The Integration of Biodiversity into National Environmental Assessment Procedures

National Case Studies

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CASE STUDY 6 INDIA

CONTENTS

6.1 Introduction to biodiversity profile

6.1.1 Biogeographic Zonation

India is the seventh largest country in the world and Asia's second largest nation, with an area of 3,287,263 km^2. The Indian mainland stretches from 8^{O}4' to 37^{O}6'N latitude and from 68^{O}7' to 97^{O}25' E longitude. It has a land frontier of about 15,200 km and a coastline of 7,516 km. This massive country with varied terrain, topography, landuse, geographic and climatic factors can be divided into ten recognizable biogeographic zones (Rodgers *et al.,* 2000) (Fig. 1). These zones encompass a variety of ecosystems: mountains, plateaus, rivers, forests, wetlands, lakes, mangroves, coral reefs, coasts and islands.

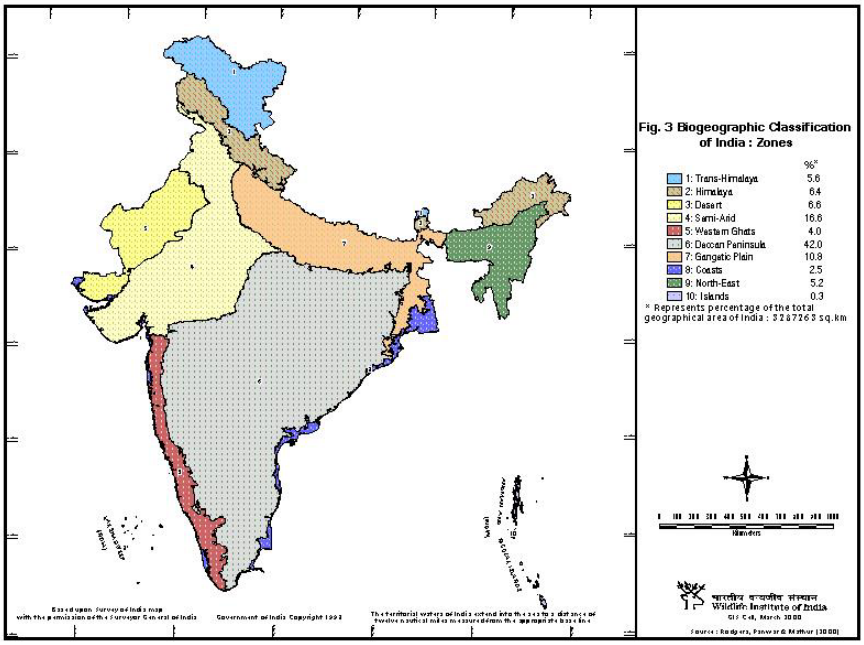


Fig. 1 Biogeographic Classification of India : Zones

The ***Trans Himalayan*** region includes the high altitude cold and arid montane areas of Ladakh, Jammu and Kashmir, Lahul & Spiti areas of Himachal Pradesh and North Sikkim. The zone has sparse vegetation and represents habitat for the biggest wild sheep and goat communities in the world and the rare fauna that include Snow Leopard (*Uncia uncia)* and the migratory Blacknecked Crane (*Grus nigricollis).*

The ***Himalaya*** in the far north include some of the highest peaks in the world and make India one of the richest areas in terms of habitats and species. The alpine, sub-alpine forest communities, large grassy meadows and moist mixed deciduous forests provide diverse habitat for endangered species of bovids such as Bharal (*Pseudois nayaur*), Ibex (*Capra ibex*), Markhor (*Capra falconeri*), Tahr (*Hemitragus jemlahicus*), and Takin (*Budorcas taxicolor*). The other highly rare and endangered species like the Hangul (*Cervus eldi eldi*) and Musk Deer (*Moschus moschiferus)* are also restricted to this zone.

The ***Desert*** zone includes the Thar desert of west Gujarat and west Rajasthan and has large expanses of grasslands that support several endangered species of mammals such as Wolf (*Canis lupus*), Caracal (*Felis caracal*), Desert Cat (*Felis libyca*) and birds of conservation interest *viz*., Houbara Bustard (*Chlamydotis undulata*) and Great Indian Bustard (*Ardeotis nigriceps*).

The ***Semi-Arid*** region is a transition zone between the desert and the dense forests of Western Ghats. The dominant grass and palatable shrub layer in this zone support the highest wildlife biomass. The cervid species Sambar (*Cervus unicolor*) and Chital (*Axis axis*) are restricted to the better wooded hills and moister valley areas respectively, the Lion (*Leo persica*), an endangered carnivore species (restricted to a small area in Gujarat), Caracal (*Felis caracal*), Jackal (*Canis aureus*) and Wolf (*Canis lupus*) are some of the endangered species that are characteristic of the semi-arid zone.

The ***Western Ghats*** is one of the major tropical evergreen forest regions in India. The zone stretches from the hills south of the Tapti River in the north to Kanyakumari in the south and in the west, this zone is bound by the coast. This zone represents one of the biodiversity 'hotspot' with some 15000 species of higher plants, of which 4000 or 27% are reported only from the Western Ghats, that form only 5% of the total land area of the country. The Western Ghats zone has viable populations of most of the vertebrate species found in peninsular India, plus an endemic faunal element of its own. Significant species restricted to the Western Ghats include Nilgiri Langur (*Presbytis johni*) and Lion Tailed Macaque (*Macaca silenus*), Grizzled Giant Squirrel (*Ratufa macroura*), Malabar Civet (*Viverricula megaspila*), Nilgiri Tahr (*Hemitragus hylocrius)* and Malabar Grey Hornbill (*Ocyceros griseus*). The Travancore Tortoise (*Indotestudo forsteni*) and Cane turtle (*Heosemys silvatica*) are two endangered taxa restricted to a small area of central Western Ghats.

The ***Deccan Plateau*** is a semi-arid region that falls in the rain shadow of the Western Ghats. This biogeographic zone of peninsular India is by far the most extensive zone, covering India's finest forests, particularly in the States of Madhya Pradesh, Maharashtra and Orissa. The majority of the forests are of a deciduous nature but there are regions of greater biological diversity in the hill ranges. The deccan zone comprising of "Deciduous Forests", "Thorn Forests" and "Degraded Scrublands" supports diverse wildlife species. Most wildlife species such as Chital (*Axis axis*), Sambar (*Cervus unicolor*), Nilgai (*Boselaphus tragocamelus*), Chousingha (*Tetracerus quadricornis*) are widespread in this zone. Some species are more frequent in, or are restricted to moister areas, but are still fairly widespread, e.g. Barking deer (*Muntiacus muntjak)* and Gaur (*Bos gaurus)*. Some species are more restricted to drier open areas, e.g. Blackbuck (*Antilope cervicapra)*, but still have a wide distribution. Species which have small populations include the elephant (Bihar-Orissa, and Karnataka- Tamil Nadu), Wild buffalo (*Bubalus bubalis*) in a small area at the junction of Orissa, Madhya Pradesh and Maharashtra and the hard ground Swamp Deer (*Cervus duvauceli*), now restricted to a single locality in Madhya Pradesh.

The ***Gangetic Plain*** is the flat alluvial region lying north and south of Ganges river and its major tributaries in the foothills of Himalayas. The Gangetic plain is topographically homogeneous for hundreds of kilometers. The characteristic fauna of the Gangetic plain is Rhino (*Rhinoceros unicornis*), Elephant (*Elephas maximus*), Buffalo (*Bubalus bubalis*), Swamp Deer (*Cervus duvauceli*), Hog-deer (*Axis porcinus*) and Hispid Hare (*Caprolagus hispidus*). This zone

has considerable ecological significance in today's scenario of increasing industrialization and pollution and consequent environmental degradation and deforestation.

The ***North-east*** of India represents the transition zone between the Indian, Indo-Malayan and Indo-Chinese biogeographical regions as well as being a meeting place of the Himalayan mountains and peninsular India. The North-east is thus the biogeographical 'gateway' for much of India's fauna and flora and also a biodiversity 'hotspot'. A diverse set of habitats, coupled with long term geological stability has allowed the development of significant levels of endemism in all animal and plant groups. Many of the species contributing to the biological diversity of north-east India are either restricted to the region itself, or to even smaller localized areas in the Khasi Hills.

The ***Island*** ecosystem in India is broadly of two types: coralline as that of Lakshadweep in the Arabian Sea and submerged mountain tops harbouring tropical rainforests as in the Andaman and Nicobar Islands in Bay of Bengal. These islands are centers of high endemism and contain some of the India's finest evergreen forests supporting a wide diversity of corals. Of the three groups of islands, rainforests and associated endemic island biodiversity is found only on the Andaman and Nicobar Islands. Indian wetland occurs in various geographical regions such as cold arid zones of Ladakh, warm arid zones of Rajasthan, tropical monsoonic central India, the north eastern region, the south peninsula and the coastal wetlands.

6.2 Biodiversity status

6.2.1 Species diversity

India is one of the 12 'mega diverse' countries of the world with a large array of environmental conditions by virtue of its tropical location, varied physiographic features and climatic types and its unique position at the junction of the Indo Malayan-Eurasian and Afro-tropical biogeographical realms. The biological diversity in its forests, wetlands and marine ecosystems account for 60 to 70% of the world's biodiversity. This richness is shown in absolute numbers of species and the proportion they represent of the world's total (Table 1).

Table 1 Biological diversity of India

Taxa	Number of Species		Percentage of India to the World
	India	*World*	
Bacteria	850	4000	21.25
Viruses	Unknown	4000	-
Algae	6500	40000	16.25
Fungi	14500	72000	20.14
Lichens	2000	17000	11.80
Bryophyta	2850	16000	17.80
Pteridophyta	1100	13000	8.46
Gymnosperms	64	750	8.53
Angiosperms	17500	250000	7.00
Protista	2577	31290	8.24
Mollusca	5050	70000	7.21

Arthropoda (Insecta, Crustacea, etc.,)	60383	1065000	5.67
Other invertebrates (including Hemichordata)	8329	87121	9.56
Protochordata	116	2173	5.34
Pisces	2546	21723	11.72
Amphibia	206	5145	4.00
Reptilia	485	5680	8.54
Aves	1228	9672	
Mammalia	372	4629	8.03
Total	**126656**	**1719183**	**7.36**

Source: UNEP-GBA (1995), MoE&F (1997 and 1998)

6.2.2 Endemism in India

India has many endemic plant and vertebrate species. Among plants, species endemism is estimated at 33% with approximately 140 endemic genera but no endemic families (Botanical Survey of India, 1983). Areas rich in endemism are north-east India, the Western Ghats and the north-western and eastern Himalayas. A small pocket of local endemism also occurs in the Eastern Ghats (MacKinnon and MacKinnon, 1986). The Gangetic Plains are generally poor in endemics, while the Andaman and Nicobar Islands contribute at least 220 species to the endemic flora of India (Botanical Survey of India, 1983).

Endemism among mammals and birds is relatively low. Only 44 species of Indian mammals have a range that is confined entirely to India's territorial limits. Four endemic species of conservation significance occur in the Western Ghats. They are the Lion Tailed Macaque (*Macaca silenus)*, Nilgiri Leaf Monkey *(Trachypithecus johni*) (locally better known as Nilgiri Langur (*Presbytis johnii*), Brown Palm Civet (*Paradoxurus jerdoni)* and Nilgiri Tahr (*Hemitragus hylocrius)*.

Only 55 bird species are endemic to India, with distributions concentrated in areas of high rainfall. In contrast, endemism in the Indian reptilian and amphibian fauna is high. There are around 187 endemic reptiles, and 110 endemic amphibian species. Eight amphibian genera are not found outside India. They include, among the caecilians, *Indotyphlus, Gegeneophis* and *Uraeotyphlus*; and among the anurans, the toad *Bufoides*, the microhylid *Melanobatrachus*, and the frogs *Ranixalus, Nannobatrachus* and *Nyctibatrachus*. Perhaps most notable among the endemic amphibian genera is the monotypic *Melanobatrachus* which has a single species known only from a few specimens collected in the Annamalai Hills in the 1870s (Groombridge, 1983).

6.2.3 Major Threats to Indian Biodiversity

India has the second highest population density among the Asian countries. It has about 16% of the total world's population concentrated in slightly more than 2% of the world's land area, a population which is growing annually at a rate of 2.3% (Kothari *et al.,* 1989). About a third of this population subsists below the poverty line. Traditional and substantial dependence on the biodiversity resources for fodder, fuel wood, timber and minor forest produce has been an accepted way of life of the rural population that accounts for nearly 74% of India's population. With the radical demographic changes, the land to man ratio and forest to man ratio has rapidly declined. From about 20 ha in 1951, the per capita forest area

had been reduced to 0.11 ha in 1981 (Lal, 1989) with further trends of reductions in subsequent years. The lifestyles and the biomass resource needs having remained unchanged, the remnant forests have come under relentless pressures of encroachment for cultivation, and unsustainable resource extraction rendering the very resource base, unproductive and depleted of its biodiversity. Coupled with these incongruities and aberrations in landuse, the unsound development strategies have led to increasing threats to biodiversity resources by way of illegal encroachment of 0.07 million ha of forest, cultivation of 4.37 million ha and diversion of forest for river valley projects (0.52 million ha), industries and townships (0.14 million ha), transmission lines and roads (0.06 million ha) and an additional 1.5 million ha for miscellaneous purposes (TERI, 1999).

The unabated pace of development of hydraulic structures to harness hydropower driven by necessity to meet the growing requirements of water for inputs to irrigation, domestic use and industrial purposes has led to the construction of over 4000 dams in India. The creation of valley bottom reservoirs in wilderness areas has brought the destruction of some of the finest forests and biodiversity-rich unique ecosystems. The biodiversity losses due to deforestation for hydropower and mining projects are perhaps the greatest threats to biodiversity in India.

The other important factors that have contributed to staggering loss of biodiversity are pollution of rivers, destruction of mangroves and fragile mountain systems, loss of wetlands due to land reclamation, poaching and hunting. Apart from the primary loss of biodiversity due to development, there are numerous other problems contributing to the loss and endangered status of several floral and faunal species. These include habitat losses and fragmentation leading to the formation of isolated scattered populations becoming increasingly vulnerable to inbreeding depressions, high infant mortality, susceptibility to environmental stochasticity and in the long run, possible extinction. According to the Red list of Threatened Plants (IUCN, 1997), 19 species are already extinct and 1236 species are threatened. Of these, threatened 41 taxa are possibly extinct in the wild, 152 are endangered, 102 are vulnerable, 251 are rare, and 690 are indeterminate. Nearly 23 animal species, including the Cheetah (*Acinonyx jubatus*), are known to have become extinct (**Table 1.2**) and many more are possibly on the verge of extinction (WCMC, 1992 and Khoshoo, 1996).

Table 2 Animal species reported to be threatened in India

Taxonomic Group	Number of Threatened Species
Mammals	75
Birds	73
Reptiles	16
Amphibians	3
Fish	4
Invertebrates	22

(Source: IUCN, 1996)

6.3 National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan (NBSAP) process is one of the largest environmental planning exercise being carried out in the world and certainly the largest ever

in India. Initiated by the Government of India's Ministry of Environment & Forests, funded by GEF through UNDP and technically executed by the NGO Kalpavriksh, the NBSAP in India is being developed through a participatory planning process involving all major stakeholders (**Anon. 2000**).

