# National Biodiversity Strategy and Action Plan, India:

## Final Technical Report of the UNDP/GEF Sponsored Project

### Background

*Securing India's Future* is the national level document emanating from the National Biodiversity Strategy and Action Plan (NBSAP) process carried out over the period 2000-2003. The NBSAP process involved consultations and planning with thousands of people across the country, including tribal (*adivasi*) and other local communities, NGOs, government agencies, academics and scientists, corporate houses, students, armed forces, and other sections of society. Its aim was to produce an action plan on the conservation of biodiversity, the sustainable use of biological resources, and equity in various aspects relating to such conservation and use. The process involved the preparation of over 71 strategy and action plans at local, state, ecoregional, and thematic levels, and over 30 sub-thematic papers (see *Chapter 1* for full list). A large number of local events like public hearings, biodiversity festivals, workshops, *yatras*, and so on, contributed to the results. All these were built into the national level document, which was drafted towards the end of the process.

The NBSAP process was carried out by the Ministry of Environment and Forests (MoEF), Government of India, under sponsorship of the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP). In a unique arrangement, its technical coordination was undertaken by a NGO, Kalpavriksh, which set up a 15-member Technical and Policy Core Group for the purpose; and its administrative coordination was by Biotech Consortium India Ltd. Over 100 agencies (including those identified by each state government) and individuals were key partners in the process, carrying out action planning and expert reviews at various levels.

This national level document, called the National Action Plan or NAP for short, has been built on the following sources:

- 71 draft biodiversity strategy and action plans (BSAPs) at local (sub-state), state, ecoregional, and thematic levels, produced during the NBSAP process;
- 31 draft sub-thematic reviews commissioned or voluntarily offered during the NBSAP process;
- A large number of secondary sources, both documented, and through personal communication (including previous national level documents such as the National Wildlife Action Plan, National Forestry Action Plan, National Conservation Strategy, country reports for Agenda 21, Biodiversity Conservation Prioritisation Project report, National Environment Action Programme, the IXth and Xth Five Year Plan Documents and others);
- The experience and work of the Technical and Policy Core Group members; and
- Inputs of experts who were specifically requested to contribute, and others who provided comments on earlier drafts of the NAP.

The draft NAP has gone through an extensive assessment by executing agencies, sub-thematic reviewers, and other partners of the NBSAP process, as also a few hundred other institutions, experts, government official, NGOs, and activists. The draft was also reviewed by a core group of experts set up by the Ministry of Environment and Forests. Its Executive Summary was also made available in large numbers, in English, Hindi, and Telegu. It was also hosted on the website http://sdnp.delhi.nic.in/nbsap and made accessible for anyone to review. Information on its availability was sent out, with a short description, to the mass media, NGO and other networks, and various websites.

## Structure of the NAP

There are **eight main chapters** in the NAP (Volume 1):

- The **first** chapter deals with background and objectives, methodology, scope and approach of the NBSAP.
- The **second** chapter contains a statement of basic principles underlying the analysis and recommendations of the NAP.
- The **third** chapter deals with the evolutionary, physical and, historical context of India's biodiversity.
- The **fourth** chapter discusses the overall profile of India's biodiversity.
- The **fifth** chapter deals with some key proximate and root causes for the erosion of India's biodiversity.
- The **sixth** chapter discusses ongoing initiatives and key actors involved in the conservation of wild and domesticated biodiversity in India.
- The **seventh** chapter deals with broad strategies and related actions for achieving conservation, sustainable use, and equitable access/sharing of benefits for both wild and domesticated biodiversity.
- The **eighth** chapter deals with the overall implementation mechanism that would be needed for the strategies and actions presented in the seventh chapter.

Sections prior to or after these eight chapters also provide:

- Definitions of key terms used
- Glossary and List of Abbreviations
- An index of agencies and organisations identified as the lead agencies responsible for each action
- Annexures with lists of the Technical and Policy Core Group, the executing agencies and sub-thematic reviewers, and various people who contributed to or commented on the NAP.

