversity loss throughout the Eastern Himalayas Region, from the lowlands to the alpine areas. The species-rich alpine meadows, when overgrazed by large herds of domesticated yak, become dominated by a few species of unpalatable shrubs like *Berberis*, *Rosa*, *Caragana*, or forbs like *Euphorbia, Primula* and *Pedicularis*. Severe overgrazing creates bare patches that are susceptible to wind erosion, but a more common pattern is for the rangelands to be cropped into lawn-like grasslands. In the lowlands and mid-hills, the forests grazed by herds of cattle have lost all undergrowth, and no longer possess or support the natural ecosystems and associated biodiversity.

The biodiversity and ecological integrity of the alpine meadows, already subject to high grazing pressure, are also threatened by commercial collection of plants used in the traditional medicine trade. Some of these important plants include *Fritillaria cirrhosa*, *Sausuria* spp. and *Cordyceps sinensis*, the latter a species of caterpillar that becomes infected by a fungus and is highly prized by Chinese and Tibetans as a powerful tonic. Although some plants are collected for local use, large quantities are collected for export. Often entire plants are uprooted and removed even though only parts are used; thus regeneration and recovery is retarded (Lama *et al*. 2001). Despite efforts to regulate this trade, and in some instances to even prohibit it, the remoteness of the region, open borders in the north, and lack of human resources make enforcement of regulations difficult at best.

Lopping and pruning trees for fuelwood and fodder for livestock have inflicted severe damage on forests, including changes in species compositions. The lowland forests are more productive than the montane forests and can withstand greater levels of extraction, but the human populations exploiting the lowland forests are also much greater. Thus, forests with trees lacking branches and sans undergrowth are common sights throughout the mid-hills and lowlands of India and Nepal.

Wildlife Killing

Unsustainable poaching and hunting for commercial wildlife trade was identified as a major threat to several high priority species outcomes. The high demand for tiger and rhinoceros parts places these species under extreme threat. The rhinoceros has even been extirpated from important, high-profile protected areas such as Manas Tiger Reserve. Currently, even relatively well-protected parks such as Chitwan and Bardia national parks in Nepal are subject to frequent rhinoceros poaching. Similarly, tiger parts are highly prized in traditional East Asian medicines, and the open borders encourage poaching since the probability of apprehension is low while the economic returns are high.

Many of the tribal groups across the eastern Himalaya also practice traditional and customary forms of hunting, especially in the northeastern Indian states where animal pelts, feathers, and bird bills are used as adornments. Small projects are now underway to mitigate customary hunting of Endangered species; an example being the project to exchange beaks of Endangered hornbill species for models made of fiberglass.

Wildlife killing also takes place as a result of conflict with humans. Retaliation against tigers and snow leopards for livestock depredation, and against elephants and rhinoceros for crop depredation is prevalent and continue to intensify as humans and wildlife compete for land and other resources. The North Bank Landscape is a prime example of intense human-elephant conflict with fatalities on both sides brought about by extensive and *ad hoc* land clearing and encroachment of forestlands.

Because of the threats to wildlife from hunting, relevant authorities have imposed prohibitions. Yet, hunting and killing of wildlife continues. While subsistence hunting is largely restricted to the vicinity of settlements or travel routes, commercial hunting takes place in remote areas because of patrolling and policing close to travel routes (Rastogi 2000). The economic incentives from wildlife products are lucrative enough that poachers will suffer the hardships and risks of venturing far from easily accessible areas.

Illegal Logging

In Nepal, forestry contributes a significant amount to the GDP—up to 15 percent, according to Pudasaini (1993). Bhutan has pledged to maintain more than 60 percent of its forest cover, yet export timber to India and Bangladesh. And northeastern India has several Reserve Forests that are managed for timber. But the threat to biodiversity arises from large numbers of illegal, small-scale logging operations that continue to nibble away around the edges and from within the remaining forest patches. Some of the immediate anthropogenic threats from these logging operations include disturbance and loss of wildlife from the area, habitat degradation, which affects the habitat sensitive species, and hunting. But even more serious is that many of these illegal operations are extracting from slopes too steep to be logged in a sustainable, managed manner. The resulting erosion in steep slopes then triggers a cascading chain of consequential environmental problems which manifest far downslope and downstream from the sources.

Floods

High flood events were identified as significant threats in the North Bank and Kaziranga-Karbi Anlong landscapes. During high floods, Endangered species—the greater one-horned rhinoceros in particular—requires high-ground refuges. Since the Kaziranga-Karbi Anlong landscape in particular contains a significant proportion of the global population of greater one-horned rhinoceros, mitigation measures are necessary to provide flood refuges and access to high ground in the foothills to the south.

Pollution

Agrochemicals—fertilizers and pesticides in particular—were identified as significant threats to some globally threatened species. The decline of some large, Endangered birds

such as the vultures and adjutants have possibly been attributed to agrochemicals, although it is also likely that there are multiple causes acting in synergy.

Infrastructure

Infrastructure is an inevitable part of development. But development also poses inevitable threats to biodiversity, although the severity can be ameliorated with judicious planning, appropriate choice of sites, mitigation, and sound implementation methods and practices. Throughout the Eastern Himalayas Region, large dams and roads are considered to represent development priorities. These same priorities also represent significant sources of threats to biodiversity, and to the corridor outcomes in particular. Roads enable easier access and encourage settlements. Previously inaccessible areas become available for hunting and poaching. Road construction itself causes disturbance, destruction, and degradation of the habitat and biodiversity. Road networks fragment large, intact habitat blocks and disrupt the integrity of corridor outcomes.

In the eastern Himalayas the road network is most dense in the lowlands, where the human population is greatest, and road construction is easier. In the mid-hills regions, the network is relatively denser in Nepal than in Bhutan and the farthest northeastern Indian states.

Large dams built for hydroelectric power generation is another source of threats to biodiversity, especially for the corridor outcomes. In some respects the dams have a positive effect on the eastern Himalayas ecosystems since the availability of hydropower can ease some dependence on fuelwood. However, because of the rugged and difficult terrain, it is unlikely that electricity can be supplied in a cost-effective manner and with minimal environmental costs to all remote villages spread across the Himalayas Mountains. Thus, many people would still depend on fuelwood for energy, and in all likelihood the excess power would be diverted to large cities far from the region.

Dams also take up space. In Nepal, for instance, if all the proposed hydro-projects were actually built, more than 2,000 square kilometers of arable land would become submerged (Zurick and Karan 1999). The reservoirs usually submerge the fertile and arable valleys and displace the people into marginal lands, usually upslope. The generation of surplus energy drives industrial expansion in both surrounding mountainous lands as well as in the lower hills and plains. The seismic activity of the eastern Himalaya is such that a large earthquake could cause the dam to breach, wreaking havoc on the downstream watershed and communities in the densely settled lowlands. Moreover, building dams often require construction of new roads into previously inaccessible areas, opening the areas to settlement by outsiders who are likely to be more interested in higher levels of natural resource extraction than traditional and sustainable modes of existence.

The effect of dams on fisheries and fish ecology is also of concern. Although little is known about the seasonal migration patterns of aquatic species in the Himalayas rivers, there is evidence to suggest that some species of fish and the Gangetic River dolphin move upstream during the monsoon season. Preliminary research at the Kali Gandaki Dam suggests that the fish ladders—designed along the line of ladders built for salmon in

North America—do not work. Thus, alternative methods or techniques are required. Along the Karnali River, the dolphin population above the barrage in India is in decline. Dolphins from below the dam barrage cannot negotiate the dam to replenish the upriver population. The barrage also prevents fish migrations; thus, the prey base for the upriver dolphin population is also likely becoming depleted.

The Nepali government has included 18 dam projects in its Ninth Plan. Bhutan tends to favor small, run-of-the-river projects for local energy production, but there is a large 60 MW hydro project—Kurichu Hydro Project—currently under construction close to Thrumsing La National Park. The relevant state governments in northeastern India also look favorably on hydroelectric power development. Sikkim has the potential to produce 8,000 MW of power, but has tapped only 33 MW thus far. The Teesta and the Rangit rivers are recognized as having the most potential for project development. Currently, various micro, small, and medium-sized projects are under construction. Although micro projects cannot provide large amounts of energy for export that large dams would, they would provide electricity for rural villages. Thus, the optimal solution for these areas would be micro hydro plants in villages that can be built and cared for locally, which would also create less damage, and cost relatively little. Further east, the proposed Lower Subansiri hydroelectric project in Arunachal Pradesh with an installed capacity of 4520 MW will flood 4,039 ha of forestlands in Arunachal and Assam, including critical elephant corridors in the North Bank Landscape (Ecologist Asia 2003a). Because the economic interests of the State government officials and policy-makers overrule the ecological impacts, the environmental impact assessments and recommendations have become mere formalities that are often overlooked or ignored, rather than be considered for mitigation that can better inform the project plan. The impact of Loktak hydro scheme in Manipur, started in 1983 is now apparent with the absence of migratory water birds (because of higher water levels) and occurrences of flash floods (Ecologist Asia 2003b), and should serve as an example for development in the region.

Mining

Mining is generally quite destructive to habitats and biodiversity. The immediate area around mines can become converted to ecological wastelands as massive amounts of waste materials degrade surrounding land and water bodies, and huge landslides can result from blasting. Fortunately, because of inaccessibility to most deposits there is relatively little mineral extraction in the eastern Himalayas. However, as the road network expands, mining and its side effects could be much more pervasive.

In Nepal, low-grade iron ore, scattered copper deposits, zinc, limestone are mined in some places (Zurick and Karan 1999). Bhutan has significant deposits of dolomite coal, limestone, and gypsum but extraction is currently negligible. In Sikkim, the Rangpo Copper Mine has potential for further development. Open cast mining and oil exploration are, however, major threats in the other northeastern states of India (Goswami 2000), where deforestation, soil erosion and air and water pollution (pH value as low as 2.7) are obvious manifestations.

Forest and Grassland Fires

Fires are lit in the forests to burn the understory and open the forest for easier access and induce a flush of vegetation for livestock. But these fires sometimes spread out of control, burning up into the subalpine zone. Thus, forest fires were identified as a major threat in Bhutan and in the Terai Arc Landscape.

The current use of fire as a management tool in protected areas can also be a threat to some species outcomes. Many of the grasslands in protected areas are maintained by annual burning to provide suitable habitat for large ungulates, especially for rhinoceros and wild water buffalo. However, this management regime is detrimental to smaller, grassland habitat specialists such as the hispid hare, pygmy hog and several grassland birds, which are also Critically Endangered and require conservation management. Thus, the use of fire in these protected areas should be reviewed and appropriate measures taken to use it more judiciously, with due consideration for overall biodiversity characteristics of the grassland communities, rather than a few select species. This is especially important in the sites and corridors identified as outcomes in the Terai and Duar savannas and grasslands.

Lack of Information

Poor baseline data and unreliable scientific information are serious impediments to designing appropriate strategies and policies for biodiversity conservation and management in the region. Inadequate species inventories and distribution records, poor documentation of information, and absence of trained manpower to undertake scientific and analytical studies have retarded progress in conservation. In the absence of reliable data, unintentional habitat destruction may have occurred in the context of siting development projects, and even when designing and managing protected areas and conservation landscapes. Even the development of this profile has been hampered by lack of information on the distribution and status of most species, and much of the eastern Himalayas are biologically unknown. Thus, even these priorities are based on limited knowledge.

