

BIOLOGICAL DIVERSITY AND TROPICAL FOREST ANALYSIS

FAA 118/119 ANNEX

USAID/India 2002-2007 COUNTRY STRATEGIC PLAN

Executive Summary

Biologically, economically, culturally, and politically, India is a nation of immense and growing stature and importance in a rapidly changing global environment. In terms of the extent, diversity, and uniqueness of its biological and tropical forest resources, India ranks as one of the world's most important countries. India is the world's seventh largest country in terms of area, and the world's second largest nation in terms of its population. India presently supports more than 1 billion people (one sixth of the World's total human population) within a land area of 3,287,263 square km. India has an estimated 8.1% of the world's total biological diversity contained within about 2.4% of the earth's area. India is perhaps better characterized as a "*continent*" rather than a "*country*" in terms of the biodiversity and biogeography of its floral and faunal resources, and the cultural and ethnic diversity of its human inhabitants.

Most of India's biodiversity conservation issues are inextricably linked to sustainable development and poverty-alleviation challenges. Actions necessary to conserve India's biological diversity and tropical forest resources include:

- increasing knowledge and protection of biodiversity and forests outside the protected areas network;
- encouraging sustainable use of fuelwood, fodder, and forest resources;
- preventing overgrazing by livestock;
- controlling and mitigating agricultural, industrial, and urban pollution;
- reducing over-harvesting of medicinal plants for commercial markets;
- controlling impacts caused by mining, energy production, and urbanization;
- reducing levels of poaching and trade in endangered species products; and
- integrating a gender perspective into management of these resources.

The Environment Team will continue to address elements of the above conservation actions, particularly those relating to pollution mitigation, energy, and urbanization. An additional discussion of agricultural links will be expanded upon below. Managing urban pollution and the process of urbanization is central to the Regional Urban Development Office and their contributions to environmental work in India. The rationale for this continued focus on energy and environmental services is presented in section 13.1.

Within the planned portfolio the most direct link to biodiversity and forestry resources appears to be with the new Water and Energy Activity (WENEXA). WENEXA will attempt to capitalize on the inter-relationships between water and energy, address the inefficiencies in both sectors, and conserve both energy and water resources. Among other activities, WENEXA will work with farm families (women, men, and children) and user groups to identify and implement water-conserving strategies, which can produce adequate crop yields. Another potential link might exist through examining the role carbon sinks could play in a yet to be defined carbon emissions trading program.

As a result of India's nuclear bomb test in 1998 and the subsequent USG sanctions imposed against India, the USAID environment portfolio has been constrained to activities to support energy programs aimed at reducing emissions of greenhouse gases. These sanctions were recently lifted. Though neither the current nor the proposed USAID/India environment portfolio emphasizes biodiversity and forestry activities, past USAID/India activities have focused on these sectors and are still paying dividends today.

1.1 INTRODUCTION

India's vast size and the exceptional range of physical and climatic conditions contained within its landscapes and seascapes present both enormous challenges and tremendous opportunities for biodiversity and tropical forest conservation. The Indian mainland stretches from 84° N to 37° N latitude and from 68° E to 97° E longitudes, extending southward from its northern frontiers along the Himalayan massif deep into tropical latitudes of the great southern oceans. Flanked by the Indus valley of Pakistan on the west, and the Irrawaddy watershed of Myanmar on the east, India contains a vast range of both biological and cultural diversity. The southern peninsula extends into the tropical waters of the Indian Ocean with the Bay of Bengal lying to the east and the Arabian Sea to the west, and includes more than 17,000 km of coastline.

India's principal climatic and biogeographic provinces include the Himalayan mountains and foothills complex, the subtropical Gangetic river plains, the dry central Deccan plateau, and the tropical oceanic islands of Lakshadweep, Andaman and Nicobar. The Himalayan province of the northern frontier includes some of the world's highest and coldest montane ecosystems, reaching elevations of up to 8,800 meters above sea level. The Shivalik Mountains flank the Indo-Gangetic Plains to south rise to elevations of 900-1,500 m. India's remaining large tracts of tropical rainforest are concentrated in the northeastern and southwestern parts of the mainland, and in the Andaman and Nicobar Islands. Tropical and subtropical dry forest ecosystems were formerly more widely distributed within the country, but have been heavily impacted by clearing and cultivation. The marine and coral reef faunas of the tropical atolls and islands of the Andaman and Nicobar Islands add another important dimension to the total range of India's bioersivity. The climate of India is dominated by the Asiatic monsoon and trade winds, which bring in rains from the oceans between June and October, and the dry winds from the north between December and February.

Table 1.0.1 India's share of world biodiversity

	Numbers of species		
	India	World	% Of World Total
Birds	1224	9,702	12.6%
Fishes	2546	21,730	11.7%
Mammals	350	4,629	7.6%
Reptiles	408	6,550	6.2%
Flowering Plants	15,000	250,000	6.0%
Amphibians	197	4,522	4.4%

2.0 BIODIVERSITY IN INDIA

India has an estimated 8.1% of the world's total biological diversity contained within about 2.4% of the earth's area. India has an estimated 12.5% of the world's plant and microorganism species, and about 6.7% of the world's animal species. India's terrestrial biota is extremely diverse, and includes floristic and faunal elements from the 3 of the world's 7 major biogeographic realms: Palaeartic, Afrotropical, and Indo-Malayan. India is also becoming increasingly important for biodiversity conservation in Asia as the last refuge for formerly common and wide-ranging species of birds and mammals that have been largely or entirely extirpated from most areas of their range outside of India (e.g., lion, tiger, Asiatic elephant, Indian rhino).

The majority of the country is associated with three principal terrestrial life zones (biomes): tropical humid forests, tropical dry/deciduous forests, and tropical/subtropical deserts. India's rich biodiversity heritage includes two of the world's 18 designated biodiversity "hot spots" (i.e., Eastern Himalayas, Western Ghats). India has 26 recognized endemic centres of plant biodiversity that support nearly a third of all known species of flowering plants. Montane glaciers, alpine tundras, high deserts, tropical rainforests, subtropical savannas, great rivers, vast coastal mangrove forests, coral reefs, coral atolls, cold mountain deserts, hot lowland deserts, and temperate and subtropical wet and dry woodland ecosystems - India's biodiversity spans all of these diverse and distinctive ecosystems, and more.

A substantial portion of India's biodiversity consists of organisms that are restricted to this country, and found nowhere else. India has approximately 32,000 native plant species, of which about 1 in every 6 species (5150) are endemic or restricted in their distribution to India proper. Of these endemic plant species, 2532 species are found in the Himalayas and adjoining regions, with another 1782 species in peninsular India. Of the 316 mammals found in India, 44 are endemic species whose range is confined entirely to within Indian territorial limits.

There are 58 bird species endemic to India, most of which are found in areas of high rainfall and tropical rainforest habitats. They are located mainly in eastern India along the mountain chains where the monsoon shadow occurs, in the Western Ghats of southwest India, and the Nicobar and Andaman Islands. Four endemic mammal species of global conservation significance are found only in tropical forest regions the Western Ghats. Endemism in the Indian reptilian and amphibian fauna is relatively high. Approximately half of the reptiles found in India are endemic species (188 of 390 species), as are more than half of its amphibian species (122 of 209 species). Eight of the resident amphibian genera are not found outside of India. The freshwater fish fauna includes 748 species. Table 2.0.2 lists the numbers of known species of plants and animals in India and their endemism and endangerment ratings for each group.

Table 2.0.2 Species endemism and endangered ratings

Category	Total known species	Endemic species	Threatened & endangered
Plants	32,000	5,150	1,236
Birds	926	58	73
Reptiles	390	188	16
Amphibians	209	122	3
Freshwater Fishes	748	(no data)	4
Mammals	316	44	75

2.1 Agricultural biodiversity

2.1.1 Plants

India is one of the 12 major centers of origin for cultivated plant species. India's agricultural biodiversity is extremely high, with 166 crop species and 320 wild relatives present. India's agricultural biodiversity in both plants and animals has declined markedly in recent years. The varietal diversity of India's rice crop, for example, has declined from about 30,000 varieties historically to approximately a dozen major varieties at the present day.