6.3.1 Levels of Coverage

The NBSAP process entails the assessment and stock taking of biodiversity related information at various levels* including distribution of endemic and endangered species and site specific threats and pressures with an ultimate aim to develop Strategy and Action Plans (SAPs) at the following five levels:

- Local and Regional Strategy and Action Plans (LSAP's) for a few selected regions in the country, e.g., Karbi-Anglong District in Assam, North Coastal Belt in Andhra Pradesh, Vidarbha in Maharashtra.
- State level Strategy and Action Plans (SSAP's) for all Indian States and Union Territories.
- Inter-state, Ecoregional Strategy and Action Plans (IESAP's) for biological regions cutting across States (e.g., eastern ghats, western ghats, western coast, West-himalayas)
- Separate detailed Thematic Strategy and Actions Plans (TSAP's) for major topics related to biodiversity.
- A National Strategy and Action Plan (NSAP) for the whole country which will build on the four levels above.

In addition to the above, the NBSAP will also include:

- Several brief review papers on specific topics, to be integrated into relevant SAPs and/or brought out as independent papers.
- Detailed project proposals for action (including funding support) (PPs), integrated into the above or attached with them.

6.3.2 Scope of Coverage

The term 'biodiversity' is being taken in its holistic sense, to encompass all levels of biodiversity, ecological and evolutionary processes including:

- Natural ecosystems: e.g., forests, grasslands, wetlands, deserts, mountain, coastal and marine areas, including the historical changes taking place in such ecosystems.
- 'Wild' species and varieties: species of plants, animals and micro-organisms existing in their natural states and the genetic variations within each of these species.
- Agricultural ecosystems: e.g., farmlands, pastures, capture fisheries, aquaculture, including historical changes in landuse patterns.
- Domesticated species and varieties: species of crops, livestock (including poultry), captive-bred fish, pets and micro-organism in *ex-situ* collections, and the genetic variations within each of these species.

6.3.3 Aspects of Coverage

The NBSAP would cover the following aspects of biodiversity:

- Conservation of biodiversity at ecosystemic, species, and genetic levels (through *in-situ*, *ex-situ*, *in-vitro*, and other measures), and of the associated ecological functions with a special focus on endemic, threatened, and otherwise critical elements;
- Sustainable use of biological resources, implying their use in such a manner as will not impair their long term existence or will not in other ways threaten biodiversity;
- Social, economic, political and inter-generational equity, including in decision- making with regard to conservation and use, in sharing of benefits, in access to and protection of knowledge and information relevant to biodiversity, and so on.
- Ethical, cultural, scientific, and economic dimensions, including:
    - The right of species and ecosystems to survive;
    - The primacy of survival and livelihoods based on biodiversity, and of creating a stake for people in conservation and sustainable use;
    - The implications of research and use of human genetic diversity;
    - Various cultural ways of relating to nature; and
    - The role of biodiversity in economics and technology.

6.4 NBSAP Process

National level policy processes in the past have often been 'top-down' and limited to a small number of 'experts' and consultants and as a result often ended remaining on paper. The present NBSAP process in India is reaching out to a large number of village-level organizations, and movements, NGOs, academics and scientists, government officers from various line agencies, the private sector, the armed forces, politicians and all those who have a stake in biodiversity conservation.

The various SAPs would :

- Assess current gaps in integrating biodiversity concerns into each economic and social sector of planning and other gaps in achieving the above mentioned aspects of biodiversity.
- Identify the major impacts of information and action gaps on how biodiversity and related livelihoods are being negatively effected by policies and programs in each sectors.
- Identify and assess the efficacy of existing measures to plug information and action gaps.
- Identify specific actions needed to plug the gaps and strengthen measures already being taken to achieve integration of biodiversity concerns in various sectors of planning.

6.4.1 NBSAP Institutional Structure

The institutional structure of the NBSAP process is shown in Fig. 2.1. There are two significant aspects of this structure, which make it different from past such initiatives. First, though the project direction is with the Ministry of Environment and Forests, its technical execution has been given out to an NGO, Kalpavriksh, which has formed a Technical and Policy Core Group (TPCG) that does the day to day planning and monitoring. A separate agency, BCIL, is in charge of project administration. Secondly, each of the teams coordinating the various levels of SAPs, are multi-stakeholder forums, consisting of people from within and outside government, and from various sectors of society.

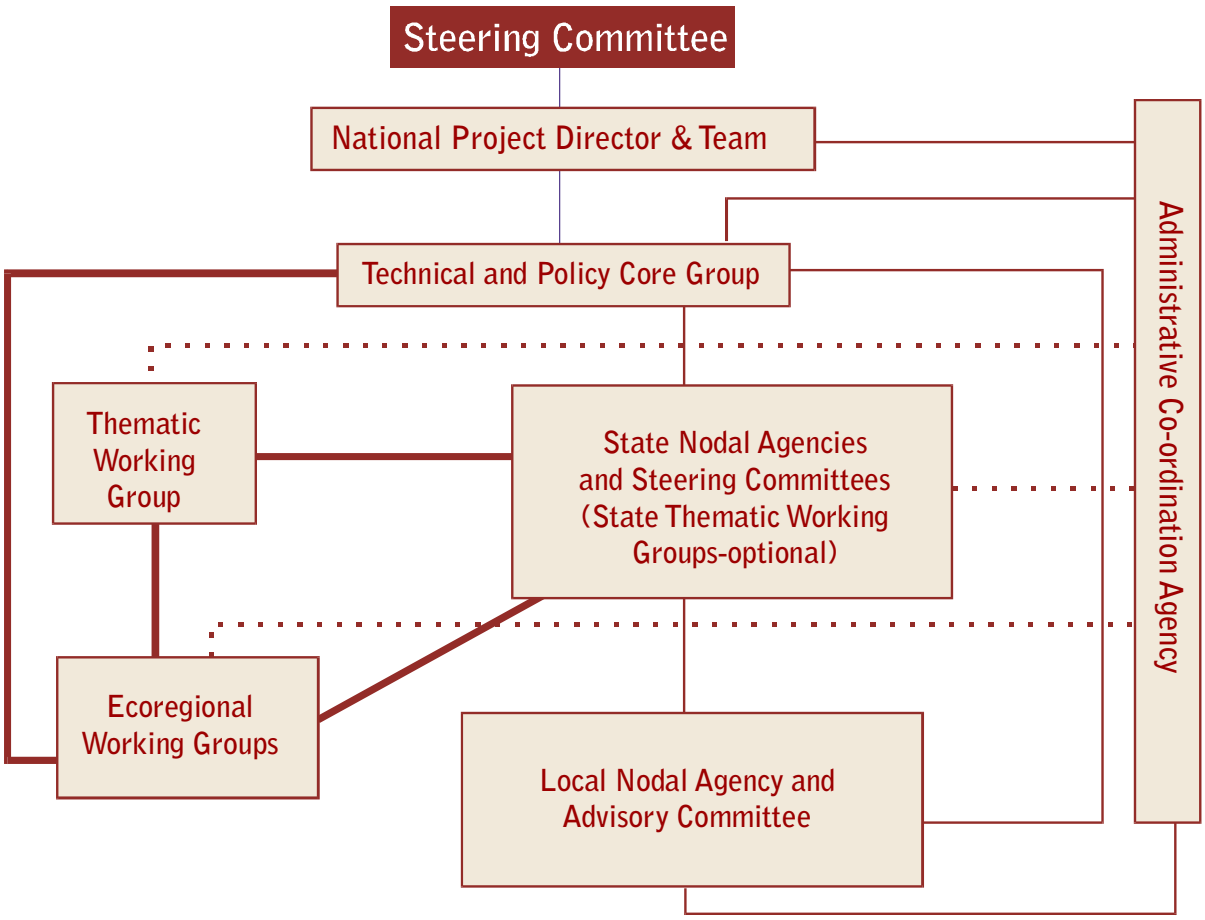


Fig. 2.1 NBSAP Institutional Structure

6.4.2 Outputs of NBSAP Process

The NBSAP process aims to produce not just a national level action plan but a series of other action plans at local, state, inter-state and thematic levels. These plans will also contain integrated or attached project proposals for further action including funding support. The NBSAP process will specifically result in the production of the following:

- Local/regional (sub-state) Strategy and Action Plans
- State level Strategy and Action Plans
- Inter-state, Ecoregional Strategy and Action Plans
- National Strategy and Action Plan
- Separate, detailed Thematic Strategy and Action Plans
- Several brief review papers on specific topics to be integrated into relevant SAPs and/or brought out as independent papers.
- Detailed Project Proposal (PPs) for action including funding support, integrated into the above or attached with them.

6.5 Progress in implementation of the NBSAP

The NBSAP process in India was initiated in the year 2000 and is expected to be complete by the end of the year 2002 and hence it is not feasible to comment on the progress of its implementation at this stage. Presently, about 25 concept note and guiding papers have been produced. Public inputs are being achieved through a series of activities. An attractive brochure called *Call for Participation,* has been printed in 16 Indian languages, and about 30,000 copies are being distributed. Anyone who responds to this is guided to relevant ways of participating. Media coverage is being maximised. Biodiversity festivals, or participation in existing agricultural and cultural fairs, are reaching the message out through folk media, exhibitions, and other popular methods. All information is transparent, and is available on request or on the website **http://sdnp.delhi.nic.in.**

There are a number of serious hurdles that NBSAP process has to confront (**Kothari, 2000**). Some State Governments have been reluctant to involve NGOs and community representatives on their action plan committees. Many agencies do not have access to the kind of reliable information needed to generate a credible action plan. Conflicts and contradictions in the perceptions of different stakeholders could also undermine the attempts to arrive at consensus recommendations. Various ministries and line agencies which deal with biodiversity matters, may simply ignore this exercise and carry on as usual.

The critical questions that the NBSAP process faces are: will all this effort be worth it? Will anything actually change on the ground? Will the government amend its policies to integrate biodiversity concerns into developmental planning process? Will there be the political will and the economic and social resources for NBSAP implementation?

As the NBSAP in India is in the process of being developed it is difficult to provide answers to the above questions. However, there are some positive indications. One significant breakthrough is the readiness of the National Planning Commission to set up a working group to integrate biodiversity into the sectoral planning process in the upcoming 10^{th} 5-year plan. At State level too, the steering committees set up for the purpose in most States, consist of all key departments, and they have agreed to work towards such integration. Another positive signal is that people are building their own actions and responsibilities into the action plans, rather than depending only on government agencies. The greatest hope is however, generated by the process itself. It will be hard for the government or other agencies to ignore the work, needs and aspirations of thousands of individuals and groups, and if they still do, hopefully they would mount serious pressure to force the NBSAP implementation. At the very least, the NBSAP process will lead to a nation-wide churning of ideas, fresh ways to visualizing the society and its relations with nature, an in-depth questioning of developmental and economic dogmas and most important how to transform centralized, top-heavy planning processes into truly participatory ground-up ones.

For an update on the progress in NBSAP implementation please refer to
http://sdnp.delhi.nic.in/nbsap/

6.6 The EIA System

6.6.1 Historical Perspective

Conservation, protection and preservation of the environment and reverence for nature have been the unifying ethical principle of Hindu religion and the cornerstone of Indian ethos, culture and traditions. Environmental protection was enshrined in the Indian constitution through the 42nd amendment to the constitution in 1976. Subsequently, environmental protection and conservation of natural resources emerged as key national priorities and found expression in subsequent documents such as National Wildlife Action Plan (1983), National Forest Policy (1988) and the National Conservation Strategy and the Policy Statements on Environment and Development (1992) brought out by the Ministry of Environment & Forests (MoE&F). The first ever concrete legislative provisions for environmental protection were made through the enactment of Environmental Protection Act (EPA) in 1986 which came into existence in whole of India vide notification no. G.S.R. 1198(E) published in the Gazette of India No.525 on 12.11.86. This EPA came into force in response to the need for developing legislative instruments for enforcing good environmental management practices after the country faced a major environmental crisis (also referred to as 'Bhopal gas tragedy') due to the leakage of methyl isocyanate gas from the industrial unit of Union Carbide Corporation in the city of Bhopal in Madhya Pradesh State. The EPA provides rules to protect the environment from pollution through planning and execution of a nation wide programme for the prevention, control and abatement of environmental pollution. The subsequent Notifications (Table 4.1) issued as amendments to EPA (1986) also incorporate the provisions for the protection of ecologically sensitive and fragile ecosystems of the country.

Until 1993, there was no formally established procedure for environmental appraisal of development projects. The MoE&F, Government of India scrutinized the projects on the basis of EIA reports submitted by the project proponents. A set of sector specific environmental guidelines that were available for all key sectors by the year 1989 issued by MoE&F (Table 4.1) specified the structure and contents of EIA reports, and the accompanying Environmental Management Plans and determined the protocols to be adopted for the preparation of EIA reports.

6.6.2 Adoption of formal EIA system

The notification on Environmental Impact Assessment issued on 27th January 1994 and later amended on 4th May 1994 under the clause (a) of sub rule (3) of rule 5 of the Environmental (Protection) Rules streamlined the EIA process in India. This notification published in the Official Gazette of Government of India on 27th January 1994 and amended on 4th May 1994 became the umbrella legislation for EIA. This notification imposes restriction and prohibition on the expansion and modernisation of some select activities or new project to be proposed in any part of India unless environmental clearance has been accorded by the Central Government or the State Government. The salient provisions under this notification are:

- Any project proponent who desires to undertake any new project or expansion or modernisation of existing projects listed in Schedule - I of this notification will have to obtain environmental clearance from the Ministry of Environment and Forests,

Government of India. The Schedule I of the EIA Notification after a recent amendment on 27th January 2001 includes a list of 30 categories of projects in sectors as diverse as power (hydro, thermal and nuclear), mineral extraction and processing industries, tourism, transportation (rail, road & air), petrochemical, manufacturing and handling of chemicals and synthetic products e.g. rubber, paint and yarn.

- The project authorities will also have to obtain Site Clearance in case of site specific projects like mining, pit head thermal power stations, hydropower and major irrigation projects, ports and harbours and prospecting and exploration of major minerals in areas above 500 ha in extent.
- The clearance granted shall be valid for a period of 5 years from the commencement of construction or operation of the project.
- The projects listed in Schedule - I of this notification in respect of which the required land and all relevant clearances of the State Government have been obtained before 27th January 1994 are exempted from obtaining environmental clearance from the Impact Assessment Agency.
- The clearance can be revoked if it is established that the project authorities have either provided false or engineered reports or have concealed the factual data.

One of the key responsibilities under the EIA Notification is to also ensure that the project proponents fulfil other legal/statutory obligations under the earlier enacted legislations by the Ministry of Environment & Forests from time to time and those subsequently enacted through amendments of existing rules and notifications under EPA (1986) to strengthen the efficacy of EIA process (Table 3).

Table 3 Environmental Policy Documents, key EIA legislations and Guidelines issued by MoE&F

Policy Documents

- National Wildlife Action Plan (1983).
- National Forest Policy, 1988.
- National Conservation Strategy and Policy Statement on Environment and Development, June 1992.
- National Biodiversity Strategy and Action Plan (under preparation)

Key EIA Legislations

- The Environmental Impact Assessment Notification, (as amended on 4.5.1994).
- Public Hearing Notification (10.04.1997).