The second volume of the NAP includes the summaries of each of the local, state, ecoregional, and thematic BSAPs, and of the sub-thematic reviews. In addition, it contains annexures relevant to various parts of *Volume 1*, such as listings of protected areas and threatened species, forest types, germplasm collections, and so on. It also includes, a chart showing the points of commonality between the strategies of the NAP and those recommended in the local, state, and ecoregional BSAPs

## Chapter 1: Introduction to NBSAP and to the National Action Plan

This chapter presents a background to National Biodiversity Strategy and Action Plan (NBSAP), including the context, objectives, scope and approach to the entire process. It highlights the use of flexible and innovative methodologies for preparing the BSAPs, employed because it was felt that the process of formulation is as important as the final product itself. The chapter also presents the methodology adopted in the process of putting together the national level plan.

The NBSAP preparation for India has attempted to move away from the general trend in centralized planning. Efforts have been made towards decentralizing the planning and proceeding from the grassroots level upwards, as far as possible within the available time and resources.

Apart from the conventional methods of workshops, formal meetings and data collection, many BSAP processes have used interesting and innovative methods, for both outreach and feedback. Several states formed networks to help facilitate substantive inputs into their plans. Public hearings were held at almost all levels of the process. Students were also involved at various stages and levels of the process. Perhaps the most innovative methodology used was organizing biodiversity festivals and celebrations. These were in the form of festivals, cycle rallies, cultural programmes, bullock cart rallies, *yatras* and boat rallies.

Some states already had, or were in the process of drafting, biodiversity or environment plans, under initiatives other than NBSAP. Instead of starting from scratch, the NBSAP process linked up with and built upon the work that had already been done in such cases.

The chapter also presents a critical analysis, which was carried out at two stages of the project. This was based

on 11 parameters that were derived by reading through progress reports, minutes of various meetings held by executing agencies, reports of visits to sites undertaken by members of the Technical and Policy Core Group (TPCG), BSAPs submitted by the executing agencies, as well as an independent evaluation mission. The key questions analysed, were:

i. Were all kinds of biodiversity covered?
ii. Were all aspects of biodiversity covered?
iii. Were all guidance, coordination and communication adequate?
iv. Was the process participatory enough?
v. Were the stated outputs achieved?
vi. Were cross-cutting issues adequately integrated?
vii. Was there adequate buy-in from the government?
viii. Was the process adequately built on past and existing processes and information?
ix. What were the unanticipated impacts?
x. Were the resources adequate?
xi. We the time frame followed?

The analysis revealed that the process had covered a very wide range of issues, achieved a very high level of participation, and produced not only most of the originally envisaged outputs but a number of unanticipated one. However, there also remained critical weakness. These included the inadequate participation of women, armed forces, the corporate sector, and political/religious leaders; and in the case of some of the local/state/ecoregional processes, the inadequate integration of cross-cutting issues like equity and gender. Ownership of the process by some section of government at state and central levels was also low.

*In conclusion, the review revealed that this has been a unique process, one that in its scale and coverage has never before been tried in India in the context of natural resources and development. Both in its successes and failures, therefore, it has critical lesson for future planning processes in all sectors.*

## Chapter 2: Statement of Principles

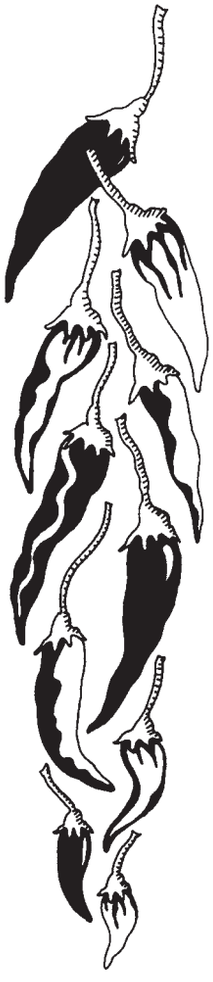
*(Being reproduced here in full as it appears in the NAP, not summarised)*

1. ***Biological diversity*** is the central tenet of nature, one of its key defining features. Evolution has produced an amazing variety of plants, animals, and micro-organisms, and the ecosystems of which they are a part, all intricately linked. Humans are one amongst these millions of species. The survival of human societies and cultures is dependent on biological diversity. It provides the essential ***ecosystem benefits*** including hydrological and geochemical cycles and climatic regulation that form the basis for human survival. It also meets the myriad survival and ***livelihood*** needs of fisherfolk, farmers, forest-dwellers, pastoralists, craftspersons, and others. This wonderful diversity and each of its components are worthy of highest ***respect*** and conservation in their own right. Most importantly, biodiversity is the basis for the continuous ***evolution*** of species and ecosystems.