Insurgency

Political unrest manifested as insurgencies plague the region. Protected areas and forests that harbor wildlife also serve as refuges for insurgents, who indulge in indiscriminate poaching and felling of trees. Effective patrolling and protection in these refuges by protected area staff is then made difficult at best and impossible, usually. Manas National Park in Bhutan and Manas Tiger Reserve in India, where the rhinoceros population has been extirpated and the tiger population severely depleted, are good examples of the threat to biodiversity and conservation efforts caused by insurgencies. Outside protected areas, large tracts of plantation forests throughout the state of Tripura are being destroyed in the absence of Forest Department staff or Joint Forest Management committees due to the insurgency. Similar insurgencies occur in Nagaland. And in Nepal, the Maoist insurgency has severely constrained conservation activities on the ground.

SYNOPSIS OF CURRENT INVESTMENTS

Investments in biodiversity conservation in the Eastern Himalayas Region come from the

national governments, bilateral and multilateral agencies, and international and regional NGOs. Below, we summarize the major funding sources and projects in the region. The summary does not represent an exhaustive list, but is only meant to act as a guide in determining funding gaps and opportunities for complementary investment by CEPF.

In Nepal, the Terai Arc Landscape receives funding from several bilateral and multilateral donors. One of the largest investments is the $12.8 million GEF Nepal Biodiversity Landscape Project to be implemented from 2004-2011 for landscape conservation in the western complex of the Terai Arc Landscape within Nepal. The government's contribution to this project will be $3.7 million, while $9.1 million will be sought from UNDP/GEF, WWF, the Netherlands Development Organization (SNV) and GEF. The British Aid Agency (DFID) will implement the 10-year, GBP 8.2 million Livelihoods and Forestry Program in three Terai districts and 11 other hill districts. The three districts in the Terai and one hill district (Dang) are within the Terai Arc Landscape. The program's focus is to increase benefits to the poor by assisting them move from passive to active community forest management. The program also seeks to move government and donors involved in forestry toward a sector-wide approach including supporting policy developments. USAID will invest $8.7 million between 2002-2006 to improve local control over conservation, management, and sustainable natural resource use, and to increase advocacy capacity of selected civil society organizations. From 2001-2006, SNV will invest $2.2 million under the BISEP project for forest management in the inner Terai and Siwalik Hills for biodiversity conservation and equitable economic development. SNV, KFW (German Bank) and HMG Biogas Support Program will fund 200,000 biogas plants between 2003 and 2010. Since 1997, Action Aid/DiFD has been implementing a 1.5 million GBP project to eradicate poverty through community empowerment of the poorest and most marginalized sectors by enhancing their capacities to have access and control resources, advocating in their favor, and strengthening local government involvement in poverty alleviation. The Save The Tiger Fund has invested more than $1 million in tiger conservation the Terai Arc Landscape. WWF Nepal has committed $800,000 per year over the next five years under the Critical Area Restoration Project (CARP) to restore degraded corridors. A comprehensive strategic plan is being prepared for the Terai Arc that may show large gaps in real biodiversity conservation.

In the Kanchenjunga-Singalila Complex, the secured and anticipated budget for three years is roughly $500,000. Most of the secured funds are from the MacArthur Foundation. The Kangchenjunga Conservation Area Project has more than $20,000 from WWF-UK mostly on a snow leopard project and another $20,000 is expected from the ADB to develop ecotourism within the conservation area. The Kadoorie microhydro project is expected to receive about $75,000 in funding.

In Bhutan, several bilateral donors have been investing in conservation of the Bhutan Biological Conservation Complex. Between 1998 and 2003, the government of Denmark (DANIDA) invested $13.3 million in capacity building and training to establish an institutional framework of professionals to carry out environmental management and awareness. The European Union ($13.8 million for watershed management in western Bhutan, Germany/GTZ ($5.6 million), Helvetas/SDC ($3 million) and Canada/IDRC

($238,000) have been supporting projects to promote sustainable natural resource use and improve livelihoods of rural people. SNV has also been supporting protected areas management and community development, the latter with a $2.1 million investment, with $125,000 support for protected areas management. The Dutch government has also allocated $12 million over five years to establish an *ex-situ* plant conservation facility and information database. Since 1995, the Save The Tiger Fund has provided roughly $150,000 for tiger conservation within the Bhutan Biological Conservation Complex. Since 1998, the Bhutan Trust Fund for Environmental Conservation has invested $4.3 million in capacity building within the nature conservation and forestry sector through overseas and in-country training; staff recruitment to government institutions; management of protected areas, forests, and wildlife; and environmental education. Within the NGO sector, WWF has, and is supporting various activities such as anti-poaching, environmental education, database and information, capacity building, and protected areas management with an ongoing investment that has now exceeded $1.6 million. Much of this represents complementary support to large projects. However, WWF has also made significant investments through non-monetary support to the Nature Conservation Division in conservation and by promoting the creation of the Bhutan Biological Conservation Complex. There are also several GEF-funded projects in Bhutan implemented by UNDP.

Detailed investment portfolios are difficult to obtain from the northeast India states. Many small national NGOs cannot receive funds directly from foreign organizations, and central government and state funds are entrenched within a complex bureaucracy. Within the NGO sector, there are a few larger organizations that serve as overall coordinators for smaller grassroots projects. These NGOs are able to serve as 'nodes' to receive foreign exchange grants, and disburse grants to support work by the numerous grassroots NGOs and CBOs.

Aaranyak is one of these nodal NGOs that have supported a range of projects, from education and outreach to research, surveys, and *ex-situ* conservation of Endangered species, to legal, advocacy issues and community-based conservation with investments ranging from $500 to $35,000. Aaranyak implemented these projects through collaborations with a number of grassroots NGOs such as Green Guard, Nature's Foster, Green Heart Nature Club, Green Forest Conservation and New Horizon, and with larger regional institutions such as CEE and the Bombay Natural History Society. Several of these projects address conservation of priority species outcomes (greater one-horned rhinoceros, Asian elephant, golden langur, pygmy hog, adjutants and dark-rumped swift) and site outcomes (Manas National Park, Namdapha National Park, Kaziranga National Park), which are within the priority corridor outcomes in the northeast region of India. Financial support for these projects has come from a variety of organizations, such as the International Centre for Conservation Education, U.K., Primate Conservation Inc., Conservation International, The American Society of Primatology, Community Conservation Inc., USA, the David Shepherd Wildlife Foundation and the U.S. Fish and Wildlife Service.

CEE administers a UNDP small grant program on environmental protection in the eight northeastern states. Currently there are 11 ongoing projects in the region. Over the last two years, WWF has invested about $70,000 to initiate conservation activities in the North Bank landscape with a focus on elephants, and will spend $120,000 this year. WWF offices in Guwahati (Assam), Ithanagar (Arunachal Pradesh), Sikkim and Darjeeling (W. Bengal) implement many small projects with local NGOs and CBOs. The MacArthur Foundation has supported projects in the northeast Indian states of Sikkim and Arunachal Pradesh through various NGOs, as well as in Nepal and Bhutan (2002 to 2004, $2.5 million). Among the bilateral donors, the India-Canada Environment Facility (ICEF) has funded several projects that focus on developing natural resources and improving environmental management capacity within the government and NGO/CBO sector to address natural resource, water, and energy issues. Some of the projects funded by ICEF include: the Nagaland Environment Protection and Economic Development Project to regulate and improve productivity in traditional *jhum* by Naga farmers; a project to empower Village Development Boards to support and promote development through agro-forestry in Nagaland; to restore the ecology of Loktak Lake (a priority site outcome); and education and capacity building to promote nature conservation and environment among students and teachers in Arunachal Pradesh. The International Fund for Agriculture Development is implementing a FAO-funded project in six upland districts of Manipur, Assam, and Meghalaya to enable community institutions and self-help groups to manage natural resources. The project sites include the Kaziranga-Karbi-Anlong Landscape.

CEPF NICHE FOR INVESTMENT

During stakeholder consultations when compiling this ecosystem profile and from previous expert consultations when developing a biodiversity vision for the eastern Himalayas ecoregion complex, the regional experts emphasized the need for: a) large-scale conservation for saving the region's megafauna and representative ecosystems; b) conservation efforts that transcend protected areas boundaries; c) innovative public-private alliances and partnerships for conservation and; d) the participation of local people in natural resource management.

CEPF's geographic focus for investments should be the 60 priority site outcomes and the corridor outcomes in the five priority landscapes (Figure 4, Table 5), which capture important populations of all the priority species (Table 4). While the 24 priority sites outside of the priority corridors (Table 5) capture species outcomes that can be conserved within sites, the landscapes are necessary to conserve the region's wide-ranging megafauna. Landscape conservation requires maintaining landscape matrices that are compatible with conservation objectives. Most of these matrices and unprotected sites are—or were—managed under traditional systems that are now being eroded by external economic forces, introduction of new technology that can undermine the emphasis traditional systems placed on biodiversity and unsustainable use of land in attempts to increase productivity or support larger, denser human populations. Thus, CEPF should take up the challenge of building strategic alliances and coalitions among civil society groups to enable them to address key conservation issues in landscape conservation and seize opportunities for conservation presented by major national policy changes in favor

of biodiversity.

CEPF resources are will be make the greatest incremental impact in the Bhutan Biological Conservation Complex, the Kangchenjunga-Singalila Complex, and the North Bank Landscape. These three corridors have traditionally received less funding for conservation than the Terai Arc and Kaziranga-Karbi Anlong Landscape. While all five priority corridors are eligible for CEPF support and are important for global significant biodiversity, particular emphasis will be placed on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape. CEPF support in the Terai Arc and Kaziranga-Karbi Anlong Landscape will be used for very targeted and strategic activities that leverages, maximizes and complements the existing funding already going to these landscapes. CEPF will therefore invest the majority of its resources for the Eastern Himalayas toward building momentum in the lesser-funded landscapes in the region.

National governments, bilateral and multilateral aid agencies, and several international organizations are already infusing substantial financial support to environment-related programs in the priority landscapes. But, as evident from the current investment analysis, many of these focus on natural resource management and lack adequate biodiversity conservation components. Thus, even with the relatively modest funds available, CEPF has a good opportunity to leverage matching funds and catalyze larger conservation programs. By collaborating with larger initiatives in the region, CEPF can provide momentum for a long-term regional conservation initiative in the eastern Himalayas.

CEPF should also seek to build partnership approaches with grassroots NGOs capable of conducting species-specific conservation actions (e.g., Green Guards, Green Manas).

Therefore, CEPF's niche in the region should be to:

- influence and add synergy to existing biodiversity conservation programs through civil society;
- complement and leverage funds where large development projects do not directly address biodiversity conservation or where the investments are inadequate; and
- support and strengthen civil society's role in conservation, especially in species-specific actions and in influencing biodiversity policies.