Other EIA related Environmental Legislations and Notifications

- The Water (Prevention and Control of Pollution) Act, 1974,1977.
- The Air (Prevention and Control of Pollution) Act, 1981.
- Notification for Declaration of Air Pollution Control, 1989 .
- Wildlife Protection Act,1972 (Amended in 1982,1986 and 1991).
- The Environmental (Protection) Act, 1986.
- Forest (Conservation) Act, 1980 (Amended in 1992).

Environmental Legislations for Protection of Sensitive Ecosystems and Biodiversity Resources

- Notification for declaration of 'no development zone' round Numaligarh (5th July 1996).
- The Eco Sensitive Zone - Pachmarhi, Notification, (17th September, 1998).
- Coastal Regulation Zone – Notifications (19th February,1991).
- Notification for restricting industrial activities, mining and other developments in Doon Valley (1st February 1989).
- Notification for prohibition on the location of industries in Murud - Janjira area in Raigarh (6th January, 1989)
- Notification for protection of Dahanu Taluka in District Thane (as amended up to 2nd August 2000).
- Notification for restricting certain activities in specified areas of Aravalli Range (7th May 1992).
- National Environment Appellate Authority Ordinance, 1997.
- Environment (Siting for Industrial Projects) Rules, Notification (21st June, 1999)
- New Biodiversity Bill – 2000 (proposed)

Environmental Guidelines

- Environmental Guidelines for Shipping and Harbours (1981).
- Environmental Guidelines for Development of Beaches (1983).
- Environmental Guidelines for Siting of Industry (1984).
- Environmental (Siting for Industrial Projects) Rules, 1999 Notification of June 1999?.
- Guidelines for Environmental Impact Assessment of River Valley Projects (1985).
- Environmental Guidelines for Thermal Power Plants (1987).
- Guidelines for Location of Industries, Mining Operations etc. for various Areas (1989).
- Environmental Guidelines for Rail/Road/Highway projects (1989).
- Environmental Guidelines for Communication Projects (1989).
- Guidelines and Procedures for the Environmental Appraisal of New Towns (1989).
- Environmental Guidelines for Airport Projects (1989).
- Environmental Guidelines for Airport Projects (1989).
- Guidelines for Diversion of Forests Land for Non-Forest purposes under the Forest (Conservation) Act, 1980. (1998).
- Guidelines for Integrating Environmental Concerns and Exploitation of Mineral Resources.

Source References:

*Website of Ministry of Environment & Forests (**http://envfor.nic.in/**)*

Handbook of environmental procedures and guidelines,(1994). Ministry of Environment and Forests, Govt. of India.

6.6.3 Regulatory framework for EIA

The Union Ministry of Environment & Forests (MoE&F) is the nodal Impact Assessment Agency responsible for the enactment of environmental legislations in the entire country. The State Pollution Control Boards (SPCB) established in every state of the country are responsible for implementing most of the legislations as well as for issue of notifications for permissible emissions. In case of Union Territories (UTs), the Pollution Control Committee (PCC) are responsible for this. The Central Pollution Control Board (CPCB) at New Delhi, co-ordinates the activities of SPCBs and PCCs and plays an advisory role for the Government of India.

The Environment Division of MoE&F also plays the pivotal role in the processing of proposals received for environmental clearance of the projects and in the review of the project proposals for compliance of provisions under Wildlife (Protection) Act (1972), the Forest Conservation Act (1980), the Coastal Zone Regulation (1991) and all other legislative provisions that safeguard the ecological and biological values of the country (Table 3). The Forest and Wildlife Divisions of MoE&F are also consulted for the evaluation of the projects particularly those involving diversion of forest land for projects within the wildlife areas, *viz.* National Parks and Wildlife Sanctuaries; areas designated as Project Tiger Reserves, Biosphere Reserves, Wildlife Corridors, World Heritage Site, and Ramsar Site; nesting and breeding sites of endangered species; specialized habitats of rare and endangered wildlife species and scared groves etc. The hierarchial organization of MoE&F for environmental decision making process is presented in Figure 1.

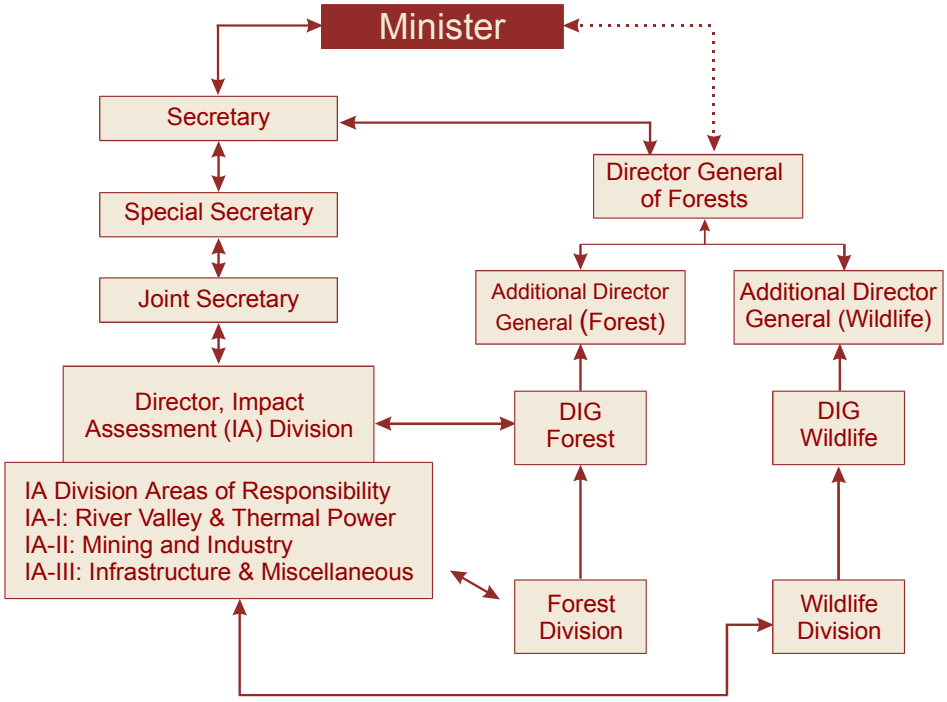


Figure 1 Hierarchical organisation of MoE and F for environmental decision making

6.6.4 Application of environmental clearance process and steps involved

As per the provisions of EIA Notification (May, 1994), the process of environmental clearance is applicable to all development projects in areas notified as ecologically sensitive/fragile areas under the EPA (1986) and its amendments through subsequent notifications. These include: Doon Valley, Murud-Janjira, Dahanu Taluka, Aravalli ranges of Gurgaon in Haryana and Alwar district in Rajasthan; Identified Coastal Areas as per Coastal Regulation Zone Notification; Forests, National Parks, Wildlife Sanctuaries, Wetlands, Mangroves, Biosphere Reserves, Hilly & Mountain Areas, 'No Development Zone' around Numaligarh, Pachmari etc.) and all projects listed in Schedule I of the EIA Notification of 1994 and its subsequent amendment through notification in January, 2000.

Proponents of all projects that have mandatory requirements for environmental assessment based on the above two inclusion criteria are required to submit an application to the Secretary, MoE&F in a prescribed format. The application is accompanied by an environmental appraisal questionnaire (that is specific to a project sector) and a project report which *inter alia* includes, an EIA report, an Environmental Management Plan (EMP)and report of public hearing prepared in accordance with the environmental guidelines of MoE&F for projects in different sectors. For projects involving clearing of forest land, the proponent is required to obtain permission for diversion of forest for non-forest purpose under the provisions of Forest Conservation Act (1980) from the Central Government. The application for clearance is prepared by the proponent and submitted to the MoE&F if the clearing area is greater than 20 ha. Permission to clear forest land is required to be obtained before applying for environmental clearance of a project.

The documents submitted by a proponent are first reviewed by a multidisciplinary expert group in the MoE&F (Fig. 4.2) who may undertake site visits wherever required, interact with the proponent and hold consultations with experts and 'other stakeholders' on specific issues, whenever necessary. After this preliminary internal scrutiny by the MoE&F, the documents are placed for independent scrutiny by the Environmental Appraisal Committees (5 in number and constituted by MoE&F) for appraisal of projects in different sectors.

Based on the technical evaluation (Fig. 4.2) of documents submitted by the proponent and other clarifications sought by the EAC and the site visit, the committee puts forth the recommendation to either approve, reject or approve with conditions. The recommendations and conditions of the committee are then processed by the MoE&F. All conditions stipulated are binding and must be dealt with by the proponent to the satisfaction of the MoE&F before the project can 'break ground', or before the date specified in the statement of conditions. Interestingly, there is no legal requirement for the submission of a completion report in which the proponent certifies that all conditions have been met. In other words, implementation of conditions is based on the honour system.

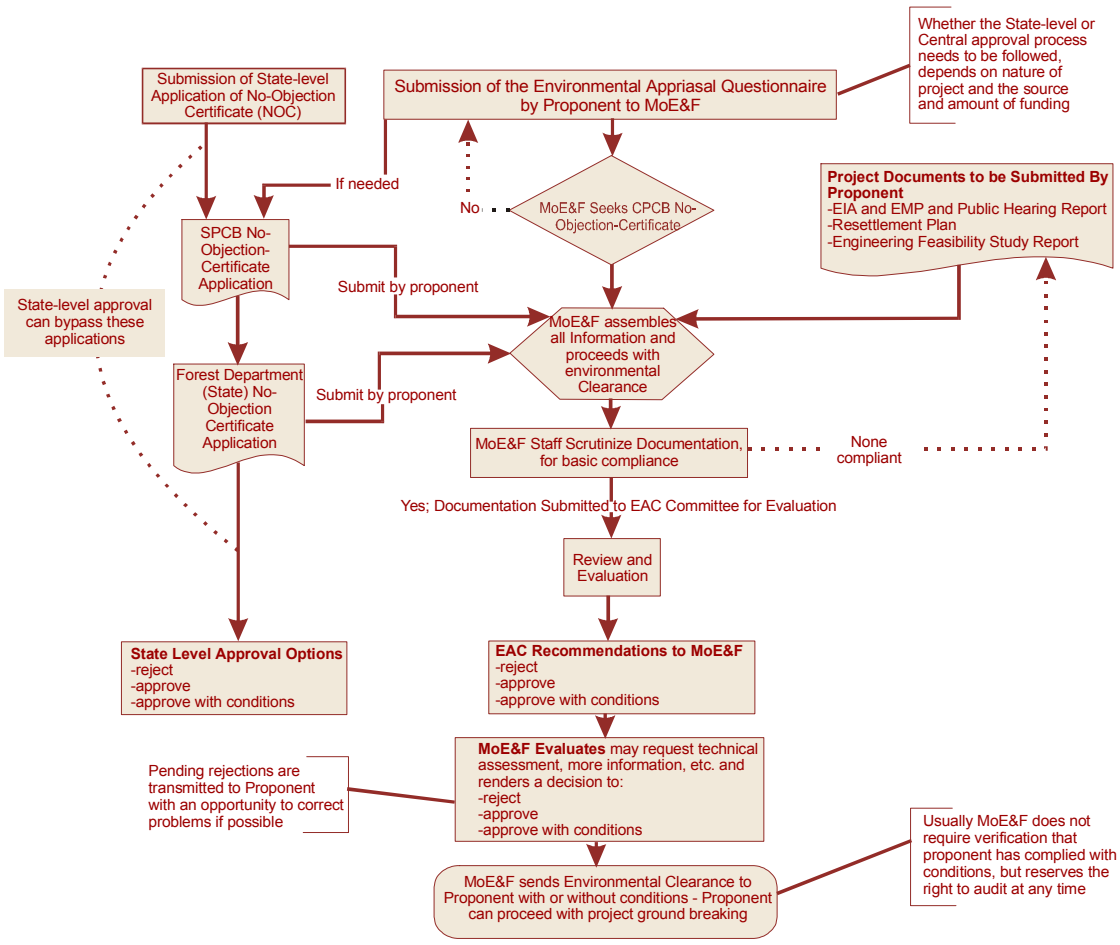


Figure 2 Steps for obtaining environmental clearance in India

The entire process, from when all relevant documentation has reached the MoE&F, through the EAC Committee evaluation and the subsequent MoE&F decision, should take less than 120 days. In practice, this deadline is seldom met. The involvement of several agencies, with communication gaps between them, often results in long delays.

6.6.5 Recent Trends of Application of Environmental Assessment to Programmes and Plans

The application of environmental assessment procedures to plans and programmes has only recently been attempted in India. These assessments have been necessitated largely because of the operational directives of several donor agencies for environmental review of investments proposed for supporting civic infrastructure expansion, pollution control and environmental improvement programmes. The India Ecodevelopment Project (1996 – 2001) of the Ministry of Environment & Forests, Government of India is a major programme that is being supported by Global Environment Facility (GEF) and International Development Aid (IDA) funds of the World Bank. The programme aims to conserve biodiversity in seven select Protected Areas by implementing ecodevelopment strategies. The Environmental Review of investments proposed under this programme is one of the most recent initiative of applying EIA procedures to plans and programmes. There are also

several other World Bank assisted forestry programmes in the States of Andhra Pradesh, West Bengal, Madhya Pradesh and Uttar Pradesh in which environmental reviews have been conducted for fulfilling funding requirements.

6.7 EIA implementation

6.7.1 Effectiveness of EIA Implementation

Environmental conservation policies, legislative instruments, government machinery and technical expertise provide the framework for EIA implementation in India. Despite this, conflict between the objective of conserving biodiversity as an invaluable component of the environment and harnessing natural resources for economic development in a country supporting the world's second largest population of over one billion, has limited the effectiveness of EIA- implementation.

The contrasting stands taken on environmental issues by economic ministries in the government which are responsible for promoting development and those ministries responsible for environmental protection often results in slowing down the pace of development projects.

Some of the other factors that influence the implementation of EIA are the poor quality of documentation and the deficiencies of the implementation process itself.

Information contained in environmental guidelines at best serves as a guide for inclusion of certain basic parameters in the study such as land-use, pollution loadings in air and water and likely health impacts etc. But there is still no single set of guidelines on what constitutes a complete EIA of a project. As a result, the EIA reports prepared by consultants with varying levels of technical expertise differ greatly in their treatment of biodiversity impacts and their mitigation.

Perhaps the most important aspect of the EIA is the approval process. There is thus an obvious need for making the evaluation of EIA as competent and transparent as possible and for ensuring that the entire process remains credible. On the contrary, the EIA reports prepared by the consultants appointed by the project proponents create a scope for doubting the credibility of the document because of conflicting interest. There have been enough evidences of reports that have reflected serious distortions of facts to provide positive reports that facilitate environmental clearance. The outcome of such actions is opposition of the project from several forces including Project Affected Persons (PAPs), public, environmentalists and other interest groups which ultimately lead to 'burial' of the EIA application under the heap of 'pending cases' in the official documents in MoE&F.

Process deficiency

The Indian EIA system suffers from some major process deficiencies. These include lack of co-ordination amongst the agencies involved, lack of efficient compliance monitoring mechanism and an ineffective public hearing process.

The EIA and the environmental clearance procedure falls within the powers of Central Government whereas the implementation of pollution control, co-ordination of public

hearings and grant of forest clearance under the Forest Conservation Act continues to be a State responsibility. This creates an awkward bureaucratic muddle whereby multiple agencies share similar responsibilities but without adequately defined roles in a single clearance procedure. As a result the entire EIA implementation process is akin to a 'black box' in which the applications are churned and clearances are granted after several weeks, if one is fortunate!