Table 2.1.1

Genetic erosion in crop genetic diversity		
Crop	Country	Number of varieties
Rice	Sri Lanka	Down from 2000 varieties in 1959 to 5 major varieties in widespread cultivation at present
Rice	India	30,000 varieties formerly; 75% of production now comes from less than 10 varieties

Table 2.1.2

Wild relatives of important crop and medicinal plant species in India

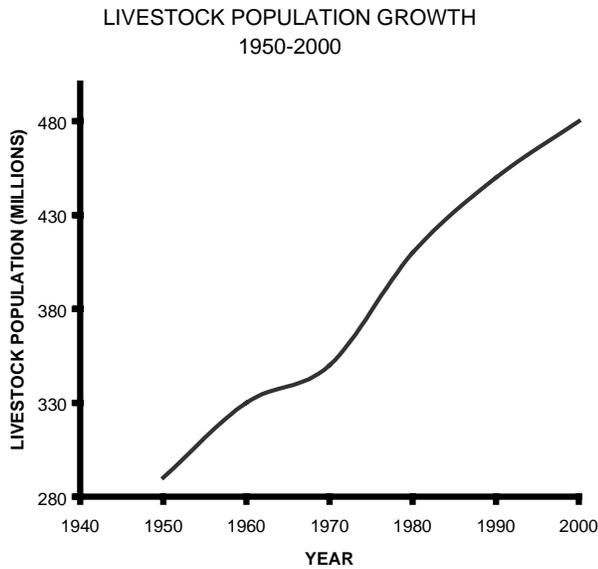
Crop	Number of wild relatives
Cereals and Millets	51
Fruits	109
Spices and condiments	27
Legumes [peas,lentils]	31
Vegetables	54
Fibre crops	24
Oil seeds	12
Medicinal plants	3000
Others	26

2.1.2 Animals

India supports large populations of the wild progenitors of some important domesticated animals (chicken, pig, water buffalo, yak, donkey), as well a large number of traditional breeds of most major livestock species (cattle, horse, ass, sheep, goat, camel). India's livestock diversity and abundance is both a blessing and a curse, however, in terms of its effects on landscapes, vegetation, and wildlife. Livestock populations in India have nearly doubled over the past 50 years, with correspondingly increased impacts on grazing systems. Between 1951 and 1991, goat populations increased from 47 million to 110 million while cattle populations from 290 million to 445 million.

Livestock grazing heavily impacts most of India's forests; approximately 30% of fodder consumed by livestock comes from forest areas. Overgrazing degrades soils, prevents regeneration of forest trees, contributes to soil erosion, degrades riparian zones, and contributes to the desertification of arid lands. India's present livestock population is about three times greater than the country's estimated sustainable carrying capacity. Overgrazing impacts are widespread and increasing throughout India.

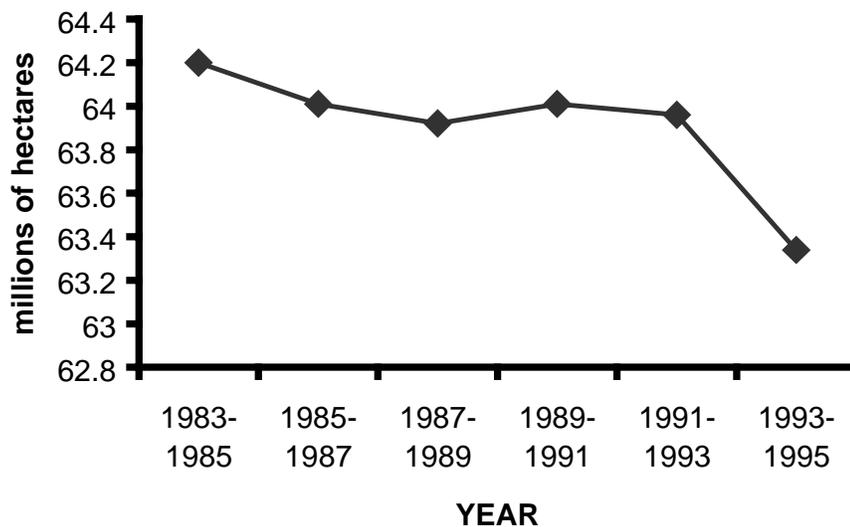
Fig. 2.1.3 Livestock populations in India



3.0 TROPICAL FOREST RESOURCES

India's tropical forests have been intensively exploited for centuries. Most of India's original forest cover is now gone, and the only remaining large areas of intact forest are those within protected areas and Forest Reserves. Only about 1% of India's original dense forest habitats remain intact, and more than half of India's few remaining large tracts of intact natural forest ("frontier forests") are threatened by

FOREST DECLINES IN INDIA 1983-1995



disruption from illicit logging, mining, or conversion to agriculture.

It must be emphasized that much if not most of India's forests today are not natural forest, but tree plantations and late-succession "*plantation forests*" established during the past 200 years. Plantations account for 80-90% of the existing forest cover in several states (e.g., Punjab, Haryana, Tripura), and 20-40% in several others (Karnataka, Sikkim, Himachal Pradesh, Rajasthan, Madhya Pradesh, Utaar Pradesh). Although India's rates of deforestation are presently lower than those of most other countries within the region, large scale conversion and degradation of forests are continuing threats to India's remaining forest habitats both inside and outside of the forest reserves and protected areas networks.

Table 3.0.1 Forest Cover in India

TOTAL LAND AREA	Original Extent of Forest Cover	Tropical Forest Cover (original)	Tropical Forest Area Remaining
2,970,000 km ²	2,400,000 km ²	445,000 km ²	40,000 km ²

Less than 20% of India's remaining natural forest cover has never been logged. Large-scale logging, conversion and degradation of forests is a continuing threat to India's remaining dense forest habitats, both inside and outside of reserves and protected areas. Directly and indirectly, urbanization and industrialization are becoming increasingly important drivers of forest loss and degradation.

Overall forest cover (including both natural and plantation forests) declined by approximately 21% over the twenty year period between 1975 and 1995. During the decade between 1980 and 1990, India's natural forests declined by more than 6% from 551,000 km² ha in 1980 to 517,000 km² ha. Natural forest extent declined by an estimated 3% between 1990-1995 (WRI 2001). Recent data indicate a potentially alarming trend: India lost nearly 5% of its remaining dense forests during the subsequent 2-year period between 1995 and 1997(CSE 1999). Despite on recent government ban on logging, the illicit felling and sale of trees continues in some areas of the country.

Table 3.0.2 Extent of India's Unlogged Natural Forests circa 1980

Unlogged Natural Forest (1980)	Undisturbed Natural Forest (1980)	Unlogged tracts Within logged forests (1980)	Unlogged Forest in Protected Areas (1980)
572,000 km ²	60,000 km ²	22,000 km ²	68,000 km ²

4.0 COASTAL AND MARINE BIODIVERSITY RESOURCES

Coastal habitats are often subjected to relatively greater pressure from development because of the higher concentrations of human populations often associated with coastal regions. Tropical mangrove forests are a particularly critical ecological and economic resource due to their role in linking terrestrial and marine ecosystems, high standing crop biomass, high productivity, and importance as nursery grounds for commercial and subsistence fishery resources. India's mangrove ecosystems support 225 species of crustaceans (shrimp, prawns, crabs, etc.), 105 species of fish, and 20 species of shellfish. No major government initiative to protect marine resources has been undertaken thus far.