CEPF INVESTMENT STRATEGY AND PROGRAM FOCUS

Program Focus

The CEPF program focus in the Eastern Himalayas Region is based on a subset of biogeographical priorities for biodiversity conservation—species, site and corridor outcomes—that are considered priorities for CEPF investment; an urgency to abate threats to biodiversity; socioeconomic realities; institutional capacity of civil society in the region; and an assessment of current investments, funding gaps and opportunities in the region.

Government institutions and civil society are active in conservation in the region, but often lack coordinated action and capacity to implement biodiversity programs. CEPF can build on existing programs to strengthen the role of communities in biodiversity conservation. This includes empowering local and national NGOs and local communities to participate in natural resource management and to promote customary and usufruct rights to land managed under traditional, sustainable regimes that support important biodiversity. Civil society can play an active role in restoring degraded corridors with such traditional and contemporary land management to link existing protected areas and create reserve networks.

Although protected areas are the cornerstones of biodiversity conservation, the current investments for protection and species management have been meager, relative to investments in community development in buffer zones and other areas within corridor outcomes. CEPF can strengthen protected areas in priority landscapes by supporting these sites. CEPF can also support field research and biological surveys through civil society—preferably through civil society-government partnerships—to enable more effective conservation planning and decisionmaking.

Strategic Directions

Four strategic directions and associated investment priorities were identified for CEPF investment based on the consultations during expert roundtable consultations, other discussions with civil society and governmental stakeholders, and from background research commissioned through consultants (Table 7). The strategic directions are underlain by scientific principles of conservation biology, especially with ecological and demographic needs that warrant landscape-scale approaches to conservation of priority, wide-ranging species in the region.

Table 7. Strategic Directions and Investment Priorities for CEPF in the Eastern Himalayas Region

CEPF Strategic Directions	Investment Priorities
1. Build on existing landscape conservation initiatives to maintain and restore connectivity and to protect wide-ranging threatened species in priority corridors with a particular emphasis on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape.	1.1. Identify important habitat linkages between site outcomes in the priority corridors. 1.2. Engage civil society in developing and implementing management plans for key habitat linkages. 1.3. Support targeted conservation education and awareness programs among communities, schools, journalists and decisionmakers in priority corridors. 1.4. Promote forest management practices that benefit biodiversity conservation in the priority corridors.
2. Secure the conservation of priority site outcomes (key biodiversity areas) in the eastern Himalayas with a particular emphasis on the Bhutan Biological Conservation Complex,	2.1. Support targeted efforts to manage, protect and monitor site outcomes (key biodiversity areas). 2.2. Provide incremental support to effective, ongoing alternative livelihood projects with local communities that ease threats to and enhance conservation of priority sites. 2.3. Support traditional land- and resource-use practices in

Kangchenjunga-Singalila Complex, and North Bank Landscape.	projects that will ensure effective conservation of priority sites.
3. Leverage partnerships among donor agencies, civil society and government institutions to achieve priority biodiversity conservation outcomes over the long term.	3.1. Strengthen and support government and civil society partnerships that result in new funding for achieving conservation outcomes in the eastern Himalayas. 3.2. Support training programs to protect, manage and monitor species, sites and corridor outcomes. 3.3. Develop and strengthen capacity among grassroots civil society organizations to manage, monitor, and mitigate threats to biodiversity. 3.4. Support transboundary initiatives for conservation of wide-ranging species that require collaboration across international borders.
4. Develop a small grants program to safeguard globally threatened species in the eastern Himalayas.	4.1. Support targeted, high-impact projects to conserve Critically Endangered and endemic species. 4.2. Support action-oriented research to enable or improve the conservation of priority species outcomes. 4.3. Implement a monitoring program for priority species outcomes. 4.4. Support conservation assessments of lesser-known taxonomic groups (plants, invertebrates, fish) for inclusion into the IUCN Red List.

1. Build on existing landscape conservation initiatives to maintain and restore connectivity and to protect wide-ranging threatened species in priority corridors with a particular emphasis on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape.

The Eastern Himalayas Region contains globally important populations of several landscape species, such as the tiger, Asian elephant, snow leopard, clouded leopard, greater one-horned rhinoceros, and takin as well as large birds such as vultures, hornbills, and adjutants. These species cannot be contained and conserved within the bounds of small, isolated protected areas; instead their best chance for long-term survival is through a metapopulation conservation strategy where dispersal and migration routes link core populations within protected areas. Several smaller birds that undertake altitudinal migrations also cannot be effectively conserved within small sites. These migrations and dispersal events, together with the hydrologic regimes represent important ecological processes that depend on habitat connectivity.

Creating, restoring, and conserving landscapes by linking the core protected areas, or site outcomes, within the larger corridors to allow dispersal and migration of focal species will require involvement of civil society since many areas within the corridors are used or owned by civil society groups. CEPF will support civil society to focus their work for the Eastern Himalayas toward building momentum in the lesser-funded landscapes such as North Bank, Kanchenjunga –Singalila, and Bhutan biological corridors in the region.

1.1. Identify important habitat linkages between site outcomes in four of the priority corridors

The priority corridors for the Terai Arc Landscape have been identified, but the corridor outcomes for all other landscapes represent initial assessments and approximations based

on expert opinions and cursory examination of remotely sensed data. GIS analyses coupled with field surveys and ground verification is now necessary to better define and delineate these corridors and their suitability as dispersal and migration routes for the priority landscape species in the North Bank, Kaziranga-Karbi Anlong, and Kangchenjunga-Singalila landscapes. These and the Bhutan Biological Corridor Complex also require further analyses and definition of the corridors using more recent remote-sensed data to establish a baseline for monitoring and restoration of critical degraded linkages. These analyses will provide the scientific basis for the configuration of the corridor outcomes, and should be done within the next three years since habitat loss and fragmentation is rapid, especially in the northeast Indian states.

1.2. Engage civil society in developing and implementing management plans for key habitat linkages

Throughout the Eastern Himalayas Region, traditional village-level and other community-level institutions have played dominant roles in protecting community resources. Even today, most local communities are heavily dependent on forest products, natural resources, and ecological services for their livelihoods and for daily subsistence. In many areas, although local people have used the land and resources for generations, national laws do not usufruct rights; thus land tenure is undefined and the rights are uncertain. As resource demands grow and these communities become more integrated socially and politically, the laws of the land begin to have more influence than the traditional rights and customs. The assimilation into the broader socioeconomic and political framework causes a disintegration of the traditional sustainable management and harvest regimes, especially if the traditional rights and sense of ownership are perceived as being at risk. This is especially true in some of the northeastern Indian states, notably Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Tripura, and Nagaland, and in the Nepal Terai, where the local people and communities have had traditional rights over forestlands for generations.

The corridor outcomes and several sites will, in most cases, consist of lands under community forestry, joint forest management, agroforestry, leasehold forestry, plantations, and other traditional land-use regimes that are managed or owned by civil society groups. An important strategic direction for CEPF would be to support and strengthen the traditions of local communities and CBOs in conservation, especially within the context of landscape conservation.

Thus, CEPF should support civil society to facilitate and conduct conservation initiatives in the landscape matrices by managing land and adopting land-use practices that are compatible with conservation objectives. This could galvanize other funding agencies to adopt holistic approaches to biodiversity conservation. CEPF funding to civil society is also likely to leverage large support from larger bilateral and multilateral partners as exemplified in the Terai Arc.

1.3. Support targeted conservation education and awareness programs among communities, schools, journalists and decisionmakers in priority corridors

An awareness campaign to highlight the need to conserve biodiversity in traditional and

community lands in the face of increasing anthropogenic threats can help to bring about a renewed cognizance of the consequences of unsustainable harvests and extraction levels. Informed civil society advocacy groups can also advocate for changes in policy, against detrimental projects, unsuitable land use and land acquired illegally by outside interests. Thus, CEPF can support local capacity building to train environmental journalists and to form community-based groups, community ecoclubs, and nature clubs in schools to educate others and raise awareness. All priority corridors and site outcomes within priority corridors should be eligible for funding.

Some existing and planned investments by other donors, especially in Nepal, include building capacity of civil society to participate in decisionmaking about community rights and access to management of natural resources. Although information on the extent of similar investment in northeastern India is unavailable, it is likely that some may be present. Regardless, CEPF's niche should be to raise awareness about and the ability to participate in biodiversity conservation for economic and ecological service-related benefits as well as ethical and stewardship reasons. The latter is an important cultural and religious component of the tribal people in the region who still comprise the majority of the population in the hill states.

1.4 Promote forest management practices that benefit biodiversity conservation in the priority corridors

The well-managed forest patches under community ownership in northeast India are testimony to the success of community initiatives in forest management conceived by the indigenous societies and have evolved through ages of practice. These viable systems include the sacred forests and groves of Meghalaya and Manipur, the village safety and supply reserves in Mizoram and Tripura and in the community-held forests of Arunachal Pradesh. Unfortunately, however, the protection these forests have enjoyed for centuries is being eroded by increased demand for resources; perceived loss of traditional rights; cultural, economic and political integration; and in-migration and settlement by outsiders.

In Nepal, community forestry is of relatively more recent origin. But the economic benefits that accrue to the local communities has established the practice as a favorable land management regime by local communities, and recognized by state laws. Community forestry is also a management tool that can help to conserve biodiversity, especially in the buffer zones of protected areas and corridors. Thus, appropriate policy changes that recognize usufruct rights can ensure continued conservation of land held and managed under traditional rights. Precedence for this has already been established in Arunachal Pradesh, where the government and the land-owning tribes of Arunachal Pradesh jointly manage the forest resources under the Arunachal Pradesh Anchal Forest Reserve (Constitution and Maintenance) Act in 1975 that provides for revenue sharing between the government and Anchal Samitis.

CEPF can empower local communities by supporting development and implementation of conservation plans based on traditional and cultural conservation practices in the priority landscape and site outcomes. The North Bank Landscape, Kanchenjunga-Singalila Complex, and sites in northeast India are some of the outcomes where

traditional forestry practices can enhance biodiversity conservation. In the Terai Arc Landscape, Bhutan Biological Conservation Complex and the sites in Nepal outside landscapes, contemporary practices such as community forestry are viable options.

2. Secure conservation of priority site outcomes (key biodiversity areas) in the eastern Himalayas with a particular emphasis on sites in the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape.

The Eastern Himalayas Region contains globally important sites supporting globally threatened species that only occur in those sites, or are one of few sites that are *known* to contain globally important populations of such species. For instance, Namdapha National Park in Arunachal Pradesh is the only site in the world known to support Namdapha flying squirrel and one of only two sites known to support the snowy-throated babbler, or Orang, which is the only site from where the Orang sticky frog has been recorded. World Heritage sites such as Kaziranga, Manas and Chitwan national parks harbor globally important populations of the greater one-horned rhinoceros, tigers, pygmy hog and several globally threatened birds. The populations of these species represent important core populations from which to increase the global populations through translocations or by providing additional habitat through landscape conservation to either augment smaller populations or establish founder populations. These key sites have to be secured through appropriate conservation and protection measures.