In the present set up, the six regional offices of MoE&F covering all the 29 States are responsible for post project monitoring of all the cleared projects in all the sectors. Limited staffing, long distances between projects sites spanning across the boundaries of several States covered under the single regional office and bureaucratic hurdles often affect the functioning of these regional offices, making monitoring literally ineffective.

In the existing framework of EIA, there is an apparent dichotomy between public hearing process conducted and coordinated at the State level and the EIA reporting by project proponents. This excludes the incorporation of public view in various phases of EIA including scoping, prediction and mitigation rendering the process non-transparent. There are ample examples where conflicting public hearing reports have forced a reconsideration of EIAs, delaying clearance procedures to an extent that substantially distorted the benefits of the project because of the cost escalations setting in.

6.8 Environmental Decision Making from a Biodiversity Perspective

India, like many other developing nations has a mixed track record of 'successful' integration of the biodiversity perspective in its decision making. In recent years their have been a few successful examples where biodiversity considerations have positively influenced the ultimate outcome of the EIA process leading to the shelving of some of the economically important developmental projects. However, such successes are few and far between. The forces of globalization, imperatives for rapid economic development, the underlying need for improving the infrastructure (both physical and social) and alleviation of poverty are some of the major considerations which have relegated the biodiversity perspective in the background. However, the scenario is not dismal. India has one of the strongest environmental legislation in place and a strong conservation ethic. Many a times when political expediency has governed decision making, public outcry has forced a review. Similarly, where executive has failed the judiciary has come to the rescue.

In fact some of most recent conservation initiatives have come from intervention of the judiciary. The Indian constitution has a provision for filing a 'Public Interest litigation' in the court of law whereby any concerned citizen can move the court against any developmental project which is likely to lead to environmental degradation or loss of biodiversity. Thus, where politician and executive fail to protect biodiversity a common citizen can seek judicial intervention. However, the key issue remains that of inadequate awareness of biodiversity concerns and issues. As far as integration of social concerns in environmental decision making is concerned, it is only very recently that a clause of `Public Hearing' has been incorporated in the EIA process. The intent, though good, is seldom effective as 'Public Hearing' is taken by the project proponents as a necessary evil for obtaining environmental clearance.

Thus to conclude one can say that integration of environmental biodiversity and social concerns have begun to find a place in the Indian EIA system but is not strong enough to hold ground in face of vested interests who have the capability to influence decision making.

6.9 Biodiversity and EIA

The biodiversity issues in India to some extent have been guiding the environmental considerations of projects even in the pre-EIA era. One of the earliest development projects to have been strongly opposed by environmentalists and conservationists was the Silent Valley Hydroelectric Project proposed in early seventies in the State of Kerala. The key considerations that forced the Department of Environment, Government of India to take the decision to shelve the project in 1983 were impacts on the highly rare and endangered biodiversity values of the tropical rainforests. Subsequent ecological movements in the country, opposed mining in Doon valley, construction of Tehri Dam in Garhwal Himalayas and dams on the river Narmada in Central India and demonstrated the significance attached to ecological and biodiversity issues in developmental planning (Shiva, 1991). Similarly the Bodhghat Hydroelectric Project, proposed in the tribal belt of Central Indian forests in the early eighties was shelved in the early nineties after environmental studies highlighted the proposed risk of extinction of a population of a highly endangered Wild Buffalo (*Bubalus bubalis)* from its Central Indian home range (WII, 1989).

Subsequent to the establishment of some EIA process in India, biodiversity considerations have continued to gain prominence in the environmental appraisal of development projects.

6.9.1 Consideration of Biodiversity Issues in Assessment Procedures

The legal instruments and the mechanism adopted in the EIA process ensure to some extent only that the biodiversity concerns are integrated in the various stages of the EIA implementation.

Initial scrutiny by MoE&F

The initial stage in EIA includes the process of scrutinizing of all documents received by MoE&F from the project proponent as part of the application submitted for obtaining environmental clearance.

The environmental appraisal questionnaire forms an integral part of the documents submitted to MoE&F along with the application for seeking environmental clearance. The format of this questionnaire provides a definite scope for seeking information on several parameters that address biodiversity issues related to developments in different sectors (Table 4).

Table 4 Biodiversity-related information required in environmental appraisal for different sectors

	Information required
Common information requested in appraisal questionnaires of all sectors (Industry, Thermal Power, Mining, River Valley and Hydro Projects, Hotels and Tourism in Coastal Areas, Roads and Highways)	• Information on forests, marshes and mangroves and the current landuse of proposed project site. • Area and aerial distances of the features like National Park/Wildlife Sanctuary, Tiger Reserve, Elephant Reserve, Turtle Nesting Ground, Core Zone of Biosphere Reserves, habitat for migratory birds, lakes, streams reservoir, estuary/sea mangroves and mountain/hills, within 7 km periphery of project site. • Description of fauna within 7 km covering listing of faunal elements, endemic faunal species, endangered species, migratory species, route of migratory species of birds and mammals. • Details of aquatic fauna. • Description of flora within 7 km periphery, plantation, natural vegetation/forest type, grasslands, endangered sp., endemic species
Specific information requested in different sectors Industry	• Description of forest land, river, lake, estuary, sea, green belt, fallow and agricultural land at the point of effluent discharge
Mining	• Description of land-use, river, lake, estuary and sea at the point of final discharge of mining effluents. • Identification of species in core and buffer zones of mining project and consultation of the Wildlife Protection Act, 1972 as amended subsequently for listing of species with common name, scientific name and position in various Schedules of Wildlife Protection Act. • List of flora & faunal species authenticated by Chief Wildlife Warden of the state.
River Valley	• Information on land-use at the site of main dam structure, submergence area, canal network, township, settlement and any other facility • Description of fauna within 7 km periphery with additional information on species of economic significance, species of special interests to local population or tourists, aquatic fauna of commercial/recreational value and migratory fish species along with their spawning ground.
Hotels, Resorts and other projects in Coastal Zone	• Information on sand dunes and `No Developmental Zones' under different land-use. • Categorizations of project site into Coastal Regulation Zone categories • Description of breeding and nesting ground of aquatic organisms. • Information on the conservation status of the trees to be removed and mangroves to be cleared. • Area and aerial distance of core zone of Biosphere Reserve, reserved forest, wildlife habitat, habitat of endangered/exotic species, coral reef within 7 km of the periphery of the project site

For the original questionnaires, refer to MoE&F (1999). Application form and questionnaire for environmental clearances. Ministry of Environment and Forests, Government of India, New Delhi and the website **http://envfor.nic.in/**

Based on the nature of the preliminary information elicited through the questionnaires, the importance value of biodiversity components and the requisite levels of detail required are evaluated by MoE&F. EIA reports are then examined for their comprehensiveness in terms of coverage of the issues flagged up by MoE&F.

Some key information sources such as the National Wildlife Database on National Parks, Wildlife Sanctuaries and Biosphere Reserves, Red Data Books on Endangered Plants and Animals following IUCN guidelines, the IUCN listing of Threatened Species and the list of species protected under the Wildlife (Protection) Act (1972) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) form important references for MoE&F during the initial phase of scrutiny. These information sources greatly help in establishing the biological significance of the project area in terms of its status as a biodiversity hotspot, habitats of rare and endangered species and the Protected Area Network. They also help in evaluating the conservation status of species in the project area in terms of rarity, threat, endangerment, restricted distribution or endemism and in flagging up biodiversity values for consideration at the time of initial scrutiny, even in the absence of adequate information initially put forth in environmental appraisal questionnaire.

6.9.2 Existing sources of information and databases on biodiversity

The problems of predicting impacts on biodiversity values in less well-known areas outside the Protected Area Network that could also be critically important for conservation often becomes evident during the initial scrutiny by MoE&F. In the absence of reliable, relevant and comprehensive documentation on biodiversity status for the area of interest, EIA studies become the only means to interpret the conservation significance of such areas for consideration in the appraisal of the project. Over the years, through institutional efforts at the country level, information on diverse aspects of biodiversity is being increasingly generated to provide appropriate ecological reference points to initiate EIA studies. Some of the major institutional contributions in generating key information on biodiversity aspects that could serve both as bench marks for scoping phase of EIA and a tool kit for initiating baseline studies are presented in Table 5.

5 Major institutions contributing to information on biodiversity

Aspect of Biodiversity	Institution	Significant Outputs
Species diversity, floral inventories, checklists and status surveys of the endangered species at a National level	Botanical Survey of India with its 9 regional centers	Regional and State Flora Red Data Book of endangered plants
Taxonomic studies and status survey of faunal resources of the country	Zoological Survey of India with its 16 regional centers	Faunal checklists, inventories and status survey reports
Forest Diversity	• Forest Survey of India, Dehradun • Indian Institute of Remote Sensing, Dehradun • French Institute , Pondicherry • Indian Council of Forestry Research and Education, Dehradun	Forest cover maps and status reports, database on forests of different regions of the country, forest resource maps and vegetation maps, maintenance of national library and information for forestry
Forest Diversity of Eastern and Western Ghats	• Salim Ali Institute of Ornithology and Natural History (Coimbatore) • Tropical Botanical Garden and Research Institute (TGBRI), Coimbatore • Kerala Forest Research Institution, Peechi, Kerala • Wildlife Institute of India, Dehradun • Regional centers of Zoological and Botanical Survey of India • Indian Institute of Science, Bangalore • Indian Institute of Remote Sensing, Dehradun • Centre of Ecological Sciences, Bangalore	Status Survey Reports, Documentation of floral diversity of Western Ghat and Eastern Ghat Forests, Extensive database on distribution and conservation status of floral and faunal species.
Mountain Diversity Himalayan Diversity North-eastern diversity	 G.B. Pant Institute of Himalayan Environment & Development, Almora Regional centers of Zoological Survey of India at Dehradun, Shillong, Itanagar and Solan Wildlife Institute of India, Dehradun Institute of Bioresources, Shillong	 Published reports and monographs on diversity of mountains ecosystems and status reports on mountain species
Desert Biodiversity	Central Arid Zone Research Institute, Jodhpur	Inventories and Status reports of desert flora and fauna
Wetland Diversity	• Bombay Natural History Society, Bombay • Salim Institute of Ornithology and Natural History,	Waterfowl census reports Research, monitoring and status report on aquatic mammals, reptiles, birds and

	Coimbatore • Wildlife Institute of India, Dehradun • World Wide Fund, New Delhi • Zoological Survey of India	amphibians Directory of Indian Wetlands
Coastal and Marine Diversity	• National Institute of Oceanography, Goa • Central Marine Fisheries Institute, Barrackpur • Zoological Survey of India, Port Blair, Chennai, Kolkata and Digha • Botanical Survey of India, Port Blair • M.S. Swaminathan Research Foundation, Chennai • Madras Science Foundation, Chennai • Wildlife Institute of India, Dehradun	Documentation of estuarine flora and fauna. Identification and documentation of Indian coral reef diversity. Database on Indian mangroves and marine flora and fauna
Island Diversity	• Zoological Survey of India, Kolkata • National Institute of Oceanography, Goa • Central Marine Fisheries Research Institute, Goa	Inventorying and monitoring of biodiversity in Andaman and Nicobar Islands. Documentation on coral reef diversity

Apart from these systematic sources of information on biodiversity resources of the various regions and ecosystems, the Forest Working Plans of the State Forest Departments and the Management Plans of the Protected Areas provide floral and faunal inventories of the area within their specified administrative boundaries.

In addition to this pool of information that is available on various aspects of biodiversity, there are two important national database centers – the Indira Gandhi Conservation Monitoring Centre, New Delhi and the Wildlife Institute of India, Dehradun. These centers house computerized database on India's biodiversity resources including indigenous plants and animals species and habitats of conservation importance and a network of protected areas in India (these centers can be visited at http://www.wcmc.org.uk/igcmc/main.html and http://www.wii.gov.in

One of the most comprehensive initiative for collection, collation, storage and retrieval of scientific and technical information on specific areas of environment including biodiversity and its dissemination in the form of reports, reprints, bibliographies, abstract, databases and periodic bulletins is the establishment of a network of 25 nodes of the Environmental Information System (ENVIS) in select organizations and institutions under MoE&F. Of these, Zoological and Botanical Surveys, Centre for Ecological Sciences, Bombay Natural History Society, Forest Research Institute, Wildlife Institute of India and G.B. Pant Institute of Himalayan Environmental & Development represent some of the ENVIS centers that are exclusively dedicated to the dissemination of biodiversity related information.

6.9.3 Adequacy of biodiversity data for meaningful assessment and mitigation

The existing information sources and data banks on various aspects of biodiversity are of immense help in developing a broad framework for conducting EIA studies. Beyond this, the disparate nature of information collected at various spatial scales using contrasting approaches and methodologies in different time spans with wide variability both in terms of seasons and actual locations cannot really substitute the need for a detailed study.

Existing floral and faunal inventories and status survey reports generally provide snap shots of biological richness for areas at much larger scales than usually required for individual projects and therefore have limited use in meaningful interpretation for project EIA. Possible exceptions are hydro projects in larger river valleys and mineral exploration projects in large forested tracts. At the same time status survey reports, resource maps, vegetation profiles, animal census data, population estimates, species distribution records and floral inventories provide some clues in selection of sites for conducting reconnaissance to define study limits and determine the scope of studies for generating ecological baselines.

The secondary information sources certainly guide in selection of valued ecosystem components within the project area. This becomes all the more useful for achieving a better characterization of baseline conditions within limited time and funds available for field studies. In some cases good, consistent and reliable secondary data sources are extremely helpful in narrowing down the scope of work to accomplish more focused studies that help in prediction of some key impacts on indicator species or valued ecosystems. Examples of data sources that have been helpful in planning systematic baseline surveys are remotely sensed data for detecting trends in forest cover extent, changing profiles of biotic and anthropogenic pressures and vegetation and land-cover maps.

6.9.4 Relevance of field studies in biodiversity impact assessment

Consistent and regularly updated meta data on regional and local taxonomy and floristic and faunal diversity of areas for country as big as and as diverse as India are almost non existent to aid in the instant plugging of information on biodiversity profiles required almost universally as part of baseline studies for EIA. In such a situation, though good baseline studies are essential pre-requisites for ensuring reliability of primary data, yet most EIAs reflect that the baseline information has been generally deficient because of lack of adequate data inputs from field studies. Such EIAs defeat their basic purpose of ensuring informed decision making . The professional ethics of the EIA practitioners, their will and the skill to conduct field surveys, accessibility of key information sources and the availability of the technological resources for undertaking EIAs primarily govern the levels of coverage of biodiversity issues in EIA in India. This however is not a rule and extensive biodiversity surveys have been an integral part of some good EIA studies in India. The results of these biodiversity surveys have also effectively contributed to enriching the existing pool of knowledge of the biodiversity of the country. These contributions are sometimes recognised in the actual value additions in terms of new records or a new database but are more often recognized in the validation and updating of the existing information base.