2. Given the above, the two bottom lines that are considered pre-requisites in this action plan are: **Ecological Security** of the country or of any region within it, and **Livelihood Security** of those most critically dependent on biodiversity and its components:
   - *Ecological security* refers to the maintenance of: the diversity of ecosystems and habitats; the diversity of species, subspecies/varieties, populations and communities; the interactions between species, populations, communities and their habitats and ecosystem; their integrity including biological productivity of ecosystems and taxa; the evolutionary potential of natural and agricultural systems; and critical ecosystem benefits. This refers to both wild and domesticated biodiversity.
   - *Livelihood security* refers to the security of human communities and individuals critically dependent on biological resources, including guaranteed access to, control over, and responsibility to, such biological resources and related knowledge.

3. Both ecological and livelihood security have been severely eroded, and continue to be **threatened**. Therefore there is a need to take urgent and comprehensive measures to reverse this trend.

4. Three basic goals need to be achieved to reverse this trend:
   - **Conservation** of biodiversity, including the integrity and diversity of genes, species and ecosystems and their evolutionary potential;
   - **Sustainable use** of biological resources, referring to the use of components of biological diversity in such a manner and at such rates that does not lead to the long-term decline of the biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations;
   - **Equity** in conservation and use, including equitable access to and decision-making control over biodiversity as well as equitable distribution of costs and benefits associated with conservation and sustainable use. In particular, this includes creating democratic spaces for the voices of disprivileged women and men in defining conservation and use priorities.



5. Meeting these basic goals requires the following broad **measures**:
   - Reorientation of the development process, ensuring that ecological and livelihood security become central concerns, and that the conservation of biological diversity receives the highest priority.
   - Restoration and regeneration of degraded ecosystems.
   - Recognition of community tenurial rights, ensuring rights of women, children and other disprivileged sections within them.
   - Recognition and integration of the full range of intrinsic as well as direct values of biodiversity into human activities.
   - Recognition, respect, and revitalisation of gender-differentiated indigenous and community knowledge systems relating to biodiversity, and synergising these with mainstream knowledge systems.
   - Development of alternative (including community) intellectual rights systems appropriate for indigenous knowledge, which respect the principle that life forms should not be subjected to private and monopolistic IPR regimes.
   - Balancing of local, national, and international interests related to biodiversity, on the basis of principles of ecological sustainability and social equity; within these principles, local interests to get priority over national, and national over international.
   - Respect for cultural diversity, and the diversity of governance systems, customary practices and laws, and other aspects of human society, in so far as these are in consonance with the basic principles of ecological sustainability and social equity.
   - Elimination of absolute poverty and preventing deprivation of local communities from natural resources necessary for them to maintain an acceptable living standard.
   - Development and strengthening of formal and non-formal education efforts at primary, secondary and tertiary levels, aimed at enhancing understanding and awareness of biodiversity and promoting action for sustainable use and biodiversity conservation.

## Chapter 3:
## Evolutionary, Physical, and Historical Context of India's Biodiversity

India is the seventh largest country in the world with an area of 32,87,263 sq.km extending from 8˚ 4′ to 37˚ 6′ N and 68˚ 7′ to 97˚ 25′ E. The country extends for 3,214 km on the north to south axis and for 2,933 km east to west. It has a land frontier of 15,200 km and coastline including that of the islands amounting to 7516 km. **Section 3.1** describes the Physical and Geographical Features of the country, starting with an introduction in **Sub-section 3.1.1**.

**Sub-section 3.1.2** describes the geological evolution of the country, followed by the geological time scale. It is estimated that some 225 million years ago in the Palaeozoic era, all the present-day continents were part of one landmass called Pangaea. By about 180 million years ago, in the late Triassic and early Jurassic periods, this super mass started breaking, creating Laurasia (Angara) in the north, and Gondwanaland in the south, with the Tethys Sea in

the middle. Gondwanaland then split in the Jurassic period, with South America and Africa drifting to the west, India breaking off from Antarctica, and the southern hemisphere landmasses slowly coming into their present-day positions. By about 45 million years ago, India had begun thrusting into Eurasia, creating the buckling and folding which produced the mighty Himalayan chain. This northwards push of the Indian landmass is continuing even today.