2.1. Support targeted efforts to manage, protect and monitor key biodiversity areas (site outcomes)

Protected areas play a critical role in *in situ* conservation and represent the core areas of larger, landscape-scale conservation initiatives. If core populations of Endangered species cannot be effectively protected within such sites, their future will not be assured. Since an important conservation goal for CEPF is to assure the future of these species outcomes, support for better management and protection of these site outcomes that represent core habitat and refuges should be a priority.

Many protected areas are managed by government institutions, which are usually under-resourced and understaffed. Consequently, they lack effective management mechanisms. Non-protected key sites (e.g., Ada Lake, Teesta-Rangit Valley, Siroi, Rongrengiri, Siju Caves, Jatinga) should be managed to conserve and protect the globally threatened species they harbor, either by empowering and engaging local communities, declaring them as protected areas and thus placing the management onus on the responsible government institutions, or an arrangement where both government and local communities manage the sites jointly.

CEPF should support partnerships and institutional mechanisms that will help to develop an adequately trained cadre in government sectors as well as stakeholders within civil society who are directly involved in natural resources management in key sites. Support for training will enhance capacity of a staff capable of multi-tasked jobs such as anti-poaching, social forestry, park management and protection, field research and community motivation.

2.2. Provide incremental support to effective, ongoing alternative livelihood projects with local communities that ease threats to and enhance conservation of priority sites

Despite the sustainable nature of traditional natural resource management practices, the rising population levels inevitably lead to increasing resource use and extraction rates. Eventually the extraction rates will exceed the sustainable use thresholds. Both in the hills and lowlands—whether in forests or grassland meadows—the sizes of domestic livestock herds have grown considerably over the past few decades. As a result habitat degradation has become widespread. Alpine meadows rich in plant diversity are becoming eroded, with consequences ranging from loss of biodiversity to landslides. Forests have lost all undergrowth and capacity to regenerate. Extraction of fuelwood, timber, medicinal plants and other forest products from these stressed ecosystems will inevitably lead to their collapse as functioning, natural communities. Since human communities also depend on these forests, the socioeconomic consequences are also obvious. Several donors are already investing in promoting alternative livelihoods among communities in the region. CEPF's focus should be to promote alternatives that can ease pressure on natural systems, but with direct economic links to conservation of biodiversity, such as ecotourism, horticulture, and other cottage industries that utilize materials harvested from forests and depend on the well being of the forests and other ecosystems. Support can take the form of complementing and coordinating with current investments. Filling this niche will ensure the explicit link between these alternative livelihoods and conservation, which other donors often under-emphasize.

All the sites identified as site outcomes are potential candidates for CEPF investment.

2.3. Support traditional land- and resource-use practices in projects that will ensure effective conservation of priority sites

Throughout the Eastern Himalayas Region, traditional village-level and other community-level institutions have played dominant roles in protecting community resources. Even today, most local communities are heavily dependent on forest products, natural resources and ecological services for their livelihoods and for daily subsistence. But in many areas the laws of the land have begun to gain authority over traditional rights and customs and traditional usufruct and land tenure rights have become uncertain, even though the local people have been using the land and resources for generations. The assimilation into the broader socioeconomic and political framework has also begun a disintegration of the traditional sustainable management and harvest regimes, especially if the traditional rights and sense of ownership are perceived as being at risk. This is especially true in some of the northeastern Indian states, notably Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Tripura, and Nagaland, and in the Nepal Terai, where the local people and communities have had traditional rights over forestlands for generations.

The sites outcomes under traditional use regimes and land tenure, community forestry, joint forest management, agroforestry, leasehold forestry, plantations and other regimes that are managed or owned by civil society groups should be targets for CEPF investment. Funds can be provided to strengthen and even resurrect or revive the

traditions of local communities and CBOs in conservation, especially within the context of site and corridor conservation.

3. Leverage partnerships among donor agencies, civil society and government institutions to achieve biodiversity conservation outcomes over the long term

The conservation outcomes analysis showed that a large number of important species and sites fall outside of protected areas. Many species also require a landscape approach for effective conservation. Local communities directly or indirectly manage these unprotected sites and corridors. Thus, there is a need to build capacity within local, grassroots-level communities to manage natural resources at levels that can sustain biodiversity and enable conservation, while also providing livelihoods. But in doing so, there is also a need to build capacity within communities and government institutions to monitor and assess threats and unsustainable harvest or extraction levels. Effective conservation outside protected areas, and especially at landscape scales, requires much greater collaboration among a diverse group of partners and stakeholders, with a good understanding of common conservation objectives. Many civil society organizations and government agencies lack financial, technical, and institutional capacity to co-manage high biodiversity areas outside formally protected areas; thus presenting a great opportunity for CEPF to support development of partnerships and local stewardship of these areas. CEPF can also leverage funds from other, larger projects to implement mitigation and conservation measures. In a bid to strengthen and catalyze synergies between government agencies and community groups, CEPF can support joint measures to prevent poaching, illegal logging, and unsustainable or illegal trade in wildlife and timber.

3.1 Strengthen and support government and civil society partnerships that result in new funding for achieving conservation outcomes in the eastern Himalayas

Effective conservation of priority species and management of corridors require collaboration between communities and government institutions. For example, poaching, illegal timber extraction, medicinal plant harvest, and related trade have been identified as important, overarching issues that threaten biodiversity in the region. Often these activities are carried out or sponsored by interests outside the local communities. And often government departments are unable to implement effective policing systems because of a lack of resources and intelligence networks. Supporting joint community and government anti-poaching and informant networks was considered to be an important contribution CEPF could make. The collaborative efforts will also result in new funding (CEPF funds can leverage larger funds from both government and nongovernmental donors) as well as closer ties between government and civil society organizations.

All priority corridor and site outcomes are eligible. The sites and corridors that harbor important populations of Endangered species such as the tiger, Asian elephant, greater one-horned rhinoceros, snow leopard and turtles are especially important in this regard. Support to civil society to develop partnership plans with donors and government in managing landscape level programs are worth considering. The transboundary corridor outcomes are also more Vulnerable to poaching and illegal logging because the international boundaries provide refuges from national-level policing, and entry points to poachers.

3.2. Support training programs to protect, manage and monitor species, sites and corridor outcomes

CEPF can support development of capacity within CBOs to assess and inventory biodiversity in their traditional and customary forests areas and community forests and to develop monitoring protocols to identify degradation from unsustainable extraction levels and external threats.

CEPF should also support development of an adequately trained cadre in government sectors as well as stakeholders within civil society who are directly involved in natural resources management in all site and corridor outcomes. Such training support will enhance capacity of staff who are capable of multi-tasked jobs such as anti-poaching, social forestry, park management and protection, field research and community motivation.

3.3. Develop and strengthen capacity among grassroots civil society organizations to manage, monitor and mitigate threats to biodiversity

CEPF can also build capacity within civil society groups to advocate for and participate in effective local and central-level policymaking to mitigate threats—a logical follow-up step to the monitoring and assessment capacity building within civil society groups. In the Nepal Terai and the northeastern Indian hill states, land is frequently lost to outside interests. As a result the traditional users of these lands become marginalized and begin to use smaller, less productive areas of land more intensively with little thought for the environmental costs and long-term consequences. Informed advocacy from the grassroots level can often help to prevent such land grabbing, and the local communities are in the best positions to become effective watchdogs.

The corridor and site outcomes in Nepal and northeastern India are candidates for such interventions and CEPF support. CEPF can support development of capacity within the CBOs to assess and inventory biodiversity in their traditional and customary forests areas and community forests; develop monitoring protocols to identify degradation from unsustainable extraction levels and external threats; and contribute to more effective laws, legislation and regulations.

3.4. Support transboundary initiatives for conservation of landscapes that extend across international borders

Three priority corridors for CEPF investment—Terai Arc Landscape, Bhutan Biological Conservation Complex, and Kangchenjunga-Singalila-Kangchenjunga Landscape—extend across international boundaries. The movements of species in these corridors transcend these political boundaries, exposing them to different levels of risk from poaching, retaliation due to conflict, and land conversion and land-use regimes, because threat intensities can differ across boundaries. Ecological processes such as hydrological regimes are also dependent on cross-border conservation initiatives; for instance, flows in the Manas and Karnali rivers that flow south into India would depend on land use, dams and other river manipulations in Bhutan and Nepal. Similarly, dams and other hydrological projects in India will affect fish migrations and the survival of species such as the Gangetic River dolphin in Nepal. Poachers are also said to cross international

boundaries within transboundary reserve complexes. Thus, effective management of these landscapes will require cooperation and coordination between countries.

CEPF can support dialog between the countries at the central, district, village and departmental levels through civil society mediators and facilitators. CEPF can also support activities that help to coordinate and mitigate threats to biodiversity, such as controlling cross-border incursions for poaching and logging, identifying and eliminating international trade routes, alleviating detrimental land use and habitat conversion practices across borders to maintain corridor integrity. In addition, CEPF can support international conferences for civil society and government to discuss conservation issues that relate to transboundary conservation of key species outcomes; exchanges between park managers, universities and institutions; and joint surveys and research.

4. Develop a small grants program to safeguard globally threatened species in the eastern Himalayas

Large areas of the eastern Himalayas are still biologically unexplored, and the full extent of biodiversity remains unknown. Effective conservation of even the largest and most obvious species, the Asian elephant, is hindered by lack of reliable information about its ranging behavior, while population declines of species such as vultures and adjutants require further investigations to determine causes.

There are a few success stories in conservation from the region that are worth noting, however, such as the protection and translocations of the rhinoceros to increase the existing populations and establish additional founder populations. In addition, a captive-breeding program for the pygmy hog has created a temporary refuge for this Critically Endangered species.

CEPF can help to conserve these priority species outcomes through select small grants to support recovery programs and other strategic activities implemented by civil society to add to the successes.

4.1. Support targeted high-impact projects to conserve Critically Endangered species

There are several NGOs and CBOs in the region that are engaged in captive breeding and species recovery programs of Endangered species. These programs contribute significantly to conservation of species outcomes, and can benefit from CEPF funding. All priority species outcomes should be eligible.

4.2. Support action-oriented research to enable or improve the conservation of priority species

Successful conservation of species depends on good, reliable information about their ecology, behavior and demographics, especially for specialist species that require specific conservation actions. CEPF can support required research and specific conservation actions such as controlling illegal trade of Endangered species conducted by civil society organizations, identifying priority populations for conservation and spatial area needs for wide-ranging species.

Many priority sites and corridors have had very little biological exploration, surveys and inventories. Thus, the current assessment is based on a limited taxonomic scope, and even within this limited group, the population status and reliable distributions of several species are unknown. CEPF can support civil society groups to conduct biological surveys and inventories to fill the information void and to develop databases that will be available for conservation across the region. All corridor and site outcomes should be priorities for biological surveys.

The priority species, especially the landscape species, should be priorities for information on ranging patterns to better define the corridor outcomes and to determine spatial requirements for viable populations. Research should also be conducted on the effects of habitat fragmentation on migratory behavior of birds that undertake seasonal altitudinal migrations, and on the distribution and status of indicators species, such as the amphibians. The aquatic biodiversity has been neglected, and inventory and research is needed on the fishes and Gangetic River dolphins.