India's tropical mangrove forests have been reduced from an estimated original area of 14,000,000 ha to about 3,500,000 ha at the present time. Mangrove forest cover along India's coastline has been reduced by an estimated 26-44%. Major threats to mangrove forests include logging (for fuelwood, timber, and woodchips), livestock grazing, and conversion to agriculture and aquaculture (shrimp and fish farming). The Sunderbans of India and Bangladesh are the world's largest and most biologically important mangrove forest (420,000 ha). The Sundarbans is home to 64 species of mangroves and numerous threatened and endangered species, including the Ganges dolphin and the black finless porpoise, and the earth's largest surviving population of Bengal tigers. India's portion of the Sunderbans is under partial protection as a Tiger Reserve, while the Bangladesh portion remains subject to unregulated exploitation.

Coral reef ecosystems are the most highly productive and species-rich of all marine ecosystems. India has about 19,000km² of coral reef habitats in its coastal and island regions. The rich and diversified fisheries and shellfish resources of coral reefs are heavily exploited, and the reef "bedrock" itself is mined for use in industrial lime and cement manufacture.

5.0 INLAND WATERS: THE MISSING LINK

Aside from the direct biodiversity links of inland waters to freshwater and estuarine floras and faunas, inland watersheds have inextricable ecological links to the forested upland areas of watersheds, the agricultural and urbanized landscapes through which they flow, and the coastal and marine ecosystems that they feed into. Management interventions that affect the quantity, quality, or flow-rates of water in surface drainages and aquifers have both direct and indirect effects on biodiversity.

Water withdrawals from rivers and aquifers for agricultural, urban, and industrial uses directly affect the distribution and abundance of surface water and exert both direct and indirect effects on the biodiversity of upland, wetland, and aquatic ecosystems. Damming and channelization of rivers can radically alter aquatic and riparian ecosystems and result in the loss of native plant and animal species

(including but not limited to fish, waterfowl, and aquatic mammals) dependent on natural flow and flooding regimes. Of particular concern in this regard are aquatic species such as the Ganges dolphin that are restricted in distribution to particular rivers or drainage systems.

Experiences in India and elsewhere around the world have demonstrated that the negative effects of large river dams are not limited to direct impacts on wildlife and riparian vegetation within the immediate precincts of dams and their associated man-made lakes: such projects may also have severe and devastating impacts on human communities living in the vicinity of, and far upstream and downstream from, major dam projects. These impacts are often related in part to the effects of dams on resident fish populations, because of their impacts on the availability of spawning grounds, nursery habitats, seasonal feeding habitats, and upstream and downstream migratory patterns.

Urban and industrial water withdrawals, and the degradation of river systems by wastewater-transported sewage and industrial pollutants, are severely impacting most of India's major and minor river systems. Agricultural runoff carries heavy loads of silt, fertilizers, and pesticides into rivers. Livestock concentrations along riparian zones result in destruction of riparian vegetation, erosion of streambanks, excessive nutrient loads, and high levels of fecal bacterial contamination. Religious practices contribute significantly to the pollution of waters in areas where large numbers of human and animal remains, or religious effigies and offerings, are ritually immersed in lakes or rivers. The pollution of watersheds, rivers, coastal and marine ecosystems by toxic chemicals, heavy metals, pesticides, and sewage present serious and growing threats to biodiversity and human health throughout most of India.

Urbanization and industrialization are expanding and increasing throughout India, paralleled by an ongoing decline in the quality of urban environments within the country. Water and air pollution levels are extraordinarily high, and still rising. India's larger cities rank high among the world's most polluted cities with Delhi, Mumbai, and Chennai ranking among the top ten, with several others not far behind. Earthquakes and extreme weather events, droughts and flooding overwhelm and disrupt existing sewage and effluent control and treatment capabilities, contribute to further breakdowns in operational capacity, and divert available funding from investment in new facilities and technologies to the repair and maintenance of existing and already overburdened infrastructure.

There is little direct information available on the primary or secondary impacts of air pollution from India's cities and industries on forests and biodiversity within the region, but experience from other areas around the world clearly demonstrates the adverse impacts of airborne pollution on biodiversity. These include the acidification and sterilization of lake and river ecosystems by acid rain, and the smog-poisoning of forest vegetation by aerosol chemicals and particulates within areas located downwind from major urban and industrial centers.

6.0 MAJOR THREATS TO BIODIVERSITY AND TROPICAL FORESTS

6.1. Overview

The rich biodiversity of India's terrestrial and aquatic habitats is under severe threat owing to habitat destruction and over-exploitation of forest, freshwater, and marine resources. Habitat conversion to agriculture, deforestation, and encroachment of human populations are major problems for protected areas and forest reserves in many parts of the country. Urban and industrial pollution of river systems is destroying aquatic ecosystems and actively threatening human health in many regions of India. Outside of the cities, human impacts are correspondingly high and yet still increasing apace. Rural communities are typically heavily dependent upon harvests of forest and non-cultivated plant resources for fulfilling their energy and material needs (fuel, construction materials, medicines, tools, utensils, commodities, etc.). Activities severely impacting habitats both outside and inside reserve areas include overgrazing by livestock, fuelwood and fodder collection, wildlife poaching, and medicinal plant harvesting.

More than one quarter of India's population lives within 100km of the coastline, and there is correspondingly heavy pressure on coastal landscapes and ecosystems for agricultural land, fisheries, and forest resources. Threats to coastal and marine biodiversity include logging and conversion of mangrove forests, over-fishing of freshwater and marine fish and shellfish species, by-catch mortality among non-commercial fish and animal species, fishing net and gear disruption of seafloor habitats, and coral/limestone mining. Siltation from agriculture and industry is heavily impacting reefs along India's coastlines. Over-harvesting of ornamental corals and molluscs are a serious problem in the shallow, near-shore coastal reef systems.

Some 23 animal species, including the cheetah and Lesser One-Horned Rhinoceros, have already become extinct in India. According to the IUCN Red list of threatened plants, 19 species are extinct and 1236 species are threatened. Of these "threatened" plant species, 41 plants may already be extinct in the wild. Another 152 species are considered endangered, 251 species are rare, and 102 are vulnerable. Many more species are threatened with a similar fate unless there is increased protection from illegal hunting and exploitation, and government and private sector efforts at habitat conservation are continued and expanded.