**Sub-section 3.1.3** describes in detail the major geological divisions of India. These include the Deccan peninsula, with the Western and Eastern Ghats, the Himalaya, the Indo Gangetic plains, the Aravallis, the islands, the rivers, the lakes and the coastal stretch.

**Section 3.2** looks briefly at the evolutionary history of India with respect to the development of flora and fauna. It focuses specifically on the palaeobotany and palaeozoology of the country in **Sub-section 3.2.1.** It states that it is instructive to look briefly at the evolutionary history of India with respect to the development of flora and fauna. Interestingly, the continental drift theory, used now to explain several geological and biological features of the world, was prompted by the discovery of peculiar phenomenon in India. Fossil remains of plants and animals entombed in sediments have helped to explain the progress of life through geological ages and the distribution of land and sea in the past. **Sub-section 3.2.2** traces the evolution of humans and their early settlements in the Indian subcontinent. It follows the phases of development through the stone ages to the rise of early civilization along the Indus and later along the Gangetic plains.

India is known as a site for the first domestication of several crop and livestock species. In the case of crops, available records date back to the neolithic (4500-4000 B.P.) and Harappan (4600-3750 B.P.) cultures, both characterized by incipient farming. Neolithic culture sites have been located in the north, east and south of India, while the Harappan sites are all located in the western region of the subcontinent, including Pakistan. The history of domestication of animals in India goes back as far as 7000 years B.P., judging from evidence from the Mesolithic cultural phases at Bagor in district Bhilwara in Rajasthan and Adamgarh near Hoshangabad in Madhya Pradesh. It was from these early beginnings that Indian civilizations developed one of the world's most diverse and intricate agricultural and animal husbandry systems, one which aptly mirrored the region's great natural biological diversity. **Sub-section 3.2.2.2** describes such aspects related to early domestication of crop and livestock species.

**Section 3.2.3** describes the history of land use and the significance of people-resource relations that affected the biodiversity of India through the early historic to the colonial times. Agrarian activity attained greater pace with the emergence of the Mauryan Empire during the 3rd century BCE. Early historical (600 BCE onwards) archaeological and literary evidences (Kautilya's *Arthashastra* 321 BCE, Megasthenes *Indika*, Visakhadatta's *Mudrarakshasas* and the inscriptions of Asoka) indicate that a large share of the Mauryan resources came from the agrarian sector. The spread of agrarian activity also resulted in large-scale forest clearance all over the subcontinent. In the process, hunter-gathering communities were compelled to move into adjoining hilly tracts or take to agriculture and/or associated occupations and get assimilated into the steadily expanding caste-based rural and urban society.

In south India tanks played a very important role in local level irrigation projects. The situation continued without much change during the late Medieval and Mughal Period (1526-1700 AD). The proliferation of local-level irrigation projects over major parts of India is one of the principle features of the socio-economic and environmental history of Medieval India.

The Muslim period is credited with the selection and hybridisation of wide varieties of fruits, and the western contact for introduction of several plants. However, this still remained an era of more forests than cultivated land. A critical feature of land and water use upto this point in Indian history was the predominance of common property regimes (CPRs). Large tracts of forests, pastures or grazing lands, freshwaterbodies, coastal and marine areas, and to some extent agriculture lands (especially jhum lands), were under CPRs, controlled and managed by village institutions.

The British involvement began with renovation and maintanance of the existing irrigation systems. It was also during the colonial period that the scale and sweep of forest depredation underwent dramatic change. Forests

were destroyed not just for revenue, but also to set up the railways. Common property resources were turned into private or state property. From 1869-1925, forests, that were in states under the control of the princes, were also drawn into the orbit of colonial capitalist expansion. A large-scale slaughter of wild animals and the conversion, by British business houses, of large expanses of woodlands into tea, coffee and rubber plantations were the other features of forest degradation during the colonial period. The most serious consequence of colonial forestry policies and practices was the decline in traditional conservation and management systems around the forests. By the mid-1800s, communities across the country were resisting colonial intrusion on their lands, forests and water systems. It led to many small and big struggles by the tribals for their right to livelihood. The interaction of colonialism, technological development, and resource reallocation from subsistence use to central governments or external markets has generated land use conflicts between the Indian agricultural and forestry sectors throughout the nineteenth and twentieth centuries.