4.3. Implement a monitoring program for priority species outcomes
CEPF's conservation goals are based on achieving species outcomes in the region. Progress toward achieving these goals can be measured by monitoring the population status of these species. Therefore, CEPF should support monitoring programs for the priority species outcomes and their conservation status.

Sustainability

CEPF investment in the region can be sustainable beyond the 5-year term if it can leverage larger funds and fill current funding gaps in conservation, especially by supporting, complementing and creating synergy with ongoing efforts of other key partners in the priority corridors and sites. Improving corridor management through development and implementation of conservation action plans can help ensure that existing reserves and linkages are effective in achieving conservation objectives. Identifying and protecting sites that harbor globally important, isolated populations of globally threatened species are also an important objective. Increased transboundary cooperation will better assure effective conservation at regional scales, which is important since landscapes, species movements and distributions, and threats transcend national boundaries. Small grants targeted at conservation of globally threatened species would ensure that these species receive the attention of the conservation community and serve as indicators for conservation success in the region. Model projects to promote alternative income generation for local communities and sustainable resource use are good investments that will demonstrate the benefits of sustainable nature use and become self-financing in the long run.

Assistance and training to NGOs, CBOs, and other civil society institutions, and mentoring the future conservation leaders from the region will ensure that local organizations gain professional tools and training to participate in conservation with a sense of ownership and stewardship, and—importantly—a commitment to sustain conservation after external funds run out. But compensatory mechanisms such as

sustainable resource use will provide incentives for conservation, while also boosting local economies, which is a critical motivating factor for civil society stakeholders. By investing in developing conservation awareness and advocacy among the local communities, CEPF will help derive support for biodiversity conservation from policy makers and politicians, emanating from the grassroots constituents. By focusing and supporting conservation strategies in priority corridor outcomes that support priority landscape species, CEPF can make wise investments that will make the best and most effective use of limited resources.

CONCLUSION

This analysis presents five landscapes and a suite of site outcomes that contain the priority species outcomes for the Eastern Himalayas Region that should be the focus of CEPF investment over the 5-year funding period. These conservation outcomes, prioritized and supported by the regional experts, provide the best opportunities for conservation success for CEPF. While CEPF supports civil society organizations, these groups will also have to build partnerships with government institutions, since many of the important site outcomes are protected areas vested under the management mandate of the respective government institutions responsible for biodiversity conservation. Because partnership building is part of the CEPF mandate, joint civil society-government initiatives fit within the scope of CEPF. But large areas of the landscape matrices in the corridor outcomes are owned (either through purchase, lease or customary rights) and managed by civil society. Thus, conservation in these corridor outcomes will have to involve and include local communities, CBOs and NGOs.

Several overarching proximate threats such as habitat loss and fragmentation, poaching and illegal logging, overgrazing by domestic livestock, and human-wildlife conflicts are causing irreversible damage to biodiversity in the region. Many of these threats are attributed to economic and social problems, although some are due to politically motivated issues. International donors are already providing considerable support to help resolve some of these issues, yet funding opportunities exist in many of the corridor and site outcomes identified in this profile, particularly since many major donors do not have specific biodiversity conservation foci in their projects. This should be CEPF's niche and focus.

ABBREVIATIONS USED IN THE TEXT

AREAS	Asian Rhinoceros and Elephant Action Strategy, WWF
ATREE	Ashoka Trust for Research in Ecology and the Environment, India
B2C2	Bhutan Biological Conservation Complex
BISEP	Biodiversity Sector Program for Siwaliks and Terai
BMB	Biodiversity Management Board, Bhutan
BTFEC	Bhutan Trust Fund for Environmental Conservation, Bhutan
CABS	Center for Applied Biodiversity Science
CARP	Critical Area Restoration Project
CEE	Centre for Environmental Education, India
CEPF	Critical Ecosystem Partnership Fund
CMIE	Centre for Monitoring India's Economy
DFID	Department for International Development, UK
DNPWC	Department of National Parks and Wildlife Conservation, Nepal
DoF	Department of Forests, Nepal
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GDP	Gross Domestic Product
IBA	Important Bird Areas
ICDP	Integrated Conservation and Development Program
ICEF	India-Canada Environment Facility
ICIMOD	The International Centre for Integrated Mountain Development
IUCN	The World Conservation Union
KKA	Kaziranga-Karbi Anlong Landscape
KMTNC	King Mahendra Trust for Nature Conservation, Nepal
KSC	Kangchenjunga-Singalila Complex
MFSC	Ministry of Agriculture, Forest and Soil Conservation, Nepal
NBC	National Biodiversity Centre, Bhutan
NBL	North Bank Landscape
NCS	National Conservation Strategy
NEC	National Environmental Commission, Bhutan
NGO	Nongovernmental organization
NMCP	Northern Mountains Conservation Project, Nepal
RSPN	Royal Society for Protection of Nature, Bhutan
SCAFP	Sagarmatha Community Agro-forestry Project
SNV	Netherlands Development Organisation
TAL	Terai Arc Landscape
TCU	Tiger Conservation Units
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WCMC	World Conservation Monitoring Centre
WWF	World Wide Fund for Nature; World Wildlife Fund

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APPENDICES

Appendix 1. Species Outcomes for the Eastern Himalayas Region

No.	Scientific Name	Common Name	Global Threat Status†			Distribution by Country/ Territory		
			Critical	Endangered	Vulnerable	Bhutan	Nepal	NE India
	MAMMALS		**2**	**14**	**29**	**27**	**32**	**42**
1	*Ailurus fulgens*	Red Panda		EN		+	+	+
2	*Antilope cervicapra*	Blackbuck			VU		+	
3	*Biswamoyopterus biswasi*	Namdapha Flying Squirrel	CR					+
4	*Bos gaurus*	Gaur			VU	+	+	+
5	*Bos grunniens*	Wild Yak			VU		+	+
6	*Bubalus bubalis*	Wild Water Buffalo		EN		+	+	+
7	*Budorcas taxicolor*	Takin			VU	+		+
8	*Bunipithecus hoolock*	Hoolock Gibbon		EN				+
9	*Callosciurus pygerythrus*	Irrawaddy Squirrel			VU			+
10	*Capricornis sumatraensis*	Southern Serow			VU	+	+	+
11	*Caprolagus hispidus*	Hispid Hare		EN		+	+	+
12	*Catopuma temminckii*	Asian Golden Cat			VU	+	+	+
13	*Cervus duvaucelii*	Swamp Deer			VU		+	+
14	*Cervus eldii*	Brow-Antlered Deer			VU			+
15	*Cuon alpinus*	Dhole/Wild dog			VU	+	+	+
16	*Elephas maximus*	Asian Elephant		EN		+	+	+
17	*Eupetaurus cinereus*	Woolly Flying Squirrel		EN				+
18	*Hemitragus jemlahicus*	Himalayas Tahr			VU		+	+
19	*Hylopetes alboniger*	Particoloured Flying Squirrel		EN		+	+	+
20	*Hystrix brachyura*	East Asian Porcupine			VU		+	+
21	*Lutra lutra*	Common Otter			VU	+	+	+
22	*Lutrogale perspicillata*	Smooth-coated Otter			VU	+	+	+
23	*Macaca arctoides*	Stump-tailed Macaque			VU			+
24	*Macaca assamensis*	Assamese Macaque			VU	+	+	+
25	*Macaca leonina*	Northern Pigtail Macaque			VU			+
26	*Melursus ursinus*	Sloth Bear			VU	+	+	+
27	*Mustela strigidorsa*	Back-striped Weasel			VU	+		+
28	*Myotis longipes*	Kashmir Cave Bat			VU		+	+
29	*Myotis sicarius*	Mandelli's Mouse-eared Bat			VU	+	+	+
30	*Naemorhedus baileyi*	Red Goral			VU			+
31	*Neofelis nebulosa*	Clouded Leopard			VU	+	+	+

No.	Scientific Name	Common Name	Global Threat Status†			Distribution by Country/ Territory		
			Critical	Endangered	Vulnerable	Bhutan	Nepal	NE India
32	*Ovis ammon*	Argali			VU	+	+	+
33	*Panthera tigris*	Tiger		EN		+	+	+
34	*Pantholops hodgsonii*	Chiru		EN			+	
35	*Pardofelis marmorata*	Marbled Cat			VU	+	+	+
36	*Platanista gangetica*	Ganges Dolphin		EN			+	+
37	*Prionailurus viverrinus*	Fishing Cat			VU	+	+	+
38	*Rattus sikkimensis*				VU	+	+	+
39	*Rhinoceros unicornis*	Greater One-horned Rhinoceros		EN		+	+	+
40	*Sus salvanius*	Pygmy Hog	CR			+		+
41	*Tetracerus quadricornis*	Four-horned Antelope			VU		+	
42	*Trachypithecus geei*	Golden Langur		EN		+		+
43	*Trachypithecus pileatus*	Capped Langur		EN				+
44	*Uncia uncia*	Snow Leopard		EN		+	+	+
45	*Ursus thibetanus*	Asiatic Black Bear			VU	+	+	+
	BIRDS		**2**	**6**	**42**	**12**	**25**	**46**
1	*Aceros nipalensis*	Rufous-necked Hornbill			VU	+		+
2	*Anas formosa*	Baikal Teal			VU			+
3	*Anser erythropus*	Lesser White-fronted Goose			VU			+
4	*Apus acuticauda*	Dark-rumped Swift			VU	+		+
5	*Aquila clanga*	Greater Spotted Eagle			VU		+	+
6	*Aquila heliaca*	Imperial Eagle			VU		+	+
7	*Arborophila mandellii*	Chestnut-breasted Partridge			VU	+		+
8	*Ardea insignis*	White-bellied Heron		EN		+		+
9	*Aythya baeri*	Baer's Pochard			VU	+	+	+
10	*Brachypteryx hyperythra*	Rusty-bellied Shortwing			VU			+
11	*Cairina scutulata*	White-winged Duck		EN				+
12	*Catreus wallichii*	Cheer Pheasant			VU		+	
13	*Chaetornis striatus*	Bristled Grass-warbler			VU		+	+
14	*Chrysomma altirostre*	Jerdon's Babbler			VU		+	+
15	*Ciconia boyciana*	Oriental Stork		EN				+
16	*Columba punicea*	Pale-capped Pigeon			VU			+
17	*Eurynorhynchus pygmeus*	Spoon-billed Sandpiper			VU			+
18	*Falco naumanni*	Lesser Kestrel			VU		+	+
19	*Ficedula subrubra*	Kashmir Flycatcher			VU		+	
20	*Francolinus gularis*	Swamp Francolin			VU		+	+