6.2 Agents of Change

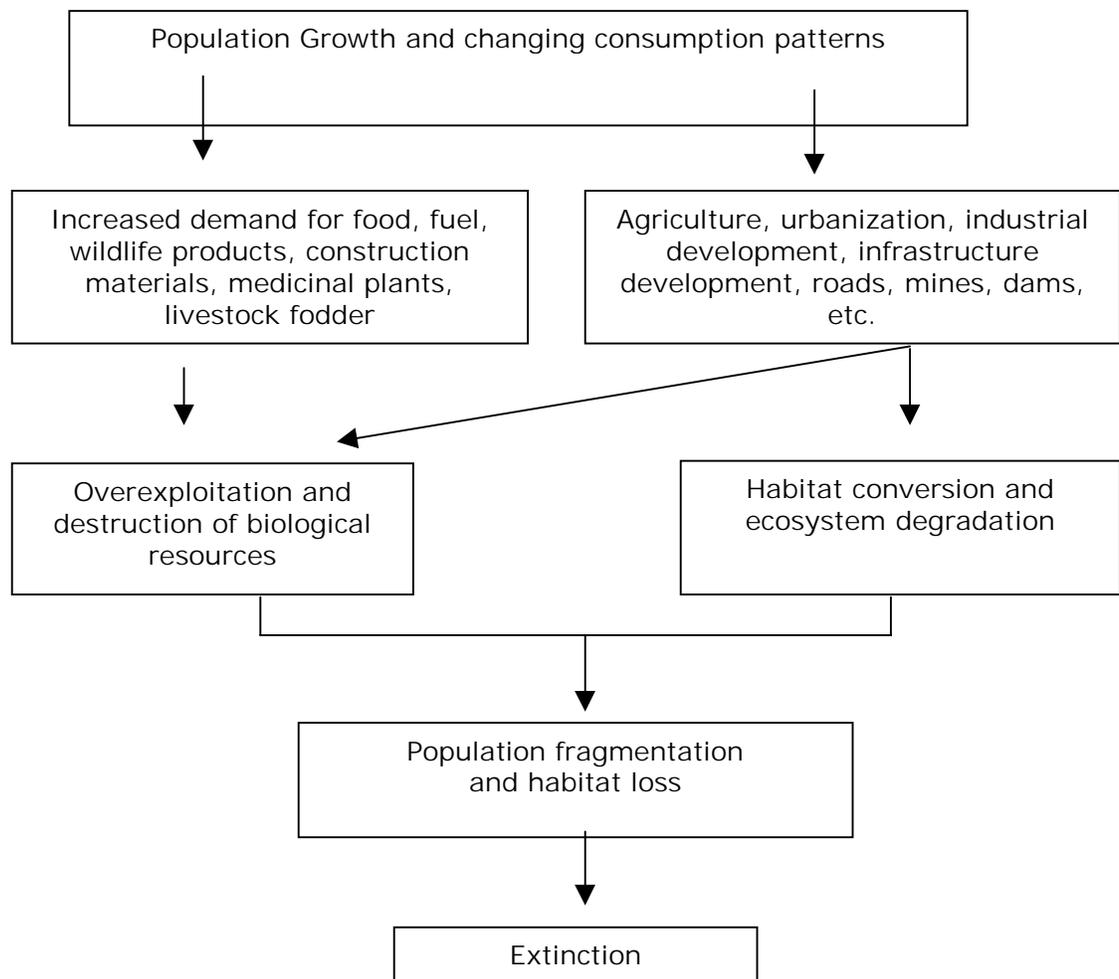
Destruction of tropical forests and the erosion of biodiversity is largely tied to conversion for agriculture, infrastructure development projects (dams, and road and canal construction), and large-scale mining for coal and minerals. It is estimated that India has lost 4.7 million hectares of forest land to non-forestry purposes since 1950. While 0.07 million ha of forest land has been illegally encroached upon, 4.37 million ha has been subjected to cultivation, 0.52 million ha given to river valley projects, 0.14 million ha to industries and townships, 0.06 million ha for transmission lines and roads; and the remainder for miscellaneous purposes. Coal mining, particularly in the State of Bihar, has been linked with

destruction of key travel corridors and breeding grounds of the Bengal tiger. The majority of India's power is generated by burning coal.

6.3 Pesticide Impacts

The indiscriminate and improper use of pesticides in agriculture may be a threat to both biodiversity and human health in India. India permits the use of pesticides whose use has been banned by the United States and many other countries. Aerial spraying of pesticides can directly contaminate surface water sources and result in the poisoning of non-cultivated vegetation, non-target species of plants and animals, and people residing in and around sprayed agricultural areas. A recent report in the *Hindustan Times* cited possible adverse effects of pesticide exposure on villagers residing in an area of Kasargode subject to the aerial spraying of Endosulfin on cashew plantations. High rates of cancer, epilepsy, mental illness, and respiratory disease are reported among local residents. A local medical doctor was quoted as saying " Within days of spraying even small birds and flies are found dead. At the time of spraying they put up a notice warning villagers to cover all sources of water. But how can we cover the two rivers that are our main source of drinking water?"

Fig. 6.1



7.0 HUMAN-WILDLIFE CONFLICTS

7.1 Livestock Competition

Apart from the primary loss of wildlife due to agriculture and industrial development and urbanization, there are numerous other problems contributing to the loss and endangered status of plant and animal species. Competition from livestock and the degradation of ecosystems from overgrazing are chronic problems throughout the rural areas of India, which despite its high human population densities still supports about one cow for every three of its human inhabitants. India has an estimated 480 million head of livestock (not including pigs) including 300 million cattle and buffaloes, 175 million sheep and goats, 2 million horses, plus hundreds of thousands of donkeys, camels, and yaks. Changes in habitat availability and habitat quality are leading to declines in primary food species for wildlife species such as elephants, tiger, gaur, and deer.

Rapidly expanding human and livestock populations impose a double burden on India's biodiversity and tropical forest resources. The increases in fuelwood and fodder requirements of rural populations, and increased livestock grazing in forests take a heavy toll on on forest and biodiversity resources.

7.2 Wildlife Depredations

Human-wildlife conflicts are a major problem in areas where elephants, tigers, and lions live in close proximity to human settlements and stray outside reserve areas, which in India means nearly everywhere these species are still to be found. India has Asia's largest remaining populations of elephants and tigers, and the world's only remaining population of Asiatic lions. Elephants destroy crops, while tigers and lions prey upon livestock, and all of these species cause human fatalities. Crop-raiding elephants are responsible for extensive damage to houses, property, and croplands and numerous human deaths. India supports approximately 28,000 wild and 3800 domesticated elephants, more than half of the world's remaining population of this species. Wild elephants are still present in some of India's most densely populated areas, and approximately 200 people are killed by elephants in India every year. In densely populated South Bengal, the resident elephant population of only 73 elephants killed 46 people in 1998 and 48 people in 1999.

Communities in turn retaliate against elephant depredations by injuring and killing elephants using whatever means are available, including shooting, poisoning, and electrocution. Chronic crop-raiders and elephants that habitually attack and kill humans ["rogue elephants"] may be tracked down and killed by wildlife or forest officers. The management of elephant populations is complicated by the fact that the ranges of individual elephants and elephant herds often include areas lying within two or more state or district jurisdictions. Elephants sometimes end up being chased back and forth across state lines by officers of adjacent jurisdictions, with the result that elephant-human conflicts are not resolved but merely temporarily exported into neighboring districts. Experience in West Bengal has shown that this type of disturbance increases rather than decreases human-elephant conflicts, property loss, and human fatalities.

7.3 Over-harvesting and Poaching of Plants and Wildlife

Poaching for the international trade in wildlife and plant products has emerged in recent years as a major driver of the local and regional decimation and extinction of wildlife species. The pet and aquarium trade, the Ayurvedic and Chinese traditional medicine markets, trophy, specimen and biological curio markets are driving burgeoning domestic and international markets for India's wild plant and animal species. Birds, butterflies, beetles, orchids, medicinal plants, and numerous other kinds of both animals and plants are being illegally harvested and traded in India, often for illicit export by international dealers. The Chinese traditional medicine (CTM) trade in particular provides a strong and growing commercial market for a bewildering variety of animals, from snakes and scorpions to tigers, rhinos, elephant, and bears. Poaching pressures are unevenly distributed among species involved the CTM trade since certain selected high-value species such as bears, tigers, and rhinos are more intensively targeted than species with lower market values which may be taken more or less opportunistically by hunters.

In a parallel process, the over-harvesting of plants for traditional medicines has become a serious threat to many plant species used in traditional Indian *Ayurvedic* medicine. The vast majority of India's people either lack access to modern clinical treatment facilities or prefer the use of traditional herbal medicines to modern allopathic therapies. Plants are also being commercially harvested to feed a growing international market for medicinal plants and plant products used in traditional Ayurvedic and TCM medicines. Over-harvesting of medicinal plants is aggravated by a combination of a growing human population and shrinking availability of habitat for medicinal plants, the majority of which are not cultivated and must therefore be harvested from wild populations.

8.0 LEGISLATIVE AND POLICY ENVIRONMENT

8.1 Legislation

There is no existing overarching biodiversity conservation and protection legislation regulating India's biodiversity and natural resources as provided for within the Convention on Biological Diversity. India's **Wildlife (Protection) Act of 1972** is the primary existing legislative framework for biodiversity conservation in India. While the Wildlife (Protection) Act deals specifically with wildlife protection and conservation, the act does not have exclusive authority and there are numerous other laws including the **Environment (Protection) Act of 1986** that affect biodiversity conservation at various levels. The Forest Conservation Act of 1980 was enacted to check the diversion of forest lands to other uses by requiring prior approval of any proposed diversion action.