An EIA for the proposed 560 km long Haldia-Barauni Pipeline Project of the Indian Oil Corporation Ltd. was conducted by a team of Wildlife Institute of India scientists in 1994. As part of the ecological impact assessment, baseline studies were conducted to evaluate the

biodiversity values of key wildlife habitats within the pipeline route corridor. Based on the macro level assessment six rivers, four marshes and three forest areas were identified for ecological surveys within the pipeline corridor. The results of the ecological survey of the Rupnarayan river in West Bengal confirmed the occurrence of river dolphin (WII, 1994). The present distribution range of river dolphin in tributaries of river Ganges did not include this river. This value addition to the existing biodiversity data was significant with respect to river dolphin distribution in Asia and was of immense interest to IUCN's Cetacean Group for updating information on river Dolphin Status in India and Asia .

The EIA-studies conducted for Sardar Sarovar Project in Gujarat (Sabins & Amin, 1992), Tehri Hydroelectric Project in Uttranchal (BSI, 1990), Pipeline Project in Madhya Pradesh (WII, 1993), Narmadasagar Project in Madhya Pradesh (WII, 1994) and Airport Project in Mizoram (WII, 1997) have contributed in the development of biological resource inventories and in the enhancement of ethnobotanical knowledge of various regions. While some of these field studies have also helped in the standardization of modern computer aided techniques like the habitat evaluation procedures developed by US Fish and Wildlife Service, others have been significant in prioritizing areas to be recommended for upgrading to Protected Area-Status (WII, 1993 and 1994).

It thus becomes increasingly important to ensure that the collection of baseline information for prediction of impacts is adequately supported by scientific information generated through systematic and well planned field studies in areas prioritized through a good scoping exercise. This focus on the field component of EIA studies can be made more binding through specific provisions of field studies in the ToR for EIA practitioners opting to conduct Biodiversity Impact Assessment as part of the comprehensive EIA of the projects. These ToRs should also qualify the expected outputs for better incorporation of desired levels of biodiversity issues (gene, species and ecosystems) that are also in accordance with their relevance in the impact statement of a given project.

6.9.5 Mitigation approaches for addressing biodiversity threats

The significance of biodiversity impacts as established through spatial and temporal dimensions of impacts and the conservation values of the biodiversity resources of the receiving environment have determined to a large extent the choice of mitigation approaches. Some flexible approaches have been adopted to rationalize the criteria for determining the conservation significance of biodiversity resources in India but all of these essentially incorporate the rationale behind the already laid down criteria (Ratcliffe, 1977 and Margules and Usher, 1981) being globally adopted. The mitigatory approaches generally adopted are guided by the considerations of significance of impacts and may include preventing, and ameliorative strategies demanding a ban on the proposed activity, replacement/restoration of values likely to be lost and ecological compensations, by way of creating new Protected Areas. The incorporation of mitigation measures recommended for implementation of projects in India as part of EIA have met with varying degrees of success. The key factor that has influenced the successful implementation of mitigatory measures is the lack of assessment of the technological, ecological, financial, operational and administrative feasibility of recommended mitigation measures.

In such a situation the projects that are cleared with specific conditions stipulated for mitigation of biodiversity impacts are actually implemented with either no mitigation measures incorporated or with mitigation of impacts attempted only partially. The projects that have adequately addressed the biodiversity issues through sound mitigation planning are only few.

Table 6 summarizes the evaluation of EIA system with respect to integration of biodiversity concerns. The subsequent section provides illustrative examples of contrasting scenarios of biodiversity integration in the Indian EIA system.

Table 6 Evaluation of the EIA System from a Biodiversity perspective

EIA Process	Evaluation Criteria	Current practice		
Application	To plan, policy & programs		x	
	To projects	✓		
	As mandatory requirement	✓		
	As funding requirement			∅
Provision for EIA	Legal instruments	✓		
	Policy recommendations	✓		
	Sectoral environmental guidelines	✓		
Category of Projects	All		x	
	Select (based on legal provisions)	✓		
	Coverage of all projects with significant impact potential	✓		
Scrutiny/Screening	Legal instruments	✓		
	Requirement under process			∅
	Availability of expertise	✓		
	Public involvement		x	
Scoping	Legal instruments		x	
	Availability of documentation			∅
	Based on secondary information	✓		
	Based on primary information			∅
	Availability of expertise & experience			∅
	Public involvement		x	
Impact Prediction	At gene level		x	
	At species level			∅
	At ecosystem level			∅
	Adequacy of primary data			∅
	Adequacy of secondary data	✓		
	Availability of methodology			∅
	Public involvement			∅
Mitigation	Adequacy of mitigation measures			∅
	Conduct of feasibility analysis			∅
	Status of ecological feasibility			∅
	Status of technological feasibility			∅
	Status of financial feasibility			∅
	Status of operation feasibility			∅
	Public support in mitigation planning			∅
Review of EIA	At state level			∅
	At federal level		x	
	Independent process		x	
Decision Making	Incorporation of biodiversity conservation			∅
Final Outcome	Implementation of mitigation			∅
Monitoring	Local		x	
	State			∅
	Regional			∅
	Monthly		x	
	½ yearly	✓		
	Incorporation of corrective measures			∅
Post Project Review	Mandatory		x	
	Forced by public invention			∅
	Forced judicial intervention			∅
Environmental Auditing	Legal requirement		x	

(✓ - Yes x - No ∅ - Partial)

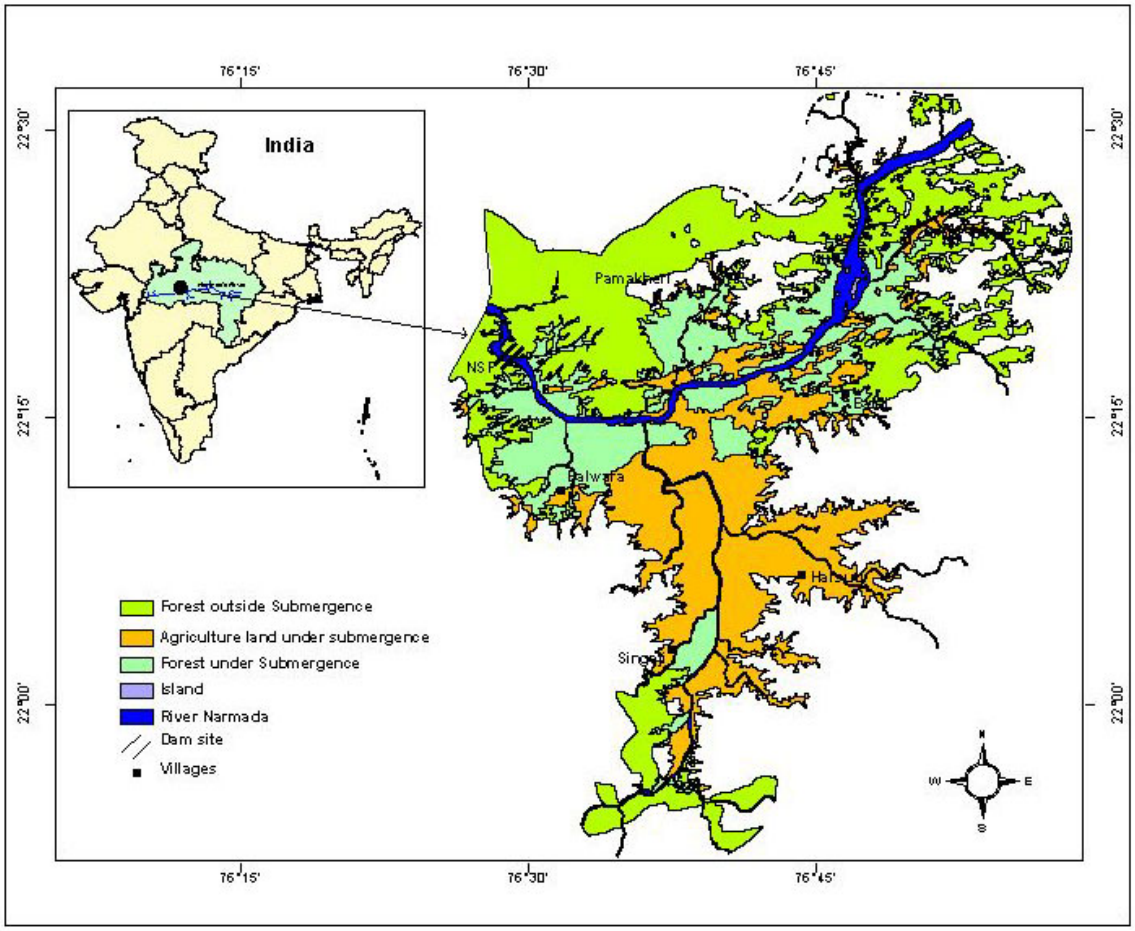
6.10 Illustrative case studies: EIA projects

6.10.1 Integration of Biodiversity Concerns in the EIA of Narmada Sagar Multipurpose Dam Project

This case study demonstrates a good example of integration of biodiversity concerns through the development of appropriate, effective and feasible mitigation measures. This case study is based on detailed EIA study conducted by the authors who were the Principal Investigators of this study.

Project location

The Narmada Sagar Multipurpose Dam Project is one of the series of projects in the Narmada Valley. It is located across river Narmada near Punasa village (latitude 22^0 17' N and longitude 76^0 28' E) in Khandwa district of Madhya Pradesh State Figure 3).



3 Location of Narmada Sagar Project

CASE STUDY 6 INDIA

Project proponent

The Narmada Valley Development Authority (NVDA), a wholly owned subsidiary of the State Government of Madhya Pradesh was appointed as the project implementation agency. Narmada Control Authority, a statutory body under the Central Government was entrusted with the responsibility of planning, implementation and monitoring of environmental safeguards.

Project proposal

The Narmada Valley Project is the single largest river valley development project that envisages the construction of 30 major dams on river Narmada and its tributaries.

Of these, the Narmada Sagar Project (NSP) is one of the two large dam projects on river Narmada. The project involves construction of a 91.4 m high concrete dam. It will have an installed capacity of 1000 MW and an irrigation potential of 1,23,758 ha. The project will submerge 91,348 ha of land of which 40,332 ha is forested land and the remaining 44,363 ha is cultivable land. The project also involves a displacement of 1,50,000 people living in 254 villages in the submergence area. The total cost of NSP was estimated to be Rs. 25,000 crores or US$ 5435 million.

Project alternatives

Initially, the project proposal was conceived on the basis of the Master Plan for water resources in the Narmada Basin, developed by a Committee appointed by Government of India. This Master Plan could not be accepted as it failed to resolve the conflict on sharing of waters between the different States involved. Finally, the Narmada Water Dispute Tribunal (NWDT) was set up in 1969 to develop the integrated project plan for harnessing the waters of Narmada. The NWDT award fixed the location of the dam, its height and other parameters with major considerations of optimizing the benefits of (power and irrigation potential) from the project. In the location of the project, biodiversity issues and the social economic consideration found no place . Consequently, this project has been mired by the controversy of 'Large Dams v/s Small Dams' on account of large scale environmental, ecological and social impacts and has been quoted as the `world's greatest planned disaster' (Goldsmith & Hildyard, 1984). Following this, the issue of alternatives to this mega dam project became more contentious than the design alternatives.

Characteristics of the development area in terms of biodiversity

The Narmada and its forests are a unique river system in the Central Indian highlands. Originating on the plateau of Amarkantak in Shahdol district of Madhya Pradesh, the river Narmada winds its 1,312 km long way to the Arabian sea through forested hills, agriculture plains and narrow rocky gorges. Its countless tributaries, and a basin bounded by mountain ranges (Satpura, Vindhyan and Maikal ranges) have shaped the river valley that is a home to over 20 million people, mostly tribals with forested habitats for many aquatic, riparian and terrestrial plant and animal communities.

The floristic and faunistic values of the project area are characteristic of the typical Central Indian well-drained forest ecosystem in the Vindhyan and Satpura Ranges. The forests in this biogeographic zone comprise of dry deciduous teak (*Tectona grandis*) dominated forest

with miscellaneous forest species forming several distinct vegetation associations in the project area.

The flora of the Narmada Sagar Project area comprises nearly 400 species of plant representing 76 families of Angiosperms (WII, 1994). The vegetation displays a wide variety of diversity in terms of structure, functions and associations. Though none of plant species are listed as threatened or rare in the Indian Plant Red Data Book (Nayar and Sastry, 1987, 1988, 1990), almost all species have established ethnobotanical values and form an extremely important resource base for tribal communities residing in the project area (WII, 1994). The forests of the project area offer excellent habitats for a variety of Central Indian fauna. These include herbivores such as Sambar, Chital, Nilgai, Chousingha and Barking Deer and carnivorous species such as Tiger, Leopard, Wolf, Hyena, Jungle Cat, Fishing Cat and Indian Fox. The other mammalian species found in the project area are Giant Squirrel, Common Langur, Rhesus Macaque, Mongoose and Indian Civet. The Indian Otter represents that only aquatic mammal of conservation significance. Fresh Water Turtles and Mugger Crocodile represent the major reptilian species. The avian diversity is represented by 209 birds recorded from the project area (WII, 1994).

Availability of biodiversity information

This EIA study was perhaps the first of its kind in India to have been undertaken as a long term study for generating a systematic, comprehensive and precise baseline for evaluation of biodiversity impacts of the project. Over 200 references on various aspects of biodiversity including detailed methodologies for inventorying, monitoring, modelling of biodiversity, study of biological communities and records of distribution, abundance and status of species were available to provide secondary information for planning a field based study. Some of key information sources that were of particular relevance for floristic and vegetation studies in the project area included the classic works of Champion and Seth (1968); Gaussen *et al.* (1970), Brandis (1972) and Puri *et al.* (1983). Ethnobotanical information was available from studies of Jain (1963a; 1963b; 1964; 1965a; 1965b; 1981a; and 1981b), Caius (1986), Oommachan *et al.* (1987, 1988 and 1989), Prasad and Pandey, 1987 and Prasad *et al.* (1988). Site-specific information on terrestrial wild mammals, aquatic vertebrates and avifauna was available from the working plan records of the State Forest Deparment and from several checklists of animals, birds, reptiles and fishes (Daniel, 1983; Ali and Ripley, 1986; Jhingaran, 1991). Habitat Suitability Index Models developed for a wide range of species by USFWS and the Habitat Evaluation Procedures developed by USDI, (1980a & b) were particularly relevant and important sources for developing similar approaches for the baseline studies.

EIA process

The EIA practice adopted for this project was a deviation from the EIA process that was in place since the promulgation of EIA Notification. This deviation was on two counts –

1. The environmental clearance to this project was granted in 1987, without an EIA. Following this, Planning Commission also granted the investment clearance in 1988, paving way for the implementation of the project.

2. As per the conditions stipulated at the time of grant of environmental clearance the environmental impact assessment studies were required to be

accomplished to implement the environmental safeguards *pari-passu* (*i.e.*, conducting environmental assessment studies concurrently with construction work on dam).

With this condition, the role of EIA shifted from that of aiding in decision making to that of aiding in environmental planning of the development project. Narmada Control Authority, a statutory body of the Central Government, which was made responsible for the implementation of the safeguards, identified the major parameters for environmental impact assessment of this project.