No.	Scientific Name	Common Name	Global Threat Status†			Distribution by Country/ Territory		
			Critical	Endangered	Vulnerable	Bhutan	Nepal	NE India
21	*Gallinago nemoricola*	Wood Snipe			VU	+	+	+
22	*Grus antigone*	Sarus Crane			VU		+	+
23	*Grus nigricollis*	Black-necked Crane			VU	+	+	+
24	*Gyps bengalensis*	White-rumped Vulture	CR			+	+	+
25	*Gyps tenuirostris*	Slender-billed Vulture	CR				+	+
26	*Haliaeetus leucoryphus*	Pallas's Fish Eagle			VU	+	+	+
27	*Heliopais personata*	Masked Finfoot			VU			+
28	*Houbaropsis bengalensis*	Bengal Florican		EN			+	+
29	*Leptoptilos dubius*	Greater Adjutant		EN			+	+
30	*Leptoptilos javanicus*	Lesser Adjutant			VU		+	+
31	*Lophophorus sclateri*	Sclater's Monal			VU			+
32	*Marmaronetta angustirostris*	Marbled Teal			VU			+
33	*Paradoxornis flavirostris*	Black-breasted Parrotbill			VU			+
34	*Pavo muticus*	Green Peafowl			VU			+
35	*Pelecanus philippensis*	Spot-billed Pelican			VU		+	+
36	*Pellorneum palustre*	Marsh Babbler			VU			+
37	*Perdicula manipurensis*	Manipur Bush Quail			VU			+
38	*Ploceus megarhynchus*	Finn's Weaver			VU		+	+
39	*Prinia cinereocapilla*	Grey-crowned Prinia			VU	+	+	+
40	*Rynchops albicollis*	Indian Skimmer			VU		+	
41	*Saxicola insignis*	White-throated Bushchat			VU		+	+
42	*Sitta formosa*	Beautiful Nuthatch			VU	+		+
43	*Spelaeornis badeigularis*	Rusty-throated Wren Babbler			VU			+
44	*Spelaeornis longicaudatus*	Tawny-breasted Wren Babbler			VU			+
45	*Stachyris oglei*	Snowy-throated Babbler			VU			+
46	*Sypheotides indica*	Lesser Florican		EN			+	
47	*Syrmaticus humiae*	Hume's Pheasant			VU			+
48	*Tragopan blythii*	Blyth's Tragopan			VU	+		+
49	*Turdoides longirostris*	Slender-billed Babbler			VU		+	+
50	*Turdus feae*	Grey-sided Thrush			VU			+
	REPTILES		**1**	**7**	**8**	**0**	**8**	**15**
1	*Aspideretes gangeticus*	Indian Softshell Turtle			VU			+
2	*Aspideretes hurum*	Peacock Softshell Turtle			VU			+
3	*Aspideretes nigricans*	Black Softshell Turtle*						+
4	*Chitra indica*	Narrow-headed Softshell Turtle		EN				+

No.	Scientific Name	Common Name	Global Threat Status†			Distribution by Country/ Territory		
			Critical	Endangered	Vulnerable	Bhutan	Nepal	NE India
5	*Crocodylus palustris*	Marsh Crocodile			VU		+	
6	*Cuora amboinensis*	Malayan Box Turtle			VU			+
7	*Gavialis gangeticus*	Gharial		EN			+	+
8	*Geoclemys hamiltonii*	Black Pond Turtle			VU			+
9	*Hardella thurjii*	Crowned River Turtle			VU		+	+
10	*Indotestudo elongata*	Elongated Tortoise		EN			+	+
11	*Kachuga dhongoka*	Three-striped Roof Turtle		EN			+	+
12	*Kachuga kachuga*	Red-crowned Roof Turtle	CR				+	
13	*Kachuga sylhetensis*	Assam Roof Turtle		EN				+
14	*Manouria emys*	Asian Giant Tortoise		EN				+
15	*Melanochelys tricarinata*	Three-keeled Land Tortoise			VU		+	+
16	*Morenia petersi*	Indian Eyed Turtle			VU		+	+
17	*Pyxidea mouhotii*	Keeled Box Turtle		EN				+
	AMPHIBIANS		**3**	**6**	**3**	**1**	**3**	**10**
1	*Bufoides meghalayana*	Khasi Hills Toad		EN				+
2	*Kalophrynus orangensis*	Orang Sticky Frog	CR					+
3	*Occidozyga borealis*	Northern Frog			VU	+		+
4	*Paa blanfordii*	Blanford's Spiny Frog			VU		+	+
5	*Paa rostandi*	Dubois' Paa Frog			VU		+	
6	*Philautus garo*	Garo Hills Bush Frog		EN				+
7	*Philautus shillongensis*	Xmas Bush Frog	CR					+
8	*Polypedates zed*	Narayanghat Whipping Frog		EN			+	
9	*Rana khare*	Indian Flying Frog	CR					+
10	*Rhacophorus namdaphaensis*	Namdapha Tree Frog		EN				+
11	*Rhacophorus tuberculatus*	Tuberculate Tree Frog		EN				+
12	*Theloderma moloch*	Eerie Tree Frog		EN				+
	INVERTEBRATES		**1**		**2**	**2**	**1**	**1**
1	*Epiophlebia laidlawi*	Relict Himalayas Dragonfly			VU		**+**	
2	*Bhutanitis ludlowi*	Ludlow's Bhutan Swallowtail			VU	**+**		
3	*Haematopinus oliveri*	Pygmy Hog Sucking Louse	CR			**+**		**+**
	PLANTS		**5**	**13**	**18**	**7**	**6**	**31**
1	*Adinandra griffithii*			EN				+
2	*Aglaia perviridis*				VU	+		+

No.	Scientific Name	Common Name	Global Threat Status†			Distribution by Country/ Territory		
			Critical	Endangered	Vulnerable	Bhutan	Nepal	NE India
3	*Amentotaxus assamica*				VU			+
4	*Andrewsianthus ferrugineus*			EN		+	+	
5	*Aquilaria malaccensis*				VU	+		+
6	*Bazzania bhutanica*		CR			+		
7	*Capparis pachyphylla*			EN				+
8	*Cephalotaxus mannii*				VU			+
9	*Cupressus cashmeriana*				VU	+		+
10	*Dalbergia latifolia*				VU		+	+
11	*Diplocolea sikkimensis*			EN			+	+
12	*Dipterocarpus alatus*			EN				+
13	*Dipterocarpus costatus*			EN				+
14	*Dipterocarpus gracilis*		CR					+
15	*Dipterocarpus retusus*				VU			+
16	*Dipterocarpus turbinatus*		CR					+
17	*Elaeocarpus prunifolius*				VU			+
18	*Euodia lunuankenda*			EN				+
19	*Euonymus assamicus*			EN				+
20	*Gleditsia assamica*				VU			+
21	*Goniothalamus simonsii*			EN				+
22	*Ilex khasiana*		CR					+
23	*Ilex venulosa*			EN				+
24	*Ixonanthes khasiana*				VU			+
25	*Lagerstroemia minuticarpa*			EN				+
26	*Magnolia gustavi*				VU			+
27	*Mangifera andamanica*			EN				+
28	*Michelia punduana*				VU			+
29	*Pinus merkusii*				VU			+
30	*Rhododendron subansiriense*				VU			+
31	*Rhododendron wattii*				VU			+
32	*Scaphophyllum speciosum*				VU	+	+	
33	*Schistochila macrodonta*			EN		+		
34	*Takakia ceratophylla*				VU		+	+
35	*Ulmus wallichiana*				VU		+	
36	*Vatica lanceaefolia*		CR					+
	Total		**13**	**47**	**100**	**46**	**74**	**144**

Note: * = the black softshell turtle (*Aspideretes nigricans*) is extinct in the wild.
† = according to the 2002 IUCN Red List

Appendix 2. Site Outcomes (Key Biodiversity Areas) for the Eastern Himalayas Region

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
	NEPAL								
1	Annapurna	+	+		+	+		X	X
2	Barandabhar	+	+	+				X	
3	Dang Deukhuri Foothills	+	+					X	X
4	Dharan Forests	+	+					X	
5	Gainda Tal			+					X
6	Ghodaghodi Lake	+	+	+				X	
7	Jagdishpur Reservoir		+	+				X	
8	Kanchenjunga	+	+			+	PA	X	X
9	Khairapur	+							
10	Koshi Tappu	+	+	+		+	PA	X	X
11	Langtang	+	+			+	PA	X	
12	Lower Mai Valley Forests	+	+					X	
13	Lumbini Area (incl. Rupandehli, Kapil Vastu and Nawal Parashi)		+					X	
14	Makalu-Barun	+	+		+	+	PA	X	X
15	Manaslu	+				+	PA		
16	Parsa	+	+	+			PA	X	X
17	Phulchowki Mountain	+	+			+		X	
18	Royal Bardia	+	+	+			PA	X	X
19	Royal Chitwan	+	+	+			PA	X	X
20	Royal Sukla Phanta	+	+	+			PA	X	X
21	Sagarmatha	+	+			+	PA	X	
22	Shivapur Forest			+					
23	Shivapuri	+	+			+	PA	X	
24	Tamur Valley		+					X	
25	Upper Mai Valley Forests	+	+					X	
	BHUTAN								
26	Ada Lake-Puna Tsangchu		+					X	X
27	Bumdelling	+	+			+	PA	X	X
28	Bumthang wetlands		+					X	
29	Chele La		+			+		X	
30	Deothang-Narphang-Samdrup Jongkhar		+			+		X	
31	Dochu La	+				+			
32	Jigme Dorji	+	+			+	PA	X	X
33	Jigme Singye Wangchuk	+	+			+	PA	X	X
34	Kamji		+					X	

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
36	Kanglung Wetlands		+					X	
35	Khaling-Neoli	+	+				PA	X	X
37	Kori La		+					X	
38	Menji Wetlands		+					X	
39	Paro Wetlands		+					X	
40	Phipsoo	+	+			+	PA	X	X
41	Pobjika and Khatekha Valleys	+	+				PA	X	X
42	Royal Manas	+	+			+		X	X
43	Sakteng	+	+				PA	X	X
44	Samtse		+					X	
45	Sarbhang-Gelephu Foothills		+			+		X	X
46	Thimphu Wetlands		+					X	
47	Thimsing La		+					X	
48	Thrumshing La	+	+			+	PA	X	X
49	Toorsa	+	+				PA	X	X
50	Tshangkha		+					X	
	NORTH-EASTERN INDIA								
	Arunachal Pradesh								
70	Chayang Tajo and Khenewa Lada		+					X	
73	D'Ering	+	+				PA	X	X
76	Dibang Valley	+	+			+	PA	X	X
79	Ditchu		+					X	
82	Eagle's Nest and Sessa	+	+	+		+	PA	X	X
104	Kolo Riang, Sarli and Damin		+					X	
113	Mago-Thingbu and Luguthang		+					X	
118	Mandla Phudung		+					X	
119	Mehao	+	+				PA	X	X
121	Mouling	+	+		+	+	PA	X	X
123	Nacho, Limeking, Taksing and Majha		+					X	
125	Namdapha and Kamlang	+	+	+	+	+	PA	X	X
127	Namsang Mukh and Vodoria	+	+					X	
128	Namtok, Namheik, Nampong and Manmao		+					X	
134	Pakke	+	+	+	+		PA	X	X
138	Para-Changlagaum		+					X	
145	Sangti Valley		+					X	
155	Sirkum Pahar		+					X	
159	Tally Valley	+	+				PA	X	