The protected areas expansion catalyzed by the 1972 Wildlife Act was further strengthened by a number of internationally-supported national conservation efforts, notably Project Tiger, initiated in April 1973 by the Government of India with support from WWF and the Crocodile Breeding and Management Project,

launched in April 1975 with technical assistance from UNDP/FAO. While providing for the establishment and regulation of National Parks and Wildlife Sanctuaries, the Wildlife Act failed to recognize the needs of local communities and the importance of grassroots support for wildlife protection in terms of planning, decision making, and resource management. The active engagement of local communities in the fight against poaching, illegal hunting, and timber felling was not promoted under the Wildlife Act. The lack of active community participation in wildlife management is regarded as a major impediment to broadening the present scope of biodiversity conservation within India, given that India's system of protected areas provide coverage to only 4.5% of India's geographical area, while much of India's biodiversity lies outside the PA (protected areas) network. Efforts are currently underway to create such legislation.

The Ministry of Environment and Forests in 1997 released the draft version of a **Biodiversity (Conservation and Regulation) Act**, that was introduced as a bill to the Parliament in May 2001. Similarly, an inter-ministerial committee has been set up for working on issues relating to intellectual property rights while the Ministry of Agriculture has drafted the **Plant Variety Protection and Farmers' Rights Act** to provide protection of intellectual property for domesticated plant and animal genetic diversity resources. The **Biodiversity** bill introduced before Parliament in May 2001 provides for control and regulation of access to India's biological resources for commercial purposes, and provides for the creation of a National Biodiversity Authority and state biodiversity regulatory boards (text of the bill can be seen at <http://envfor.nic.in/legis/others/biobill.html>). A potentially important issue concerns the bill's proposed restrictions on foreign research and commercial access to India's biological resources. Under this Bill, (which was patterned upon the provisions of the 1992 UNCED Convention on Biological Diversity) all foreign individuals, associations and organizations would be required to seek the prior approval of a National Biodiversity Authority to access any biological resource, or the results of research occurring in India, for any use. Biological resources as defined within the bill include "plants, animals and micro-organisms, or parts thereof, their genetic material and byproduct for actual or potential use or value, but do not include human genetic material". Items exported as commodities would be exempted from the provisions of the Act. The Bill would require all Indian citizens to seek the prior approval of the Authority prior to the transfer of research results relating to any biological resource to any person who is not an Indian citizen. Indian citizens, local people and communities will have free access to biological resources for use within the country, for any purpose. The Authority's prior approval would be required in order to file for any patents or intellectual property rights on inventions based on biological resources from India. The Authority will have the power to impose conditions on patent holders to ensure a share in the benefits accruing from IPRs. This bill, if enacted, would likely have important impacts on international cooperation on biodiversity issues in India.

8.2 Policy

The current central government policy framework for the conservation and management of biodiversity and forest resources were broadened under the 1988 National Forest Policy and the 1992 National Conservation Strategy to include concerns recognition of access and usufruct rights of tribal and rural peoples to forest areas. The National Forest Policy of 1988 recognized the rights of access for local people, especially tribal people and members of disadvantaged castes, to biological resources in forests. The policy laid down several principles regarding the rights and responsibilities of local people in using these resources:

- **ACCESS:** Rights and concessions of tribal peoples and disadvantaged castes must be recognized and protected;
- **REGULATION:** Grazing and harvest rights of local peoples should controlled and related to forest carrying capacity;
- **PARTICIPATION:** Peoples exercising customary rights of access to forest resources should be involved in their protection.

Guidelines for the implementation of the participatory forest management practices authorized under the 1998 National Forest Policy were provided under a 1990 Notification that established qualifying criteria for access to usufruct rights on government forest lands, and provided guidelines for establishment of Joint Forest Management (JFM) partnerships between local user groups and the India Forest Department. Building upon the foundation established by the **1990 Guidelines for Participatory Forest Management**, amendments to the **Wildlife (Protection) Act** propose the establishment of two new categories of biological reserves (*community reserves* and *conservation reserves*) to supplement the existing Protected Areas categories (e.g. National Parks, Sanctuaries, Tiger Reserves, Biosphere Reserves).

Although the 1988 National Forest Policy takes into account the dependence of rural peoples on forests, the policy does not address the importance of the impacts of other sectors (urbanization, energy, industrialization, agriculture, rural development) on forests and forestry activities. Perhaps more importantly, the policy is not as yet supported by legislation and implementation of the policy has been left to the discretion of state governments.

Table 8.1

Legislation Impacting Biodiversity Conservation
Fisheries Act, 1897
Destructive Insects and Pest Act, 1914
The Indian Forest Act, 1927
Indian Coffee Act, 1942
Agricultural Produce (Grading and Marketing) Act, 1937
Import and Export (Control) Act, 1947
Rubber (Production and Marketing) Act 1947
Tea Act, 1953
Prevention of Cruelty to Animals Act, 1960
Customs Act, 1962
Cardamom Act, 1965
Seeds Act, 1966
Wildlife (Protection) Act, 1972 and Wildlife (Protection) Amendment Act, 1991
Marine Products Export Development Authority, 1972
Water (Prevention and Control of Pollution) Act, 1974
Tobacco Board Act, 1975
Territorial Water, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts, 1976
Water (Prevention and Control of Pollution) Cess Act, 1977
Coconut Development Board Act, 1979
Maritime Zones of India (Regulation and Fishing by Foreign Vessels) Act, 1980
Forest (Conservation) Act, 1980
Air (Prevention and Control of Pollution) Act, 1981
National Oilseeds and Vegetable Oils Development Board, 1983
Agricultural and Processed Food Products Export Development Authority Act, 1985/1986
Environment (Protection) Act, 1986
Spices Board Act, 1986
National Dairy Development Board, 1987
New Seed Development Policy, 1988
Foreign Trade (Development and Regulation) Act, 1992
Biodiversity Act (draft circulated 1997; Bill submitted to Parliament in May 2001)
Source: <u>MoEF 1997</u> <i>National Action Plan on Biodiversity (draft)</i> <i>New Delhi: Ministry of Environment and Forests, Government of India</i>

9.0 PROTECTED AREAS, NATIONAL PARKS, AND RESERVES

9.1 Historical Background

The protection of wildlife has a long tradition in Indian history. Sacred groves are an ancient tradition established in prehistoric times, while formal administrative protection of forests and wildlife (notably elephants) within "reserve" areas is known to date back to at least the first century B.C. in India. Religious taboos provided protection to sacred sites and totem species in prehistoric times, traditions which have been carried over in some areas into modern times. The feudal kingdoms of India (and later the Moghul Empire and British Raj), protected certain areas as royal hunting preserves and protected individual species as royal game. As more and more land became settled or cultivated, these royal hunting reserves and sacred forest groves became increasingly important as wildlife refuges. Some of these former royal hunting reserves were subsequently established as national parks or sanctuaries in India following Independence in 1947. Examples include Gir in Gujarat, Dachigam in Jammu & Kashmir, Bandipur in Karnataka, Eravikulam in Kerala, Madhav (now Shivpuri) in Madhya Pradesh, Simlipal in Orissa, and Keoladeo, Ranthambore and Sariska in Rajasthan.

9.2 Protected Areas Network

The first formal Protected Area in the modern sense, the Vandanthangal Bird Sanctuary in Tamil Nadu, was established about 200 years ago. The next designated reserve area, the Hailey (now Corbett) National Park, was gazetted in the 1930s. The adoption of a National Policy for Wildlife Conservation in 1970 and the enactment of the Wildlife (Protection) Act in 1972 led to a major expansion of the protected areas network, from 5 national parks and 60 sanctuaries in 1970 to 69 national parks and 410 sanctuaries in 1990. As of 1995, India had gazetted 80 national parks and 441 wildlife reserves with a combined area of approximately 150,000 km², covering approximately 4% of India's total land area. Protected areas and wildlife reserves are widely distributed throughout mainland India and its island territories (see web-based map at <http://www.wcmc.org.uk/igcmc/maps/indpa.gif>). India's protected areas network has been further strengthened by a number of internationally-supported national conservation efforts such as Project Tiger (initiated in April 1973 by the Government of India with support from WWF-World Wide Fund for Nature) and the Crocodile Breeding and Management Project, (launched in April 1975 with technical assistance from UNDP/FAO). Although the absolute number of protected areas is very high, most sites are relatively small and incapable of supporting viable populations of endangered large mammals such as tigers and elephants. A comprehensive list of India's national parks and protected areas can be found at <http://www.wcmc.org.uk/igcmc/parks/un93.html>.