The study of the flora and fauna of the area was one of the directives of Narmada Control Authority to incorporate the safeguards for the protection of biodiversity resources of the project area. This floral, faunal study along with attendant human aspects was undertaken by a team of scientists from Wildlife Institute of India, as a three-year project supported by funds from Narmada Valley Development Authority. The following were the specific stages in the EIA study conducted:

Scoping: Based on the scope of work defined in the Terms of Reference (ToR) of the study, reconnaissance studies were undertaken in the project area to determine the boundaries for the biodiversity surveys and scope of detailed field investigations. Finally, the following areas were defined for inclusion in the study area:

(i) Forest area under submergence
(ii) Forest area outside submergence
(iii) Islands under proposed submergence
(iv) Randomly selected villages from within the different clusters identified on the basis of socioeconomic parameters

The scope of the baseline studies in these areas included (i) study of plant communities (floristic, phyto-sociology and ethnobotany) (ii) evaluation of the wildlife habitat quality (iii) distribution and status of major faunal components in the project area and (iv) socio-economic profile of the local communities as determined by their dependence on biodiversity resources.

Impact Evaluation: This aspect of EIA was accomplished by conducting extensive field studies spanning over three years and adopting a blend of robust and well established field techniques, and computer based predictive techniques involving the use of Remote Sensing, Habitat Evaluation Procedures and GIS applications.

On the basis of the baseline information generated from field studies the following impacts on biodiversity were considered significant:

- Submergence of 175 species of plants belonging to 138 genera and 65 families recorded during the floristic survey of the Narmada Sagar Project.
- The submergence of 403.32 km^2 of wildlife habitat leading to a direct loss of 99 habitat units of Chital and 80 Habitat Units of Sambar.

- Reduction in home ranges of ungulates species such as Chital, Sambar, Nilgai, Chinkara, Chausingha, Barking deer and Wild boar and changes in the territory size of Tiger and Leopard due to submergence of wildlife habitats.
- Direct impacts on food availability and feeding ecology of Primates and Giant Squirrels due to clearance of vegetation in the submergence zone.
- Direct and irreversible loss in the avian diversity of the area currently represented by 209 bird species belonging to 53 families due to submergence of woodland habitat and inundation of small rivers & streams.
- Loss of habitats of Fishing Cat due to the submergence of Kitti group of islands.
- Changes in migration patterns, home range, breeding and denning sites of Otter due to fluctuations of water levels downstream of dam, habitations in the upstream habitats and disturbance in draw down areas of the reservoir.
- Overall decline in biodiversity resources due to increased biotic pressures and physical disturbances associated with peripheral developments outside the submergence zone and the consequently lowered biodiversity value.
- From the results of the social survey it become evident that irrespective of caste, landholding size and occupation pattern, the project affected people would suffer a substantial drop in their income.

Mitigation: considering that the wildlife species (floral and faunal) and vegetation associations found in submergence area are not unique to the project area, compensatory and restorative approaches were recommended for restoration of the lost biological values and their habitats. These included :

- Creation of three new Protected Areas – Narmada National Park (496.70 km^2), Surmanya Sanctuary (126.67 km^2) and Omkareshwar Sanctuary (119.96 km^2) comprising of a total area of 788.57 km^2 has been recommended to fulfil the twin objectives of conserving wildlife in remnant areas and providing sustenance to forest dependent communities. The recommended alignment of the proposed PA boundaries that included a part of the reservoir ecosystem, the largest forest island, the draw down areas and contiguous forests provided some special features to the PAs along with a good mix of habitats with concomitant floral and faunal values. Appropriate management interventions in the fringe forests and the draw down areas were suggested to enhance the overall habitat values over a period of time.
- Restoration and translocation of the otter and aquatic reptiles to several vacant niches in Central Indian river or within the suitable stretches of Narmada both upstream and downstream was also included in the mitigation plan.
- For ensuring the sustained use of biological resources by the local people, measures for the enhancement of existing biodiversity resource base for the local people were suggested. These involved viable rehabilitation and resettlement packages alongwith implementation of ecodevelopment strategies and Joint Forest Management (JFM) initiatives for mitigation planning.

Monitoring: The Government of India constituted a Narmada Control Authority (NCA), a statutory body comprising of State representatives and other government departments and scientific institutions for monitoring the progress in implementation and compliance of environmental safeguards included in the Action Plans for mitigation of environmental, social and biodiversity impacts of the project.

The mitigation plan suggested by the Wildlife Institute of India to address the biodiversity impacts has been accepted by the project proponent and accordingly, the State Forest Department is in the process of notifying the three new Protected Areas. The State Forest Department has also got prepared a 'Forest Harvesting' plan which ensures that wild animals would be provided a safe passage through a corridor when the actual submergence takes place.

The legal framework governing settlement in the State of Madhya Pradesh clearly stipulates that the land lost to submergence must be compensated by grant of land. As on today project authorities have not been able to identify the land. Instead the project authorities have tried to influence people to accept cash compensation in lieu of land. In this scenario, large populations have been uprooted from their homesteads and have been deprived of the cultivable lands and the resources that sustained their basic socio-economic needs. The reduction in their income is substantial, notwithstanding the commitment of the project authorities to provide economic benefits to the project affected people of the dam.

The other significant flaw in the consideration of environmental safeguards of NSP was the isolated approach to view impacts of individual projects in a single basin. This approach has clearly neglected the consideration of chain of impacts that affect the economic viability of multiple projects, the ecological integrity of the river valley ecosystem and the survival of wildlife species in a completely altered habitat, modified by pressure of displaced and resettled population within the same valley.

Final outcome and lessons learned

The project area is a part of the large Central Indian landscape dominated by dry deciduous forests and characterized by the presence of tribal communities directly dependent on the natural resources for food, shelter and employment. A major conflict arises between development and biodiversity conservation when development projects are located in the wilderness areas because such projects impact upon prevailing patterns of allocation of land and resources to people and interfere with various forestry and wildlife conservation objectives. The lifestyles of the people living in forested regions, however, continue to be substantially dependent upon forest biomass resources. Usually, therefore, when sizeable further diversion of forest result from the implementation of such projects, the residual forest area in the tract comes under even greater pressure, compounding the impacts. The river valley projects invariably alter the social fabric of local communities, affecting their indigenous lifestyles and culture and accelerate the transition to a market economy centred in big towns.

This case study has shown that mitigation has to be a continuing obligation to be carried out during the implementation of the project and not a *post facto* token acknowledgement of some 'unfortunate disruption'. It is also to be acknowledged that while it may be possible to mitigate some losses relating to species and habitats, mitigation of the social impacts on the 'Project Affected Persons (PAPs) is complex and difficult especially in view of the very number of people who would be displaced. The poor track record of the planning and implementation of the Resettlement and Rehabilitation (R and R) packages in development project also needs to be seriously considered. Thus on account of the large scale 'social

disruption' involved in river valley project including this one, the approach towards construction of large dams needs to be carefully reviewed.

The efforts towards development of this dam have stirred the people's movements against dams in India and in other parts of the world. The controversies that now surround these dams on Narmada have challenged the dominant model of development that holds chimerical promises of economic prosperity but perpetuates an inequitous distribution of resources and portends irreplaceable social, environmental impacts in which the biodiversity concerns find a much lower priority. Despite this, in the present case, the acceptance of the range of suggested mitigation measures to minimise biodiversity losses and their progress on ground is a major positive fallout of this project.

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6.10.2 EIA of Sankosh Multipurpose Project

This case example demonstrates one of the best examples of integration of biodiversity concerns in development planning through the application of timely corrective measures, suggested after an independent review of an EIA that had failed to capture the significant impacts of the projects on the unique biodiversity values.

This case study is based on the review of the EIA of this project by one of the authors (Dr. Asha Rajvanshi) who was a member of the independent review committee of Government of India for this project.

The main rockfill dam under the Sankosh Multi-purpose Project is proposed to be located on river Sankosh, 13 km from the Indo – Bhutan border near Kerabari in Sarbang subdivision in southern Bhutan at a latitude 26°41'4"N and a longitude 89°55'55"E. The left dam is located near Kalikhola at Indo – Bhutan border at a latitude 26°44'09"N and a longitude 89°51'42"E. The canal proposed under this project will take off from the right bank of the river at the lift dam and would traverse a distance of 13 km in Bhutan before entering India (Figure 4).

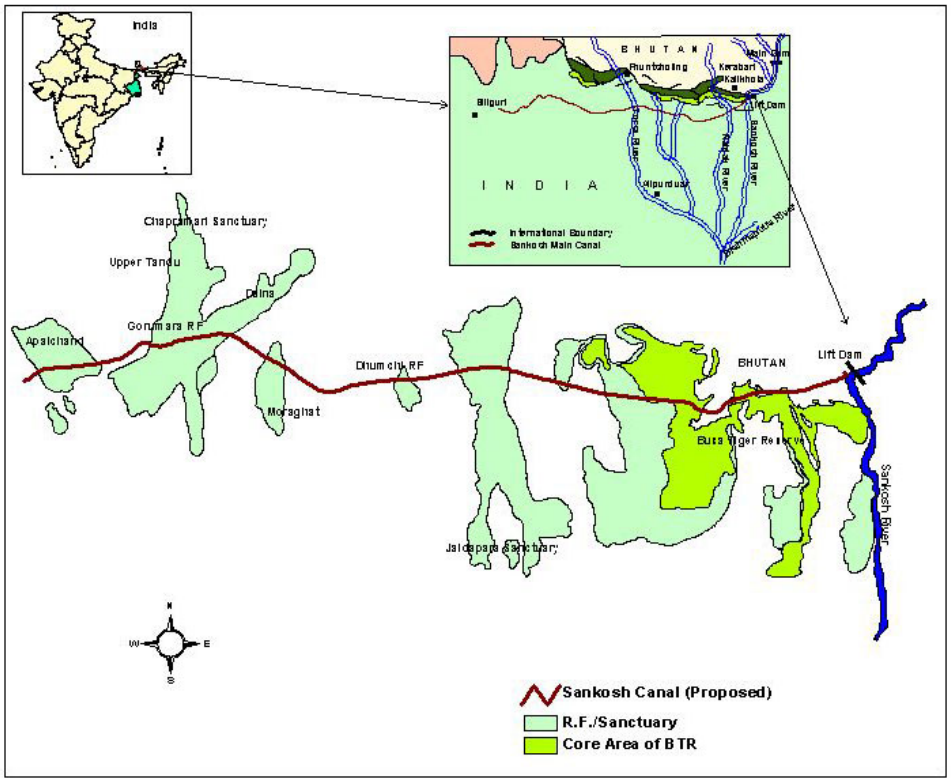

Figure 4 Location of Sankosh multi-purpose project and the canal alignment

CASE STUDY 6 INDIA

The Government of India and Royal Government of Bhutan conceived the Sankosh Project after conducting the pre-feasibility studies in 1983 and entrusted the preparation of Detailed Project Report (DPR) to Central Water Commission (CWC), Ministry of Water Resources, Government of India in 1993 who in turn associated Water and Power Consultancy Services Limited (WAPCOS), India to carry out the environmental impact assessment.

The project has been conceived as a multipurpose project with two distinct components *viz.* (i) The storage project with a 265m high dam on river Sankosh along with a downstream lift dam of 62.5m height with power generation capacities of 4000 MW and 60 MW respectively. The storage reservoir with a water spread area of 6178 ha at Full Reservoir Level (FRL) would have a gross storage capacity of 632.5 mm^3 and live storage of 4456 m^3. The lift dam pond will have a gross storage capacity of 144 mm^3 and would have a water spread area of 821 ha at FRL and (ii) The canal component of the project includes a 141.7 km of canal that would take off from the right bank of the river at the lift dam for utilization of 348.3 cusec of water for irrigation of 0.4 million ha of land in India.

The reconnaissance studies conducted in 1983 by the Indo-Bhutan joint reconnaissance team led to the preparation of the pre-feasibility report of Sankosh Project. After an in-depth study of the regional, topographic, geological conditions and water availability, the above project was conceived and the development of Detailed Project Report (DPR) was recommended. Subsequently, the task of preparation of DPR was entrusted to CWC in 1993 and the DPR was prepared in 1997 after considering the best design alternatives and maximum economic benefits in terms of both, power generation and irrigation potential.

Characteristics of proposed development in terms of biodiversity: Bhutan

Bhutan is a land locked mountainous country situated at the confluence of the major biogeographical regions *i.e.* the Palaearctic and Indo-Malayan and is endowed with extensive pristine forests harbouring a wide variety of floral and faunal species unique to this biological 'hotspot' of the world.

Of the total 7000 ha of forest land under submergence, approximately 5400 ha (77%) comprise of sub-montane, temperate and sub – alpine forest. The semi evergreen forests in the submergence area have dense tall canopy forests harbouring a wide variety of rare, endangered and endemic species that characterize the ecology of the area. Around 1830 ha of Phibsoo Wildlife Sanctuary fall under the submergence area which represents nearly 6.6% of the total area of the Sanctuary. The Sanctuary is a home to several species of threatened fauna including the Elephant (*Elephas maximus)*, Gaur (*Bos gaurus*), and Golden Langur (*Trachypithecus geei*). The results of fish surveys conducted upstream of the main dam site identified 21 species of fishes of which *Tor tor* is a Schedule I species under the Forest and Nature Conservation Act 1995 of Royal

Characteristics of proposed development in terms of biodiversity: India

The proposed 141.7 km canal will enter India after traversing 13 km length in Bhutan. In India, the proposed canal would traverse through 14.5 km of core and 9.35 km of buffer areas of Buxa Tiger Reserve (BTR). The canal would also traverse through Gorumara National Park, Jaldapara and Chapramari Wildlife Sanctuaries covering 55.25 km of total stretch of forests in North Bengal (Figure 4). The wildlife habitats *enroute* the canal represent a composite stronghold for Elephant, Tiger, Rhinoceros and also serve as a vital corridor for movement of animals between them and also between West Bengal, Assam and Bhutan. The Elephant population of the wildlife habitats *enroute* the canal is a part of the four major geographical zones of discontinuously distributed populations of Asian elephant.

Availability of biodiversity data and its use in impact prediction

Considering that the areas falling under the storage project and along the canal route represent important biogeographic zone and include parts of Protected Areas in Bhutan and India, their biological values are fairly well documented. The recent Management Plan of Buxa Tiger Reserve and the National Wildlife Database on Protected Areas in India that is housed in Wildlife Institute of India are the most important data sources that could have greatly assisted in developing the biodiversity profile and ascertaining the conservation significance of these habitats and the species in the corridor area. These references or the list of any other documents consulted in the EIA study were 'however' not referred in the EIA report.

The EA process adopted

Screening: This major water resource project with financial outlay of over US$ 10.86 million required mandatory EIA for obtaining environmental clearance. Also, since the project involved two countries, an assessment of trans-boundary impacts became a major requirement for obtaining clearance of the Government of India for implementation of this joint venture.

Scoping: a preliminary scoping exercise was attempted by the EIA-consultants appointed by CWC for the EIA of this project. This involved developing an exhaustive list of all likely impacts based on as many sources as possible. The various disciplines of environment and the likely impacts were drawn into matrix to identify critically important parameters for developing the scope of the study. Since this matrix was not included in the report, it was difficult to comment on the rationale and logic adopted for weighing the importance of parameters selected for the study.

Impact assessment: the assessment of impacts was based on very broad understanding of issues ascertained through the documentation of information on various parameters to develop impact prediction. The assessment results not only failed to capture significant biodiversity impacts but also clouded the judgement of significance of impacts by hypothesizing post-project scenarios through 'prophetic' statements with little regard to ecological concepts. Few examples of impact statement made in the EIA document are as follows:

- "Since the area falling in the submergence area is small and is the outer peripheral rim of the sanctuary, the impact of reduction of animal habitat is likely to be insignificant.