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
161	Tato, Machuka, Moni Gong and Gasheng		+					X	
163	Thungri Changlang Poshingla, Maji, Basti and Liak		+					X	
170	Upper Renging				+				X
171	Upper Rottung				+				X
173	Walong	+							
175	Zamithang, Nelya and Sageshwar Lake		+					X	
	Assam								
54	Barail and North Cachar	+	+	+		+		X	
55	Barak, Inner Line and Kathakal	+	+	+				X	
56	Barak River	+	+	+				X	
57	Bardoibam-Bilmukh		+	+			PA	X	
58	Barnadi	+	+	+			PA	X	X
60	Bherajan-Borajan-Podumoni	+	+				PA	X	
62	Botha Beel		+	+				X	
65	Burhi-Dihing		+					X	
64	Burachapori and Laokhowa		+	+			PA	X	
67	Chakrasila and Diplai-Dakra-Dhir Beel Complex	+	+	+			PA	X	
68	Chand Dubi beel	+	+	+				X	
75	Deobali Jalah		+					X	
77	Dibru-Saikhowa	+	+	+			PA	X	X
78	Dipor Beel		+	+			PA	X	
80	Dum Duma-Dangori-Kumsong	+	+					X	
83	East and North Karbi Anlong	+							X
87	Garampani and Nambor	+	+				PA	X	X
88	Gibbon (Hollongapar)	+	+				PA	X	
93	Jamjing and Sengagan		+					X	X
94	Jatinga		+					X	X
95	Jengdia Beel and Satgaon		+	+				X	
97	Kaziranga	+	+	+			PA	X	X
103	Koabari Doloni		+					X	
110	Lumding	+	+			+		X	X
115	Majuli		+	+				X	
116	Manaha Complex		+					X	
117	Manas	+	+	+			PA	X	X
120	Misamari Beel-Kokliamukh-Laojan-Dalani-Kawimari Complex		+					X	
124	Nagaon Township		+					X	
126	Nameri	+	+	+	+	+	PA	X	X

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
133	Orang	+	+	+	+		PA	X	X
137	Pani-Dihing		+	+			PA	X	
139	Pobitora	+	+	+			PA	X	
141	Ripu-Chirang	+	+	+		+		X	X
146	Sareswar Beel		+					X	
152	Sibsagar Township		+					X	
157	Son Beel		+					X	
158	Sonai Rupai	+	+				PA	X	X
160	Tamarang-Konora-Paropota-Doloni Complex		+	+				X	
164	Tirap-Paktai and Namphai		+	+		+		X	
168	Upper Dihing (East) and Kakojan		+			+		X	X
169	Upper Dihing (West), Joypur and Dirak	+	+			+		X	
172	Urpod beel		+					X	
	Manipur								
51	Ango Hills	+	+					X	
63	Bunning	+	+	+		+	PA	X	
81	Dzuko	+	+	+		+		X	X
96	Kailam	+	+			+	PA	X	
98	Keibul Lamjao (incl. Loktak, Phumlen, Kharung and Ikop Lakes)	+	+			+	PA	X	
156	Siroi	+	+			+		X	X
174	Yangoupokpi Lokchao	+	+			+	PA	X	
	Meghalaya								
52	Baghmara Pitcher Plant		+				PA	X	
53	Balaphakram	+	+	+	+		PA	X	X
71	Cherapunjee Cliffs, Gorges and Sacred Groves (incl. Mawsmai)		+		+			X	X
86	Garampani	+	+			+	PA	X	
100	Khasi Hills (incl. Shillong Peak)		+		+		PA	X	X
131	Nongkhlaw		+				PA	X	
132	Nongkhyllem	+	+	+	+		PA	X	
143	Rongrengiri		+	+				X	X
144	Saipung and Narpuh		+					X	
153	Siju		+				PA	X	X
167	Tura-Nokrek Range		+		+		PA	X	X
	Mizoram								
61	Blue Mountain (Phawngpui)	+	+	+		+	PA	X	
74	Dampa	+	+	+	+		PA	X	
107	Lengteng	+	+	+		+	PA	X	

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
122	Murlen	+	+				PA	X	
130	Ngengpui	+	+	+		+	PA	X	
135	Palak Lake	+	+					X	
	Nagaland								
84	Fakim and Sharamati	+	+	+		+	PA	X	
91	Intanki, Maratlongri and Dhansiri	+	+			+	PA	X	X
101	Khonoma		+		+	+		X	
102	Kisa		+			+	PA	X	
111	Macaque sanctuary		+				PA	X	
140	Puliebadze		+		+	+	PA	X	
147	Satoi Range	+	+			+		X	
150	Shiloi		+			+		X	
165	Tiyi Peak		+			+		X	
	Sikkim								
59	Barsey	+	+				PA	X	X
72	Chholhamo Plateau	+	+					X	
85	Fambong Lho	+	+				PA	X	
99	Khanchendzonga	+	+				PA	X	X
105	Kyongnosla	+	+				PA	X	
106	Lachung, Lema and Dombang Valleys	+	+					X	
108	Lhonak Valley	+	+					X	
109	Lowland Forest of South Sikkim	+	+					X	
112	Maenam	+	+				PA	X	X
136	Pangolakha	+					PA		
142	Rongli	+	+					X	
151	Shingba	+	+				PA	X	
162	Teesta-Rangit Valley	+							X
	Tripura								
90	Gumti		+				PA	X	
149	Sepahijala		+				PA	X	
166	Trishna		+				PA	X	
	West Bengal								
66	Buxa	+	+				PA	X	X
69	Chapramari		+				PA	X	
89	Gorumara	+	+				PA	X	
92	Jaldapara	+	+				PA	X	
114	Mahananda	+	+				PA	X	
129	Neora Valley (incl. Lava)	+	+				PA	X	

Site Code	Site Outcome	Mammals	Birds	Reptiles	Amphibians	Plants	Protected Area*	IBA†	Priority Site
148	Senchel	+	+				PA	X	
154	Singalila	+	+				PA	X	X

Notes: * = Site outcome is wholly or partly included within a gazetted protected area; † = Site outcome meets the criteria for designation as an Important Bird Area.

Appendix 3. Selection Criteria for Priority Sites in the Eastern Himalayas Region

COUNTRY / STATE	Priority Site	Reason for Selection as Priority Site	Corridor
Bhutan	Bumdelling NP	Harbors core populations of landscape species, Black-necked cranes	Bhutan Biological Conservation Complex
Bhutan	Jigme Dorji NP	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Jigme Singye Wangchuk NP	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Khaling/Neoli WS	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Phipsoo WS	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Sakteng WS	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Thrumshing La NP	Harbors core populations of landscape species, red panda	Bhutan Biological Conservation Complex
Bhutan	Toorsa SNR	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Royal Manas NP	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
Bhutan	Sarbhang - Gelephu foothills	Harbors core populations of landscape species	Bhutan Biological Conservation Complex
India, Assam	Barnadi	Important for conservation of landscape species, Pygmy Hog	North Bank
India, Assam	Dibru-Saikhowa NP and Biosphere Reserve	>20 species of Globally Threatened vertebrates, Important for conservation of landscape species	North Bank
India, Assam	Jamjing and Sengagan IBA	Important for conservation of landscape species	North Bank
India, Assam	Nameri NP	>20 species of Globally Threatened vertebrates; Indian Flying Frog; Important for conservation of landscape species	North Bank
India, Assam	Sonai Rupai WS	Important for conservation of landscape species	North Bank
India, Arunachal Pradesh	D'Ering WS	Harbors core populations of landscape species	North Bank
India, Arunachal Pradesh	Eagle's Nest and Sessa WS	Important for conservation of landscape species, red panda	North Bank
India, Arunachal Pradesh	Mehao WS	Harbors core populations of landscape species	North Bank
India, Arunachal Pradesh	Pakke WS	Important for conservation of landscape species	North Bank

COUNTRY / STATE	Priority Site	Reason for Selection as Priority Site	Corridor
India, Arunachal Pradesh	Dibang Valley WS and Biosphere Reserve	Sclater's Monal, Chestnut- breasted Partridge, Rusty-bellied Shortwing	Dibang-Dihang
India, Arunachal Pradesh	Mouling NP	Eerie Tree frog	Dibang-Dihang
India, Arunachal Pradesh	Namdapha and Kamlang NP and WS	Namdapha Tree Frog, Namdapha Flying Squirrel, Snowy-throated Babbler	Upper Lohit-Changlang
India, Nagaland	Intanki NP, Maratlongiri and Dhansiri	Important for conservation of landscape species	Kaziranga-Karbi Anlong
India, Assam	East Karbi Anlong & North Karbi Anlong	Important for conservation of landscape species	Kaziranga-Karbi Anlong
India, Assam	Garampani and Nambor WS	Important for conservation of landscape species	Kaziranga-Karbi Anlong
India, Assam	Kaziranga NP	>20 species of Globally Threatened vertebrates Largest population of Greater One-horned Rhinoceros; important populations of landscape species; Important for conservation of landscape species	Kaziranga-Karbi Anlong
India, Assam	Lumding IBA	Important for conservation of landscape species	Kaziranga-Karbi Anlong
India, Assam	Manas Tiger Reserve	Pygmy Hog, Tiger, Wild Water Buffalo, Hispid Hare; Important for conservation of landscape species	Manas-Buxa†
India, West Bengal	Buxa Tiger Reserve	>20 species of Globally Threatened vertebrates	Manas-Buxa
India, Assam	Ripu-Chirang	Golden Langur, Bengal Florican, 4 species of turtles.	Manas-Buxa
India, Assam	Upper Dihing (East) and Kakojan	White-winged Duck, White-bellied Heron, Baikal Teal	Joypur-Joydihing
India, Sikkim	Barsey Rhododendron Sanctuary	IUCN Red-listed plants, especially Rhododendrons.	Kangchenjunga-Singalila
India, Sikkim	Khanchendzonga NP	Important for conservation of landscape species	Kangchenjunga-Singalila
India, Sikkim	Maenam WS	IUCN Red-listed plants; Important for conservation of landscape species	Kangchenjunga-Singalila
India, West Bengal	Singalila NP	IUCN Red-listed plants	Kangchenjunga-Singalila
Nepal	Kanchenjunga CA	Important for conservation of landscape species; IUCN Red-listed plants	Kangchenjunga-Singalila
Nepal	Gainda Tal	Indian Eyed Turtle	Terai Arc
Nepal	Parsa WR	Important for conservation of landscape species	Terai Arc