Wildlife, together with forestry, has traditionally been managed by the forest departments of the provincial government within each state or union territory, with the role of central government being mainly advisory. Central government authority over wildlife has been expanded over the past several decades, paralleled by a major expansion of the protected areas network. The Wildlife (Protection) Act of

1972 has provided for the creation of posts of Chief Wildlife Wardens and Wildlife Wardens in the states to exercise statutory powers under the Act. Under this Act, it is also mandatory for the states to set up state wildlife advisory boards. Secondly the inclusion of protection of wild animals and birds in the concurrent list of the constitution has proved the central government with some legislative control over the states in the conservation of wildlife. Currently, all states and union territories with national parks or sanctuaries within their jurisdictions now have wildlife agencies to manage and administer these areas.

10. INDIA'S PARTICIPATION IN MULTILATERAL CONVENTIONS

10.1 Participation and Leadership

India is a signatory and participant in the following international conventions that involve or impact upon the conservation management of biodiversity and tropical forest resources. India tends to be an active participant in those Conventions that it endorses. India has played a leadership role in framing promoting and promoting implementation of the provisions of various international conventions such as the United Nations Convention to Combat Desertification (UNCCD) that may have direct effects on key economic and environmental issues and interests.

10.2 Convention on International Trade in Endangered Species (CITES)

Since India became a party to CITES on 18th October 1976 it has provided data annually to the CITES secretariat on the trade of endangered species through its CITES Management Authority.

10.3 World Heritage Convention

India ratified the World Heritage Convention in 1977. India has five registered World Heritage Sites. These sites are:

- Kaziranga National Park
- Keoladeo National Park
- Manas National Park
- Sundarbans National Park
- Nanda Devi National Park

10.4 Ramsar (Wetlands) Convention

India has been a contracted party on 1 February 1982. India now has six designated sites covering some 192,973 hectares of important wetlands. These official Ramsar sites are:

- Chilka Lake
- Keoladeo National Park
- Wular Lake
- Harike Lake
- Loktak Lake
- Sambhar Lake

10.5 Convention on Biological Diversity (CBD).

India signed the Convention on Biological Diversity on 5th June 1992, ratified it on 18th February 1994 and brought it into force on 19th May 1994. The terms of the convention are being used to provide a framework for the sustainable management and conservation of India's natural resources, under the terms of the **Biodiversity (Conservation and Regulation) Act** submitted as a bill to Parliament in May 2001. Currently India is funding preparation of a **National Biodiversity Strategy Action Plan** through a consortium of government agencies, NGOs, and academic and private sector experts.

10.6 United Nations Convention to Combat Desertification (UNCCD).

India signed the Desertification Convention on 14 October 1994, ratified it on 17 December 1996, and brought into force on 17 March 1997. India has been an active supporting member of the convention. In August 1996, India hosted the first Regional Conference on the Implementation of the United Nations Convention to Combat Desertification to prepare the ground for the preparation of the Convention's Regional Action Programme for Asia.

11.0 POTENTIAL NEW DIRECTIONS FOR COMMUNITY-BASED MANGEMENT OF FOREST AND WILDLIFE RESOURCES IN INDIA

Achievement of the conservation and sustainable development objectives underpinning the Joint Forest Management Programme and the proposed amendments to the **Wildlife (Protection) Act** will require changes in the current methodologies for conservation and protected areas management. The effective implementation of participatory management systems requires establishment of mechanisms to educate resource users regarding the full social and economic costs of resource uses, and incentives that enable those who invest in conservation to share materially in the benefits therefrom.

Motivating communities to actively protect and conserve natural resources is contingent upon

- (1) Legal or *de facto* management authority and control over the resource base,
- (2) economic or ethical incentives to conserve and manage biodiversity, and
- (3) equity in apportionment for both the cost and benefits of conservation efforts.

To promote the conservation management of biodiversity and forests, the following changes in the development policy strategies include the following.

- Revitalizing community-based systems of sustainable management of land, forest, and biodiversity;
- Reorienting the use pattern of reserve forests from production of a limited variety of timber and softwood species for industrial consumers to production of a larger diversity of non-wood forest produce of commercial value to support the rural economy;

- Identifying appropriate land-use practices that can optimize resource benefits;
- Utilizing marginal lands under private ownership for generating industrial wood supplies;
- Provision of incentives for *in situ* maintenance of traditional land-races of cultivated plants – especially evergreen fruit trees – by local people.

The increasing depletion of India's forest resources has brought into sharp focus the inherent inadequacy of traditional state-owned and -run systems of forest management in sustaining the forest resource base against the growing human and livestock population pressures, industrialization, urbanization, and overall economic development. Expanding the reach of biodiversity conservation efforts to include non-traditional, community-based conservation systems has been seen as a possible means for enhancing the protection of biodiversity while providing for community access to critical resources. In order to address this challenge, the formation of non-traditional reserve categories that could be independent reserves or adjuncts to serve as a buffers or corridors existing elements of the Protected Areas system, is intended to expand the functional integrity of Protected Areas network and promote the conservation of biodiversity.

Apart from developmental pressures, the dependence of forest user groups is a crucial factor in the state of India's forests. Forest conservation priorities cannot be determined in isolation from local people and broader patterns of natural resource use, and this must be complimented by policies promoting sustainable and equitable development of the natural resource base as a whole. In acknowledging this factor, the Ministry of Environment and Forests, Government of India issued policy guidelines for the involvement of village communities and voluntary agencies in the regeneration of degraded forest lands on 1 June 1990 under the Joint Forest Management (JFM) program.

Joint Forest Management is a concept of developing partnerships between fringe forest user groups and the FD (forest department) on the basis of mutual trust and jointly defined roles and responsibilities with regard to forest protection and development. Under the JFM program, the user (local communities) and the owner (government) manage the resource and share the cost equally. The effective and meaningful involvement of local communities in evolving sustainable forest management systems is now being looked upon as a significant approach to address the longstanding problems of deforestation and land degradation in India. The linking of socio-economic incentives and forest development has been singularly instrumental in eliciting community participation. The institutional involvement in various forest protection and developmental activities has made promising impacts on the biophysical and socio-economic environment of the JFM areas. Currently, it is estimated that 10.24 million ha of forest lands are being managed under the JFM program through 36,075 committees in 22 states. As a

follow-up, the Government of India issued guidelines on 21 February 2000 for strengthening of the JFM program.

The effective establishment of JFM and similar kinds of participatory, community-based conservation programs has been promoted by NGOs, donor agencies (including USAID), and charitable foundations (including the U.S.-based Ford Foundation) as an effective alternative and counterpart to state-controlled forest management. Participatory, community-based conservation programs entail the development of good working relationships and communication between government agencies, community-based organizations (CBOs), and local communities. Government agencies and international donor organizations can use partnerships with local CBOs and NGOs (non-governmental organizations) to develop, test, and implement innovative approaches to working with communities, especially women and the poor.

By recognizing that women, men and children utilize and depend on natural resources in different ways, activities can be designed to compensate for those differences and will, therefore, be more likely to succeed in their objectives. These activities will be better accepted by all stakeholders and will help promote strong alliances to carry the work forward in the future. A gender perspective helps to bridge the gap between environment issues and issues that address development and equity concerns. Bridging this gap should be important in USAID's work.