Moreover, the primary animals are basically herbivores and do not have a strict territorial dominance. Under these circumstances it is rather apparent that the shrinkage of the sanctuary by about 6.6% will have no adverse impact on wildlife. However, the receding of water will create mud flats which may provide suitable feeding sites for migratory birds in autumn and spring".

- "The movement of elephants across the canal can be restored by seven bridges (50 meter wide and 200 m long) on identified location with appropriate measures to camouflage the structures by giving earth cushion and growing vegetation so that these bear close resemblance with natural corridors".
- *"Tor tor,* a migratory fish species may find it difficult to survive as their migratory route will be blocked. But in the new ecological environment, fresh spout of species will be witnessed. The lacustrine environment is also likely to be rich in biodiversity and quite a few useful varieties of fish will evolve."

Similarly, the assessment of the impacts of the canal through the forested area failed to recognize the significant ecological impacts beyond those associated with physical activities in the canal route, vegetation clearing and peripheral developments in the construction phase.

Mitigation: The mitigation approach adopted was based on poor conceptualization of the impact significance and therefore offered too simplistic options for mitigating a few of the identified impacts on biodiversity. Some of the proposed mitigation measures included (i) protection of the catchment area and the maintenance of its integrity through better organization of the protection force (ii) development of the parts of catchment area into a Wildlife Sanctuary for mitigation of biodiversity losses in the submergence area and (iii) construction of bridges across the canal for mitigating the barrier impacts of the canal and for maintaining the elephant movements along their identified migratory routes.

These mitigation measures have been suggested without any prior efforts of evaluating the technical, physical, financial and operational feasibility of the measures proposed.

Acceptability of biodiversity survey techniques

Although the methodological approach adopted for the EIA study indicated that some attempts were made to collect primary information by undertaking field based studies, the report was silent on field techniques adopted and the time schedule, duration and locations of the surveys.

Obvious omissions in terms of biodiversity impacts

The EIA of Sankosh Multipurpose Project failed to capture some of the most significant threats and their long term implications on conservation of biodiversity resources. Some of these include:

- Destruction and spatial reduction of available habitat for unique & endangered wildlife species within the submergence area would have direct implications on conservation of biodiversity resulting from immediate loss of habitats of some of the unique and representative species (elephants, rhino, gaur, hog deer and hispid hare) of this biogeographic zone and the long term threats of their extinction.

- The bisection of the forest corridor by the proposed canal would have serious implications on the viability of populations of endangered species like elephant affecting their long term conservation.
- The 200 m wide canal through 55 km length of elephant habitats would pose a most formidable barrier to the movement of elephants along their traditional routes leading to manifold increase in man-animal conflicts.
- Mortality due to accidental falls of elephants and other animals in open canals proposed for alignment through natural habitat could be a direct threat to its population structure.
- The canal would redefine the spatial distribution of tiger and its prey species and may lead to increased incidence of tigers straying in surrounding villages for livestock predation.
- Population of rhinoceros and gaur would be adversely affected due to fragmentation and reduction in their habitat by the canal network.

Final analysis of impacts and the environmental decision on this project

The biodiversity conservation issues linked to this project were so serious that the EIA report prepared by the Water and Power Consultancy Services (WAPCOS) on behalf of Central Water Commission in 1997 was subjected to strict scrutiny by an Expert Committee constituted by MoE&F in 1997 specially for the environmental appraisal of the project in the light of findings of EIA. The Committee met twice in the year 1997 to review the EIA report and the DPR of the project and subsequently undertook site visit in 1998 to review the project in the light of efficacy of the mitigation measures proposed to maintain the contiguity of wildlife habitats. Based on their observations in the field and consultations with wildlife experts and the past record of poor acceptability of artificial structures by elephants for crossing over of water channels, the efficacy of bridges as crossing over structures was not found to be convincing. Reported mortality of large numbers of species due to accidental falls into canals and similar anecdotal incidences reported from canals in other project areas (Sukumar, 1989; Johnsingh and Joshua, 1994) became other supportive reasons for reconsidering the efficacy of proposed mitigation measures to overcome the biodiversity impacts. In the final project analysis, the Committee felt that exploring an alternative route for canal component of the project would perhaps be the only preventive strategy for mitigating significant biodiversity losses. The CWC, the agency appointed for implementation of the project reviewed the alternatives and confirmed that no other technologically feasible and economically viable alternatives were available for route alignment.

With only 342 MW of hydropower potential tapped of the estimated 20000 MW potential of the water resources of the country, the Royal Government of Bhutan expressed keen interest in the implementation of proposed dam component of the project and made a firm commitment to effectively mitigate the project induced biodiversity impacts by enhancing protection in remnant forest areas. Since the project would also have intended benefits to India through reduction in power deficit, the MoE&F finally took the decision to recommend the construction of the dam in Bhutan and reject the canal component in August 1999. Such a trade off between biodiversity losses and economic benefits accruing from multipurpose project demonstrated one of the best example of integrating biodiversity concerns in development planning.

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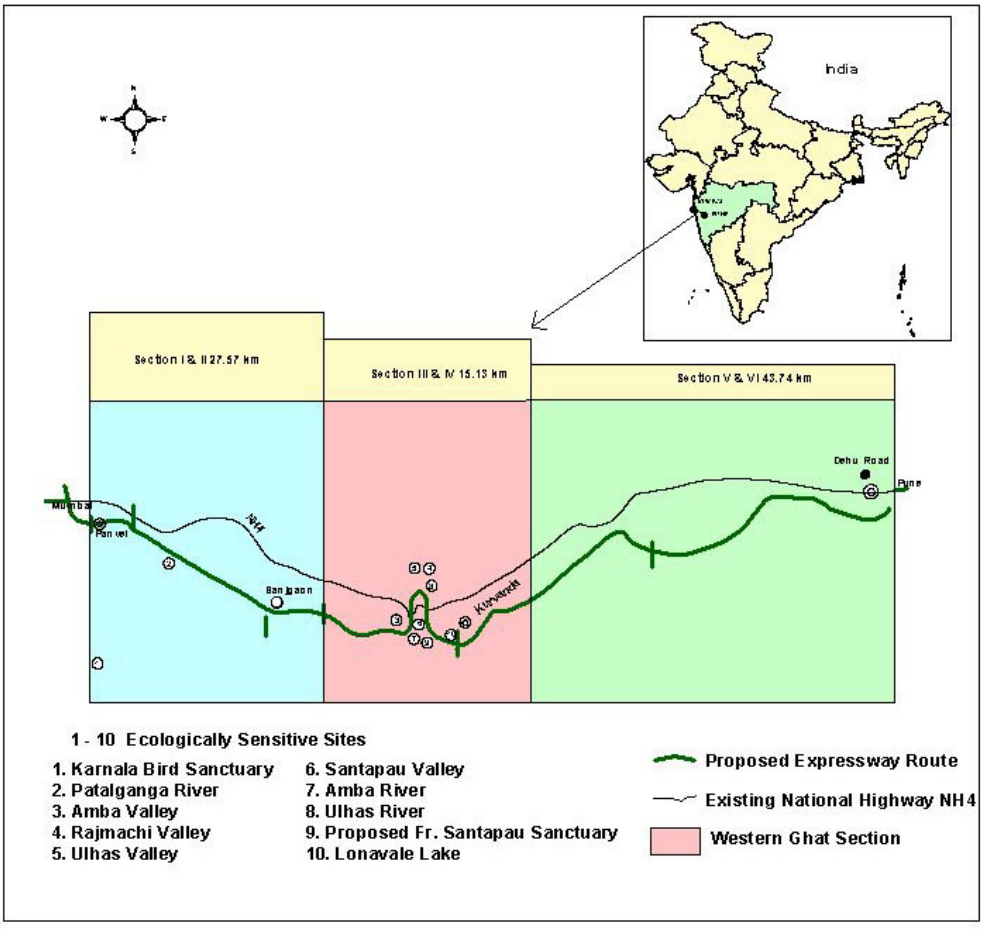
6.10.3 Integration of biodiversity concerns into EIA of Mumbai- Pune Expressway Project

This case highlights how environmental safeguards through carefully developed mitigative measures for integrating biodiversity concerns have been grossly violated during the implementation phase of a major expressway project.

This case study is based on EIA study conducted by the authors who were the Principal Investigators.

Project location

The Mumbai-Pune Expressway is aligned to connect Mumbai, which is the largest commercial town in the State of Maharashtra with Pune, a nodal township also located in the same State of India (Figure 5).



Pune Expressway Project

The Maharashtra State Road Development Corporation (MSRDC), a wholly owned subsidiary of the State Government of Maharashtra were the project proponent. Funding support for this project was obtained through loans from the State Government and other financial institutions including international bank. The total cost of the project was Indian Rs. 1600 crores or US $ 347 million.

The Mumbai-Pune Expressway Project was conceived to provide a major road alignment to divert 60% of the total existing traffic of 13748 Passenger Car Unit (PCU) and a total of 43414 PCU of the projected traffic between Mumbai and Pune for the year 2020 for (a) improving inter-urban transportation facilities; (b) boosting the economy of the state; and (c) ensuring safe travel. The 87 km long expressway is the country's first venture into the development and operation of an international standard expressway on a 'Build-Operate-Transfer' (BOT) basis. It has been aligned to provide 3 lanes in each direction with a 7m wide road divider with 6 interchanges, 4 major bridges, 10 minor bridges, 15 viaducts, 21 subways, 19 underpasses and 9 tunnels. The route of the proposed project is aligned through several ecologically important areas having significant biodiversity values (Figure 5).

Alternative expressway alignments

Several expressway alignment alternatives were explored by M/s Rail India Traffic and Economic Services (RITES), the Transportation Consultants and Engineers for the project to arrive at the most feasible route. Eight expressway routes and 3 transport corridors were investigated in terms of lengths of tunnels and viaducts, steepness and length of grades, construction costs and environmental considerations such as length passing through forested areas, impacts on wildlife and proximity to human settlements. The option of widening the existing National Highway (NH-4) between the two cities, Mumbai and Pune was also considered. Finally, the alignment starting from Panvel bypass near Mumbai and running almost parallel to the NH-4 and bypassing Khopoli, Khandala, Lonavala and reaching its endpoint near Dehu Road, Pune was selected (Figure 5).

Characteristics of the development area in terms of biodiversity values

The most important ecological unit traversed by the alignment is the Borghat region of the Western Ghats, which has received international recognition as one of the world's 18 hotspots of biological diversity. This zone representing the Borghat region of the project is a unique repository of gene pool and the cradle of evolution of taxa. The zone has unique characteristics of the flora of Western Ghats. Besides this there are also present species of Himalayan and Australian families (Jayaraman and Shanmugasundram, 1991).

Moist Deciduous Forests along high elevation in the valley, Semi Evergreen Forests along the higher elevation and crestline, Grasslands and scrublands on the plateau and the coastal belt in the expressway route offer a diversity of natural ecosystems and wildlife habitats. The crestline forests consist of rare subtropical evergreen broad-leaved forests. The semi-evergreen moist deciduous forests, and the high elevation dry deciduous communities on the gentle slopes, support a very diverse assemblage of plant species. Nearly 9% of the 4500 species of flowering plants known from the Western Ghats are represented in the Borghat region. The flowering plants of Khandala sub-region alone include 150 trees, 77 shrubs, 95

climbers and 434 herbs (Santapau, 1967). Several of these plants species are endemic (Nayar and Sastry 1987 and Sanjappa 1991).

The project area is home to a large number of animals such as leopards, wild dogs, gaur, Malabar Giant Squirrel, Bonnet Macaque, Common Langur and Palm Civet which are amongst the significant mammals reported from the Ghat region. In addition, smaller mammals like the Barking Deer, Mouse Deer, Common Mongoose, Black-naped Hare and Pangolin also occur in the Ghat region. In the Western Ghats, 5 species of non-human primates and 5 species of squirrels are represented. Of these, Slender Loris and Bonnet Macaque found throughout the Western Ghat range and are also represented in Borghat. Many of the species recorded from this region are highly endangered and are listed in Schedule I of the Wildlife (Protection) Act of India. Two species that demand greater conservation are the Malabar Giant Squirrel and the Mouse Deer, which inhabit specialized habitats in the forested pockets of Borghat.

Conservation significance of Malabar Giant Squirrel is realised in the fact that it is an indicator of habitat quality and because of their variable pelage colors Giant Squirrels can be valuable indicator of genetically distinct populations of arboreal mammals. From the survey reports that are available (Borges, 1992) the distribution of Malabar Giant Squirrel has been established in the project corridor. Records of its distribution in the Borghat region of the Western Ghats of Maharashtra, in Ulhas and Amba valley and Rajmachi foot hills have been established.

The riverine forest along the water courses and the hill forests have diverse avifauna and herpetofauna. A part of the study area also supports a variety of indigenous grasses and is home to several species of reptiles, scrubland birds and smaller mammals.

Availability of biodiversity information

The floristic richness of the northern Western Ghats has attracted the attention of plant taxonomists and ecologists for a long time. As a result of this, this region has become perhaps one of the best studied regions of the country. With several institutions dedicated to the studies of floral, faunal and ecological aspects of the region, the database on this region is fairly comprehensive. Floral inventory of the Khandala area in the Western Ghats (Santapau, 1967), research findings on plant wealth of Western Ghats (Abraham, 1986), plant uniqueness (Jayaram and Shanmugasundram, 1991), endemic orchids (Kumar, 1986), endemic trees (Nair, 1991), endemic legumes (Sanjuappa, 1991), endemic herbs (Sule, 1991), endemism in Western Ghats (Nair, 1991), rare and medicinal plants of Western Ghats (Sadhale, 1991) conservation significance plants of Western Ghats (Sastry and Sharma, 1991) and Red Data Book of Indian Plants (Nayar and Shastry, 1987) are valuable sources of information on plant biodiversity. The faunal wealth of the Western Ghats area of the Maharashtra State has also been extensively documented by Jagtap, 1997. Extensive studies on Indian Giant Squirrel (Abudulali and Daniel, 1952; Borges 1992), lizard diversity (Murthy, 1983), amphibian diversity (Daniels, 1992) and bird diversity (Gole, 1997), are some of the other key resources on biodiversity values of the project area.

All these studies above studies provided valuable biodiversity data and information for the scoping and impact assessment process.

EA process

The comprehensive environmental impact assessment for this project was undertaken by the project proponents in 1996. Based on this EIA, the MoE&F conducted its first evaluation of this project and turned it down citing the need to furnish additional information on the feasibility of widening the sections of existing National Highway (NH4) in some sections in lieu of additional land requirements and the feasibility of realignment to exclude areas of conservation importance from the proposed route corridor. The clarifications submitted by project proponents were reconsidered by MoE&F in 1997. One of the recommendations following this review by MoE&F was the need to conduct an independent biohabitat evaluation of the project area in view of the high conservation significance of the area through which the proposed expressway was aligned. The biodiversity impact assessment of this project was necessitated as an outcome of rigorous scrutiny of the initial project proposal by MoE&F in two phases and to ensure the integration of the biodiversity concerns in EIA.