COUNTRY / STATE	Priority Site	Reason for Selection as Priority Site	Corridor
Nepal	Royal Bardia NP	>20 species of Globally Threatened vertebrates; Important for conservation of landscape species	Terai Arc
Nepal	Royal Chitwan NP	>20 species of Globally Threatened vertebrates; Important for conservation of landscape species	Terai Arc
Nepal	Royal Sukla Phanta WR	>20 species of Globally Threatened vertebrates; Important for conservation of landscape species	Terai Arc
Nepal	Dang Deukhuri foothills	Important for conservation of landscape species	Terai Arc
Outside corridors			
Bhutan	Ada Lake	Important population of White-bellied Heron	N/A
Bhutan	Popjika and Khatekha valleys CA	Black-necked crane	N/A
Nepal	Koshi Tappu WR	Only site for Crowned River Turtle; >20 species of Globally Threatened vertebrates	N/A
Nepal	Makalu-Barun NP	Red Panda, Himalaya Tahr, Snow Leopard, Blanford's Spiny Frog	N/A
Nepal	Annapurna CA	Blanford's Spiny Frog, Dubois' Paa Frog Red Panda, Argali	N/A
India, Sikkim and West Bengal	Teesta-Rangit Valley	Woolly Flying Squirrel	N/A
India, Manipur	Dzuko	Keeled Box Turtle, Hume's Pheasant, Blyth's Tragopan	N/A
India, Manipur	Siroi	Manipur Bush Quail, Hume's Pheasant, Blyth's Tragopan, Hoolock Gibbon	N/A
India, Meghalaya	Balaphakram NP	Northern Frog; Khasi Hills Toad	N/A
India, Meghalaya	Cherapunjee cliffs, gorges and sacred groves (incl. Mawsmai)	Khasi Hills Toad, Xmas Bush Frog	N/A
India, Meghalaya	Khasi Hills (including Shillong Peak NP)	Xmas Bush Frog, Tawny-breasted Wren Babbler	N/A
India, Meghalaya	Rongrengiri	Kashmir Cave Bat	N/A
India, Meghalaya	Siju Caves	Kashmir Cave Bat	N/A
India, Meghalaya	Tura-Nokrek range (includes NP)	Garo Hills Bush Frog, Northern Frog	N/A
India, Assam	Jatinga	Tawny-breasted Wren Babbler, Grey-sided Thrush	N/A

COUNTRY / STATE	Priority Site	Reason for Selection as Priority Site	Corridor
India, Assam	Orang National Park	Orang Sticky Frog	N/A
India, Arunachal Pradesh	Upper Renging	Eerie Tree Frog	N/A
India, Arunachal Pradesh	Upper Rottung	Tuberculate Tree Frog	N/A

†In the definition of corridor outcomes, this site was included with the Bhutan Biological Conservation Complex because it is contiguous with this corridor and has stronger ecological links. (see text for details)

Appendix 4. Criteria Used to Prioritize Corridor Outcomes

Corridors*	B2C2	TAL	KSC	KKL	MBL	NVT	NBL	JJL	ULC	DDL	BTL	BWF	BL
LANDSCAPE SPECIES													
Mammals													
Asian Elephant	Y	Y		Y	Y		Y	Y					
Tiger	Y	Y		Y	Y	Y	Y	Y	Y				
Takin	Y		Y			Y			Y				
Snow Leopard	Y		Y						Y				
Clouded Leopard	Y		Y		Y		Y	Y	Y				
Greater One-horned Rhinoceros		Y		Y									
Number of Landscape mammals	**5**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**4**	**0**	**0**	**0**	**0**
Birds													
Rufous-necked Hornbill	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y
White-rumped Vulture	Y	Y	Y	Y	Y		Y						
Slender-billed Vulture		Y	Y	Y	Y		Y						
Greater Adjutant		Y		Y	Y		Y						
Lesser Adjutant		Y	Y	Y	Y		Y		Y				Y
Number of Landscape birds	**2**	**4**	**3**	**5**	**5**	**1**	**5**	**0**	**2**	**1**	**1**	**1**	**2**
Total number of mammal species outcomes	18	14	15	9	10	6	22	4	8	0	0	0	0
Total number of bird species outcomes	10	20	13	26	23	7	30		9	7	6	1	7
Total number of reptile species outcomes	0	4	0	7	5	0	10	0	4	0	0	0	5
Total number of amphibian species outcomes	0	0	0	0	0	0	1	0	1	1	0	0	0
Total number invertebrate species outcomes	1	1	0	0	1	0	1	0	0	0	0	0	0
Total Number of Species Outcomes	**29**	**39**	**23**	**42**	**39**	**13**	**64**	**4**	**22**	**8**	**6**	**1**	**12**
Number of World Heritage Sites	1	2	0	1	0	0	0	0	0	0	0	0	0
Overlaps with Level 1 Tiger Conservation Unit?	yes	yes	no	yes	no	no	yes	no	no	no	no	no	no

* Corridor abbreviations: Bhutan Biological Conservation Complex (B2C2), West Bhutan Subtropical Forests (BWF), Terai Arc (TAL), Kangchenjunga-Singalila (KSC), Neora Valley-Toorsa (NVT), Manas-Buxa (MBL), Bumdelling-Tawang (BTL), North Bank (NBL), Kaziranga-Karbi Anlong (KKL), Dibang-Dihang (DDL), Bariel (BL), Joypur-Joydihing (JJL), Upper Lohit-Changlang (ULC)

Appendix 5: 5-Year Investment Strategy for the Eastern Himalayas (Logical Framework)

*Please note that Performance Indicators, Means of Verification and Assumptions will be finalized as part of the transition to grantmaking in this region.

Narrative Summary	Performance Indicators	Means of Verification	Important Assumptions
Long-Term Goal Statement	**TARGETED CONSERVATION OUTCOMES**		
Improve or stabilize the conservation status of species and ultimately avoid extinctions through the conservation and improved management of key sites and corridors.	**Areas Protected** 60 sites: -Namdapha National Park, Keibul Lamjao National Park, Teesta-Rangit Valley, Siroi, Rongrengiri-Siju Caves, Dibang Valley Wildlife Sanctuary, and Jatinga, and etc 5 Landscapes: -Terai Landscape, Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, Kaziranga Karbi Anlong Landscape, and North Bank Landscape **Extinctions Avoided** • 45 species of mammals, 50 species of birds, 17 species of reptiles, 12 species of amphibians, and 36 species of plants • 13 species are Critically Endangered, 46 are Endangered, and 100 are Vulnerable, one (Black softshell turtle) is considered to be Extinct (although a population was discovered in NE India)	IUCN Red List CABS outcome monitoring PA assessment report CBD implementation	

CEPF Purpose	Impact Indicators		
Landscape conservation to protect wild ranging mega fauna over large expanses to include protected areas, etc through habitat management, wildlife protection and sustainable use of natural resources, as well as maximizing impact through partnerships with civil society, government and organizations working to achieve and enhance biodiversity conservation in priorities sites	Presence of wildlife in 10 corridors within the 5 landscapes Habitat integrity improved in 10 corridors within the 5 landscapes through restoration, exchange and extension Sustainable resource use regulated and enhanced in 10 corridors within 5 landscapes 60 percent of priority sites with management plans developed Civil society empowered and engaged in conservation planning and monitoring activities in 10 corridors and 5 landscapes Trade in wildlife products reduced as result of species specific activities, increased support to enforcement, sophisticated landscape strategies and grassroots' led NGOs Government and donor partnerships plans secured in minimum of 3 landscapes modeled after TAL Nepal Program, engaging major donors, NGOs, and line agencies, to maximize conservation impact	Wildlife monitoring and surveys Satellite imagery and ground verification Government annual reports, provincial and district statistics, community interviews, focus groups, surveys Management plans completed Tracking of increase in number of CBOs, and Number of NGOS active or leading conservation South Asia TRAFFIC Report, IUCN Red List Partnership plans submitted to CEPF committee	Level of buy in from key donors and governments in the region for large-scale conservation initiatives. CEPF Seed Funding success in leveraging bilateral and other donors in achieving conservation outcomes. Local and regional political stability including insurgency such as Maoist in Nepal which is impacting conservation work in places like Terai Arc and separatist movement in North east India by ULFA and Bodo groups.

CEPF STRATEGIC DIRECTIONS	CEPF Investment Priorities		
1. Build on existing landscape conservation initiatives to maintain and restore connectivity and to protect wide-ranging threatened species in priority corridors with a particular emphasis on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape.	1.1 Important habitat linkages identified between site outcomes in the 3 priority corridor outcomes (Kanchenjunga, Bhutan corridors and North bank) 1.2 Civil society engaged in the development and implementation of management plans for key habitat linkages 1.3 Conservation education and awareness programs among communities, schools, journalists and decision makers supported in priority corridors 1.4 Forest management practices that benefit biodiversity conservation promoted in the priority outcomes	Site Visits Mid-term CEPF Evaluations Project Progress Reports Final Review Report	Terai Arc and kaziranga- karbiyalong landscapes although very important are relatively well funded. First phase of CEPF funding will be invested in less funded and high priority landscapes. Key targets include level of funding leveraged from other donors and stakeholders. Particular emphasis will be placed on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalia Complex and North Bank Landscape. CEPF support in the Terai Arc and Kaziranga-Karbi Anlong Landscape will be used for very targeted and strategic activities that leverages, maximizes and complements the existing funding already going to these landscapes.
2. Secure the conservation of priority site outcomes (key biodiversity areas) in the Eastern Himalayas with a particular emphasis on the sites in the Bhutan Biological Conservation Complex, Kangchenjunga-Singalila Complex, and North Bank Landscape.	2.1 Supported targeted efforts to manage and protect site outcomes (key biodiversity areas). 2.2 Incremental support provided to effective ongoing alternative livelihood projects with local communities and reduced threats to and enhanced conservation of priority sites. 2.3 Supported traditional land and resource use practices in projects that ensured effective conservation of priority sites.	Site Visits Mid-term CEPF Evaluations Project Progress Reports Final Review Report PA assessment reports	Donors such as Macarthur Foundation are active in funding site levels Protected Areas and hoping they will continue to do. Civil society support in supporting government initiatives of park management and bufferzone development will be key. Particular emphasis will be placed on the Bhutan Biological Conservation Complex, Kangchenjunga-Singalia Complex and North Bank Landscape. CEPF support in the Terai Arc and Kaziranga-Karbi Anlong Landscape will be used for very targeted and

			strategic activities that leverages, maximizes and complements the existing funding already going to these landscapes.
3. Leverage partnerships among donor agencies, civil society and government institutions to achieve biodiversity conservation outcomes over the long term.	1.1. Strengthened and supported government and civil society partnerships that resulted in new funding for achieving conservation outcomes in the Eastern Himalayas. 1.2. Supported training programs for the protection, management and monitoring of species, sites and corridor outcomes. 1.3. Developed and strengthened capacity among grassroots civil society organizations for managing, monitoring and mitigating specific threats to biodiversity.	Site Visits Mid-term CEPF Evaluations Project Progress Reports Final Review Report Partnership plans for conservation Quarterly Communication and progress reports from the Coordinator	Regional coordinator's networking capability and willingness on the part of the donors in the region. Larger NGOs such as WWF continue to raise funding to invest in the priority conservation outcomes and use CEPF seed funding to leverage additional donors such as Asian Development Bank, GEF, Save the Tiger Fund and the World Bank etc. Capacity of national and regional NGOs to access funding and implement programs as a result of CEPF seed funding.
4. Develop a small grants program to safeguard globally threatened species in the Eastern Himalayas.	a. Supported targeted, high impact projects for the conservation of Critically Endangered and Endangered species in the Eastern Himalayas. b. Supported action-oriented research that enabled or improved the conservation of priority species outcomes. c. Implemented a monitoring program for priority species outcomes.	Site Visits Mid-term CEPF Evaluations Project Progress Reports Final Review Report Database	Capacity of local, national NGOs in Northeast India to access grants from donors including CEPF.