12.0 NGO ACTIVITIES

NGOs and CBOs can have a positive and important role in policy advocacy, information gathering, and information dissemination. Properly trained and equipped, NGOs have the ability to raise public awareness and provide technical assistance and other extension activities that are beyond the capacity of government departments. NGO activities can complement and supplement government efforts, and also play the very important role of monitoring and guiding the development of public policies and programs.

India has an extensive, well-established, and well-empowered NGO sector. It is beyond the scope of this document to attempt to identify and characterize even the largest and most ambitious of independent NGO projects in the biodiversity and tropical forest conservation sectors. In general, however, the current major approaches to conservation within the environmental NGO sector include

- further expansion of the protected areas network;
- environmental awareness, education and training;
- biodiversity and endangered species conservation;
- sustainable resource use and livelihoods (including especially gender and minority access and equity issues);
- participatory, community-based resource management systems.

The World Wide Fund for Nature/India (WWF) publishes a good reference to NGOs active in the environment sector. The most recent edition was published in 1999 and is organized by state. The publication lists well over a thousand NGOs active in this field and provides contact information, a brief description of activities and staff numbers.

13.0 USAID ACTIVITIES IN FORESTRY AND BIODIVERSITY SECTORS

13.1 Current USAID activities in forestry and biodiversity

The current environment portfolio in USAID/India does not focus directly on forestry and biodiversity issues, but rather on global climate change issues through reduction of greenhouse gases in production facilities, industry, transport sector, and end use efficiencies. Major activities include the Greenhouse Gas Pollution Prevention Project (GEP), the Clean Technologies Initiative (CTI), and the Energy Conservation and Commercialization Project (ECO), the South Asia Regional Initiative in Energy (SARI/E) and the newly proposed Water-Energy Nexus Activity (WENEXA).

The Environmental Strategic Objective is, "Increased environmental protection in energy, industry, and cities." The new Strategic Objective, which will be formulated as part of the new Mission Strategy, will likely build on mission strengths in the areas of energy and environmental services provision.

This focus is due to various reasons including USAID's response to changing economic conditions in India, a concern with global climate change, the realization that inefficiencies in the power sector were having a detrimental impact on socio-economic development throughout India, and USG sanctions.

A focus on energy and environmental services is driven largely by USAID's response to the massive economic reforms, which were implemented in India during the early 1990's. These reforms helped liberalize the economy, stimulated economic growth, and called for decentralization and market-based approaches including foreign investment rather than centrally-planned public investitures. Given this climate of economic reform and growth, USAID's promotion of clean energy technologies and energy efficiency helped manage emissions of CO₂ and other greenhouse gases while the economy has grown.

Controlling greenhouse gas emissions in India will have multiple benefits for the global environment as well as for human health in India. In addition, USAID activities will help with addressing global climate change issues, which in turn will have a very positive, though indirect and long-term impact on forestry and biodiversity issues in India. If the climate continues to warm, this could have a detrimental impact on Indian coastal zones through inundation, increased flooding or salt water contamination. Agricultural yields could be depressed resulting in more and more land needed to cultivate less and less food. In extreme cases, ecosystems could be altered significantly enough to further endanger threatened endemic species.

Studies have shown that the inefficiencies within the energy sector provide a tremendous drain on state fiscal resources. For example, in many Indian states, the cost of electricity to State Electricity Boards (SEBs) is up to ten times the revenue received from the rural areas. This climate of subsidies and of failure to adequately collect payments from consumers of electricity is bankrupting the SEBs. State funds used to support rural energy services are no longer available to invest in health care, education, or conserve biodiversity and forestry resources. USAID attempts to address these inefficiencies in the energy sector.

As a result of India's nuclear bomb test in 1998 and the subsequent USG sanctions imposed against India, the USAID environment portfolio has been constrained to activities to support energy programs aimed at reducing emissions of greenhouse gases. These sanctions were recently lifted.

Though the current USAID-India environment portfolio does not emphasize biodiversity and forestry activities, past USAID activities have focused on these sectors and are still paying dividends today.

13.2 Prior USAID activities in biodiversity and forestry sectors

13.2.1 Biodiversity Conservation Prioritisation Project (BCPP): \$550K/1995-1998. USAID-Global Bureau project managed by the WWF/WRI/USAID Biodiversity Support Program. Project supported development and implementation of a collaborative, multi-institutional analysis of India's biodiversity resources. A workshop sponsored under the program in April 1998 had 125 attendees from government agencies, NGOs, and academic institutions. Workshop proceedings and ancillary desk-studies were published in 2-volume text.

13.2.2 Biodiversity Conservation Network (BCN): \$1.63M/1993-1998. Three separate projects in India (Sikkim: \$450K, Garhwal: \$570K, Western Ghats: \$610K) were supported under this USAID United States – Asia Environmental Partnership program designed to test the effectiveness of enterprise-based conservation for the protection of biodiversity and biological resources in the Asia and Pacific region. BCN was funded by US-AEP as a regional program and managed through WWF/WRI/USAID Biodiversity Support Program.

13.2.3 Plant Genetic Resources Project (PGR): \$18.7M/1988-1997. USAID-India and GOI joint venture to establish India National Bureau of Plant Genetic Resources (NBPGR). GOI funding = \$9.25M. USAID funds were used to purchase equipment; construct facilities; train core scientific staff; establish Indo-US collaborative research linkages and joint endeavors; develop capacity for conducting in-country, regional and global training for dissemination of *ex-situ* biodiversity conservation technologies.

Project supported development of a state-of-the-art National Gene Bank facility for *ex-situ* conservation of crop genetic diversity resources and construction of the

NBPGR Headquarters building. The goal of this gene bank project is to conserve one million seed samples of both local and introduced plant genetic diversity in the form of seeds, vegetative propagates, tissue/cell cultures, embryos, pollen, etc. Twelve long-term storage modules (-20 °C) and one medium term storage module (4 °C) are already functioning. As of April, 2000 about 185,000 seed samples were stored in the gene bank. In addition, the cryobank at NBPGR Headquarters has a capacity to preserve 250,000 samples of small seeded crops, recalcitrant seed species, embryos, pollens, tissues, etc. in liquid nitrogen (-196 °C). Medium term storage modules have also been provided to 11 Cooperative Institutes/Centres spread over the country for storing active germplasm collections of various crops.

Another important component of the PGR project was the fabrication/erection of state-of-art environment controlled quarantine greenhouse to grow and inspect the seed/planting material imported into India or meant for export to other countries for quarantine clearance. The quarantine green house facilities have been established at NBPGR Headquarters, New Delhi, NBPGR, Regional Stations at Hyderabad, Bhowali, and Indian Institute of Pulses Research, Kanpur.

13.2.4 Social forestry program: \$94M /1982-1990

USAID supported distribution of tree seedlings. The three major projects were funded under this program involved

- Small-holder farm forestry: tree planting by individual smallholders around homesteads, field perimeters, and woodlots. Original focus on fuelwood production, shifted by participants to production of polewood for sale to commercial markets.
- Community Tree Plantations: establishment of community-managed tree plantations on deforested village "commons" lands previously used primarily for livestock grazing.
- Forest Department Highway/Railway strip plantations: planting of trees along highways and railroad rights-of-way for erosion control, windbreaks, and timber production.

13.3 USAID partner activities in biodiversity and forestry

As part of it's Title II PL 480 Food for Peace activities, USAID helps support the work of NGO's in India. Some of this work will impact biodiversity and forestry sector. The following information is extracted from the Development Activity Proposals for Catholic Relief Services and CARE.

13.3.1 Catholic Relief Services- India

Proposal to USAID for PL 480 Food for Peace assistance to help support a 5-year (2002-2006) food and water security program for tribal peoples. The agriculture and natural resources management component of this project includes community-based natural resources management, soil conservation, and pasture and forest resources management activities that may involve or affect biodiversity resources.