Scoping: The landuse features of the proposed expressway corridor are provided in Table 7

7 Land use and environmental features along the route alignment

S. No.	Environmental Features and	Section I & II (27.57 km)	Section III & IV (15.13 km)	Section V & VI (43.74 km)
1	Length passing through types of terrain (km) - Plain - Hilly	Panvel bypass to Sanjagaon 25.50 2.24	Sanjagaon to Kurwanda 2.10 13.03	Kurwanda to Pune bypass (W) 36.49 7.25
2.	Length passing through various areas (km) - Forest - Agricultural and grazing lands - Residential - Industrial	 - - - (Isolated Unit)	 7.53 7.60 - -	 0.30 42.44 - (Isolated Unit)
3.	Number of human settlements - Towns - Villages	 - 39	 2 5	 1 19
4.	Industrial areas (within 10 km)	Panvel, Rasayanj, Khopoli	-	Telegaon Pimpri-Chinchwada
5.	Water Bodies (within 10 km)	Panvel and Patalganga Rivers.	Lonavale Lake, Valvan dam, Indrayani River.	None identified
6.	River Basins through which the alignment passes	Patalganga river	Indrayani, Ulhas, Pauna, Amba	None identified
7.	Ecologically sensitive areas - Mangrove wetlands - Fisheries - Forest (diverse habitats) - Endangered species - Biodiversity hotspots - National Park - Sanctuaries	 Panvel-Khopali Karnala (8 km away from express way)	 Pauna lake Western Ghats(Giant squirrel, mouse deer) Amba Valley Proposed Father Santapau sanctuary	None identified
8.	Places of importance - Tourist centre - Hill and health resorts	Madh temple	Duke's nose, Rajamachi point. Lonavale	Karla caves, Lohgad Fort
9.	Defence Installations	-	INS Shivaji (Naval Base)	-
10.	Geologically sensitive areas	Panvel flexure	Prone to landslides	-

(Source: RITES & SWK, 1995)

Based on the ecological features of the proposed expressway public consultation and interpretation of conservation importance of the areas enroute, the following distinct areas were recognized for assessment of impacts of the expressway on biodiversity values of the region

1. A coastal ecosystem consisting of a mosaic of mudflats, mangroves and coastal marshes in the intertidal zone and a chain of wetlands in the Panvel-Khopoli section

2. The Western Ghats in the Borghat region between Sanjgaon and Kurwanda, comprising of hill forests and riverine forests along the water courses.
3. The Amba, Ulhas, and Rajmachi valleys that represent the areas under proposed Father Santapau Sanctuary.
4. The Deccan plateau, grasslands and scrubland ecosystems between Lonavale and Dehu Road.

Impact assessment

The following is a summary of the impacts predicted on biodiversity resources in the route of the expressway:

- The increased stress on the ecologically fragile landscape features would affect biodiversity values
- Lonavala Lake, a major water body in Lonavala township would become degraded due to increased silt load
- The proposed expressway route is likely to bissect the proposed Father Santapau Sanctuary, which lies within the loop of the expressway southwest of Kandala Township
- Landtake, clearfelling and deforestation activities would have a direct bearing on wildlife habitat size and characteristics
- The project would seriously degrade the habitats and disrupt migratory routes of a variety of bird species such as thrushes, flycatchers, wood peckers and bulbuls.
- The loss of critically important tall trees would result in the destruction of nesting sites for a large number of birds of prey
- The expressway would completely cut off the local people from the resource areas on the opposite side of the carriage way.
- The Amba Valley, along with some pockets of the Rajmachi Valley, is a repository of rich and diverse floral and faunal species, many of which are endemic to this region. The expressway, along the proposed alignment, would inevitably destroy the unique plant resources of the valley, especially in the area designated as the proposed Father Santapau Sanctuary.

Mitigation: The approaches adopted for the mitigation of the biodiversity impacts of this project included the following strategies:

- Design Modification

The predicted impacts were examined and two key mitigative measures were proposed. First, the Ghat section of the alignment, which would have passed through the Amba Valley and the Borghat Forests, was redesigned, such that the existing National Highway –NH4 would be improved through that area, and construction would be restricted to the existing Right of Way (RoW). Secondly, the road would also be realigned through the Lonavala lake area, where it was originally designed to pass over the lake on piers, it would now skirt around it. In the Western Ghat section, where the expressway alignment may lead to major impacts of clearing of crestline forests and the grasslands of the Deccan plateau, tunnels will be used to align the expressway so as to skirt the forests and prevent the fragmentation of the landscape. The constructions of tunnels at locations in Santapau, Ulhas and Amba Valleys will be effective in reducing the direct physical destruction of the ecological values of the valley ecosystems, provided the secondary impacts of tunneling especially the disposal of excavated rocky material on the downslope in the valley is kept in check and careful identification and use of dumping sites for excavated material is made.

- Enhancement of conservation status by establishing a wildlife sanctuary

Wilderness areas have traditionally been a resource base for subsistence based economy of rural communities. Though as a result of continuous removal of resource base from the natural stocks, these forests cannot be compared in their richness with the Protected Area systems which have specially been designated to provide adequate protection for the conservation of wildlife, they certainly represent the elements of a biogeographic zone that are unique in rarity and endemism.

From the account of ecological importance of the natural systems *en route* the project and the conservation significance that these areas command, the establishment of atleast one conservation unit – a wildlife sanctuary, representative of the values of Western Ghat systems in the Borghat area would go a long way in conserving the biological diversity of the area. With the enhancement of its conservation status, the Ghat region will serves as an important wildlife corridor connecting the Bhimashanker Wildlife Sanctuary in the north and Koyna Wildlife Sanctuary in the south.

Monitoring: Given the political expediency in matters of large scale, high cost development projects, the series of environmental safeguards and mitigative measures proposed by the team of scientists and considered by the Ministry of Environment & Forests and the State Government of Maharashtra at the time of granting the 'environmental clearance' were given a 'go-by' during the implementation phase of the project. The mitigative measures regarding construction materials handling, work camp operation and similar other measures though defined in the contract terms and conditions/specifications were not adhered to in practice and no compliance monitoring by the government agency responsible for it was carried out. Thus, the provisions of the Environmental Management Plan never got implemented.

Review and follow-up: despite the condition imposed by the MoE&F that construction in the Ghat section of the Mumbai-Pune Expressway would be considered as a "new stand-alone project as and when a biohabitat study is completed and submitted" the project proponents started construction in the Ghat section. The conditional environmental clearance also stated that `as part of the existing project, no new alignment will be undertaken in the Ghat section'. Violating this condition the expressway has been constructed along a new alignment. Another condition of the environmental clearance which has been violated is that of use of forest land for dumping of over burden. The dumping of rock and rubble excavated from the tunnel has been carreid out on forest lands and in Amba Valley. The dumping of waste consisting of lakhs of cubic meters of earth has been on pristine forest land and natural water drainage pathways and in a manner that would result in its washing off into the forests during monsoons. Further, while the environmental clearance stated that "adequate provision for infrastructures facilities i.e., water supply, fuel, sanitation etc must be ensured for labourers during construction period in order to avoid damage to the environment" labour camps have been actually constructed in forest areas.

Final outcome and lessons learned

This case study is a clear example of the utter disregard of the established EIA process. Environmental safeguards suggested through carefully developed mitigative measures for integrating biodiversity concerns have been grossly violated. This project which could have

been a 'good example' of the application of good conservation science backed by modern construction technology and innovative approaches for incorporating the biodiversity concerns in development project has been just the contrary. At the time of writing of this case study the Bombay Environmental Action Group (BEAG), a Non-Governmental Organization (NGO) has filed a writ petition in the High Court at Mumbai against the blatantly unauthorized, unlawful and illegal activities of the project proponents seeking an appropriate writ for quashing and setting aside the permission for construction in the Ghat section and removal of debris dumped on forest lands. The Hon'ble Court has appointed the National Environmental Engineering Research Institute (NEERI), Nagpur to conduct a post-project EIA, perhaps the first one in India. The Hon'ble Court has however not stopped the construction work. Much therefore depends on the NEERI's report.

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6.11 Future actions to improve effectiveness of biodiversity conservation and sustainable use

The merits and potential benefits of including Biodiversity Impact Assessment at the conceptual stage of a project, programme and a policy development are perhaps more appreciated by conservation community than others. However, the ground realities in most developing countries which are currently struggling to develop economically, pre-empt the mainstreaming of biodiversity issues in development planning. This has been aptly demonstrated in the preceding case studies. At the same time most countries, including developing ones, are also committed to conserve biodiversity and to adopt appropriate policies for sustainable development. Urgent efforts and actions are therefore needed in several articulating segments to make development truly sustainable. Some of the priority actions in this regard are discussed below:

6.11.1 Conservation Awareness

Lack of conservation awareness about the need to conserve biodiversity values and the necessity to pursue a path of rapid economic development is a dilemma faced by most South Asian nations – India, Sri Lanka, Nepal, Bangladesh to name a few. The linkages between biodiversity conservation and the sustained well-being of human societies needs to be made more explicit to the industrialist, planner, politician and the likes in order to imbibe in reality the fact that 'biodiversity is a futuristic economic resource'. Thus, an awareness campaign based on good science of conservation delivered through a variety of multi-media options would have to be developed.

6.11.2 Enhancing Capacity

Capacity building through training, education and research for project managers, technical specialists, reviewers and decision makers involved in the EIA process is an effective method of increasing the standard of practice. However, presently such opportunities not high in the agenda of most training and research institutions in India. Considering the increasing importance of BIA for ensuring sustainable development, systematic efforts are needed to develop a pool of competent scientists and professionals in the field of biodiversity assessment and evaluation techniques with skills and capability for impact identification and mitigation planning. A "Training of Trainers" programme for professionals in scientific institutions and organisations is also needed. Sharing of expertise and best practices through networking amongst individuals and institutions is a priority action. Further, despite the fact that a large number of scientific institutions and organizations are engaged in the field of biodiversity conservation in India, the availability of site-specific biodiversity information, which could be accessed by EIA practitioners, project proponents while conceptualizing the scope of EIA study is very limited. The decline in the number of 'taxonomists' is a worldwide phenomenon and India is no exception. There are many plant and animal taxa on which just a handful of taxonomists are available. The above situation needs to be addressed through a variety of capacity-building measures. Setting up of biodiversity databases and strengthening the ones which exist will serve to enhance the biodiversity information base.

6.11.3 BIA Methodology

Though a few guiding principles which govern the development of methodologies for BIA are in place, easy to use methodologies with clear guidelines and conceptual framework are needed to firmly integrate biodiversity in impact assessment. This would demand new initiatives in field research to attempt development of new methodologies for BIA and to also tailor the existing methodologies available world wide for application in India.

6.11.4 Enabling Legislative Changes

At the international level, the need for Biodiversity Impact Assessment as a means of integrating biodiversity issues into the early stages of planning process has been endorsed by the Convention on Biodiversity Diversity (CBD), enabling provisions have to be made in the country legislations so that they meet CBD mandates. However, before this happens, the BIA methodology will have to developed, tested and refined to meet country specific requirements.

6.11.5 Accreditation of Biodiversity Impact Specialist

One of the pre-requisite of ensuring the integration of biodiversity concerns in the EIA process is the 'selection of an EIA team which has appropriate technical and managerial capabilities'. The involvement of suitably qualified and experienced biodiversity specialists can have a significant positive influence on the coverage of biodiversity issues. Presently, in India as also in most other developing countries there is no system of accrediting qualified biodiversity specialists and institutions. As a result, EIAs are conducted by all and sundry, invariably leading to a poor quality report in which biodiversity issues are either absent or inadequately covered. One way to address this issue is to develop a system of accredition of individual biodiversity specialists and institution for conducting EIAs. National EIA Associations can play a vital role in planning, developing and implementing the Biodiversity Specialist Accredition System. The International Association for Impact Assessment (IAIA) and the IUCN commissions (Special Survival Commission, World Commission on Protected Areas, Commission on Ecosystem Management) can also provide valuable guidance in this matter.

6.11.6 Regional and Sectoral Assessments

Developmental projects especially water resources and transportation projects which are implemented at very large scales when subjected to a project level EIA can at best address the mitigation of project impacts but options for avoidance through relocation or redesign cannot be exercised. There is therefore a need to apply EIA tools at the sectoral and regional level so that consideration of cumulative impacts on biodiversity that may be missed by stand-alone project level EIA can be effectively addressed.

6.11.7 Effective public hearing

Public involvement in EIA has been introduced in India since 1997 only through enactment of a Public Hearing Notification. The formal public participation currently in place in Indian EIA system is in a rudimentary stage and requires substantial improvements. To make public participation truly effective, it should be extended to all phases of EIA, from project planning to final decision making and not be limited to just a one time exercise in the EIA process, as is presently the case (Rajvanshi, 2000). Local community groups are invariably users of biodiversity resources and so are knowledgeable about the status and trends of the

biodiversity resources, pressures on them and measures required for the conservation and sustainable use these resources. Changes in the existing framework of public participation are necessary to bring about the change from 'ceremonial' nature of public hearing to a more 'meaningful' contribution towards biodiversity conservation.

6.11.8 Independent Review

The EIA process in India has no provision for an independent review of projects which may have significant impacts on biodiversity. Currently the expert committee appointed by MoE&F is only a reviewing body whose consultation is contingent upon the felt need for consultation by MoE&F. It would be better if a provision for a constitution of an independent review committee is incorporated in the EIA process for review of all project impacts. This will greatly help in strengthening the scoping phase by offering timely suggestions in the planning stage of EIA. If this review is conducted at the policy/project conceptualization stage, as is proposed in the BIA methodology, then it would be possible to filter at the initial stage those projects which may have significant impacts on biodiversity values.

6.12 Final Conclusions

The three case studies presented in this document have amply demonstrated the range of variations which exist in the incorporation of biodiversity concerns in the development planning and EIA system currently in place in India. The Sankosh Project is the best example where biodiversity conservation issues have prevailed over the economic development considerations. On the other hand, the Mumbai-Pune Expressway Project highlights how even well conceived mitigatory measures and other environmental safeguards incorporated in the environmental clearance document have been ignored during the implementation phase of the project. The Narmadasagar Project demonstrates the balance which can be achieved between the economic goals of development and the urgency to protect biodiversity resources through the recommendation of effective mitigation measures emanating from a well planned and scientifically conducted EIA study.

The key questions that remain central in drawing a futuristic plan for biodiversity conservation are – How to ensure the incorporation of biodiversity concerns in the EIA process in a sustainable way? How to prevent the violations of environmental safeguards by project proponents? How to address the issue of capacity building for BIA?

Promotion of greater awareness, ensuring transparency in EIA process through information disclosure to affected groups, enhancing local ownership and systematic development of scientific capacities to conduct BIA are some of the important means of ensuring integration of biodiversity concerns. Pressures from vested groups, political expediency, inadequate appreciation of the biodiversity conservation values and the need for rapid economic development will however always influence the incorporation of biodiversity concerns in the EIA process. The best recourse is to bring in greater transparency and higher accountability along with enhanced public participation in the decision-making process. Documenting and disseminating successes and failures would also be helpful.

Most countries including India have taken the few initial and mandatory steps for protecting biodiversity by ratifying the Article 14 of the Convention of Biological Diversity (CBD) and

are also in the process of introducing appropriate procedures and arrangements for conserving biodiversity but a long and arduous journey has to be accomplished for rooting and institutionalizing the process of firmly integrating biodiversity concerns in the development planning and environmental decision-making process.

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