13.3.2 CARE India Integrated Nutrition and Health Project
Proposal to USAID for PL 480 Food for Peace assistance to help support food security and health program to develop community-based mechanisms for improving service delivery in the health and nutrition sector by fostering community involvement and empowerment in demonstration projects.

14.0 OTHER RELATED USG AGENCY ACTIVITIES

14.1 USDA Forest Service

Management of Forests in India for Biological Diversity and Forest Productivity: Technical assistance to Wildlife Institute of India.

14.2 Department of Interior, Bureau of Reclamation

In association with the World Bank-funded Tamil Nadu Water Resources Consolidation Project, the Bureau is putting together training programs and study tours on river basin management and water resources among other topics.

15.0 MAJOR DONOR PROGRAMS IN BIODIVERSITY AND FORESTRY

USAID/India has a good reference entitled "Donor Environment-Related Activities in India", which was compiled by the Research & Reference Services Project in June 2001. This resource lists contact information and a short description of donor activities in the environment field. Additional information is contained in this document on USG activities as well.

The following information was excerpted from USAID/CDIE summary of major bilateral, multilateral, and intergovernmental donor-funded projects in biodiversity and forestry sector. Existing or proposed funding levels are cited when known.

15.1 Japan International Cooperation Agency

As the result of sanctions related to India's nuclear testing program, Japan has withdrawn support from two major JICA supported GOI projects employing 4500 people: Afforestation and Pasture Development Program and Forestry Development Program.

15.2 Australian Agency for International Development

Watershed Management in Madhya Pradesh and Himachal Pradesh [proposed: \$20-30M/5 years].

15.3 Canadian International Development Agency

- Institutional strengthening for Ministry of Environment and Forests to promote environmentally sound development. \$5M/ 2000-2006.
- Technical assistance in processing and marketing of wood and non-wood products for village-based Tree Growers' Cooperatives: \$16M/1991-2003

15.4 Danish International Development Agency

Support for WWF-India project "Promoting the Implementation of the Convention on Biodiversity".

15.5 GTZ

Project to reduce overexploitation, destruction and degradation of forest resources in Changar region of Himachal (Changar Eco-Development Project).

15.6 Asian Development Bank

Sundarbans Biodiversity Conservation and Livelihoods Project: \$450K TA.

15.7 United Nations Development Program

- Collaborative Satellite Tracking of Sea Turtles in India
- Medicinal Plants Conservation and Sustainable Utilization
- Biodiversity Conservation and Tribal People's Development, Manipur
- Non-Wood Forest Products (NWFP) for sustainable forest development, rural income generation and biodiversity conservation.
- Wildlife Protected Area Management in West Bengal
- Olive Ridley Turtles Conservation
- Strengthening Natural Resource Management and Sustainable Livelihoods for Women in Tribal Orissa

16.0 CONCLUSIONS

As evidenced in earlier sections, there are many constraints and many opportunities within the biodiversity and forestry sectors in India. In terms of what is needed to conserve biodiversity and forestry resources in the country, the following recommendations can be made:

1. Increase the knowledge and protection of biodiversity and forests outside the protected areas network;
2. Encourage sustainable use of fuelwood, fodder, and forest resources;
3. Prevent overgrazing by livestock;
4. Control and mitigate agricultural, industrial, and urban pollution;
5. Reduce over-harvesting of medicinal plants for commercial markets;
6. Control and mitigate impacts of mining, energy production, and urbanization; and
7. Reduce levels of poaching and trade in endangered species products; and
8. Integrate a gender perspective in the management of biodiversity and tropical forestry management.

During the Mission Strategy proposed for 2003-2007, the USAID Environment Team will likely continue to focus primarily on energy and environmental services. This focus will have a limited impact on the eight issues identified above.

The Environment Team will continue to address elements of the above recommendations, particularly those relating to pollution mitigation, energy, and urbanization. The work in pollution mitigation is central to USAID/India's approach. An additional discussion of agricultural links will be expanded upon below. Managing urban pollution and the process of urbanization is central to the Regional Urban Development Office and their contributions to environmental work in India.

Since India's power production is largely dependent on coal burning, this link to mining is potentially an important one. USAID has been promoting energy efficiency in both power supply and demand. Through these strategies, power production will rely on less coal for the same energy produced. This energy will go further in achieving developmental goals through end-use efficiencies. In addition, USAID has been promoted alternative energy sources such as power co-generation using organic waste or renewable energy. Ultimately, less coal will need to be mined, which should have a positive impact on biodiversity and forestry resources.

The recommendation on better integration of a gender perspective is an interesting one. The new Water and Energy Activity (WENEXA) Scope of Work recognizes how women and girls are often the first and most seriously affected by declines in water quality and quantity, as well as by a lack of reliable energy. Women and girls arguably stand to benefit the most from WENEXA success. Within WENEXA they are also specifically targeted to help ensure the activity's success.

The rationale for a continued focus on energy and environmental services presented in section 13.1 can be summarized with the following points. USAID/India's Environment portfolio:

- Results from a response to economic reforms of early 1990's.
- Focuses on global environmental issues, which do have an indirect impact on biodiversity/forestry issues.
- Provides savings from efficient use of energy, which may then be used by GOI for other development interventions including biodiversity/forestry conservation.
- Has been limited by USG sanctions to only energy-related activities that reduce greenhouse gas emissions.

Outside or complementing the proposed portfolio there could be additional biodiversity and forestry related possibilities, though the Mission has not formed any concrete plans at this time to pursue them. One such possibility would be to examine the role carbon sinks (through social forestry or joint forest management schemes) might play in a yet to be defined carbon emissions trading program.

However, the most direct link to biodiversity and forestry resources appears to be with WENEXA. This activity is planned to be launched during FY02. WENEXA will attempt to capitalize on the inter-relationships between water and energy, address the inefficiencies in both sectors, and conserve both energy and water resources. Among other tasks, WENEXA will work with farm families and user groups to identify and implement water-conserving strategies, which can produce more adequate crop yields. WENEXA will include a gender component with some activities targeting women amongst other stakeholders. Some of these strategies could include environmental education and sustainable agriculture techniques such as crop diversification, use of organic matter, and agroforestry. Depending on the area selected, WENEXA activities could benefit watersheds or river basins. These types of interventions would have a direct and positive impact on biodiversity and forestry resources in those regions. In addition, should the target areas be home to threatened or endangered species, the positive impacts would be potentially even greater.

SELECTED SOURCE REFERENCES AND RESOURCE MATERIALS:

CSE 1999. The Citizens Fifth Report. Centre for Science and Environment, New Delhi.

IRG. 2001. Environmental and Natural Resources Management in South Asia: an Assessment of Issues and Opportunities. Final Report. International Resources Group, Washington DC.

MoEF, 2000. National Biodiversity Conservation Strategy and Action Plan: Guidelines and Concept Papers. Ministry of Environment and Forests, Government of India. New Delhi.

TERI 1998. Green India 2047. Tata Energy Research Institute, New Delhi.

WRI 2001. World Resources 2001-2201. World Resources Institute, Washington D.C.

WWF-India. Environmental NGOs in India: a directory. Indira Gandhi Conservation Monitoring Center, New Delhi.

WWF India/Biodiversity Support Program. 2000. Setting Biodiversity Conservation Priorities for India: summary of the findings and conclusions of the Biodiversity Conservation Prioritisation Project. World Wildlife Fund-India, New Delhi.

WEB-BASED RESOURCES

Biodiversity Profile of India: <http://www.wcmc.org.uk/igcmc/main.html>

Biodiversity in India: <http://www.wri.org/wri/data/dces-734.html>

India's Biodiversity: <http://www.teriin.org/biodiv/biodiv.htm>

National Biodiversity Conservation Strategy Action Plan:
<http://sdnp.delhi.nic.in/nbsap/index1.html>

India Biodiversity Bill (text): <http://envfor.nic.in/legis/others/biobill.html>

Gender and Biodiversity Management in India:
<http://www.undp.org/tcdc/bestprac/agri/cases/india1.htm>