**Section 3.3** discusses the present socio-economic and cultural features of India, as relevant to biodiversity. As the second most populous country in the world, the majority of whose population continues to be directly dependent on natural resources for their livelihoods, India faces immense challenges in conserving its rich biodiversity while ensuring livelihood and ecological security. **Sub-section 3.3.1** specifically looks at the demographic features of the country.

For thousands of years, people have also modified local biodiversity for meeting their changing needs.This has resulted in enhanced biodiversity at taxa levels through the creation of thousands of new crop varieties and livestock breeds. Such interaction with the local ecosystems has also led to an intertwining of cultural diversity with local biodiversity, each shaping the other in a continuing process of adaptation and change. **Sub-section 3.3.2** highlights this cultural and ethnic diversity in relation to the many communities which have lived in close proximity to nature and who have depended on biodiversity for their survival.

Communities which have lived in close proximity to nature and have depended on biodiversity for their survival, also have an innate knowledge about this biodiversity, a point that tends to most often get overlooked. **Sub-section 3.3.3** describes some of these practices and discusses the concept of traditional/indigenous knowledge.

It is a cliché to say that India remains a predominantly agrarian economy, but it is worth repeating. According to the provisional figures of the 2001 Census, 58.4% of the country's total workers and 73.3% of the workers in rural areas remain dependent on the primary sector (listed as cultivators and agricultural labourers), including agriculture, animal husbandry, forestry, fisheries, and related occupations and livelihoods. With 28% of the population now living in urban areas, significant sections of the population have also moved into the secondary and tertiary sectors, into urban and industrial settlements and livelihoods. The country today therefore displays the largest possible range of economic pursuits and livelihoods, ranging from ancient hunter-gatherers and nomadic pastoralists, to the modern computer professional and space scientist. **Sub-section 3.3.4** focuses on the range of economic pursuits and livelihoods in modern India, and indicates the continuing direct dependence of the vast majority of the country's rural population on natural resources and elements of biodiversity

**Sub-section 3.3.5** describes the changes in land use patterns over the ages. India has a geographical area of 328.73 million hectares (m.ha). Due to land being an inelastic resource, per capita availability of land is declining with the growth of population. It was 0.89ha/capita in 1950-51, and had declined to 0.33 ha/capita in 1999-2000. Land use and land management have undergone significant changes in the last 50 years. However, to date no comprehensive land use policy has been developed taking ecosystem diversity and livelihood systems into account, has been developed. Changes in land use have been effected in accordance with changes in the government's development priorities during different periods.

## Chapter 4:
## Profile of Biodiversity in India

India, with 2.4% of the world's area, has 8.1% of the world's total biodiversity, making it one of the 12 megadiversity countries in the world. This is based on the species richness and levels of endemism recorded in a wide

range of taxa of both plants and animals. This diversity can be attributed to the vast variety of landforms and climates, resulting in habitats ranging from tropical to temperate, and from alpine to desert. Adding to this is a very high diversity of human-influenced ecosystems, including agricultural and pasture lands, and possibly one of the world's largest diversity of domesticated plants and animals. India is also considered one of the world's eight centres of origin of cultivated plants. Being a predominantly agriculture-based country, India also has a mix of wild and cultivated habitats, giving rise to very specialised biodiversity which is specific to the confluence of two or more habitats.

**Section 4.1** looks at the components, range, global position, and current status of biodiversity. **Sub-section 4.1.1** under it looks at natural ecosystems and their classifications. One of the recent approaches to classification of India's ecosystems has been based on biogeography. This system divides the country into ten Biogeographic Zones, further sub-divided into twenty six Biotic Provinces. These zones are: the Trans Himalaya; the Himalaya; Desert; Semi-Arid; Western Ghats; Deccan Peninsula; Gangetic Plain; Coasts; Northeast; and the Islands.

**Section 4.1.1.1** describes natural terrestrial ecosystems, which are of the following broad kinds: forests (ranging from dry thorn scrub to wet evergreen), five types of grasslands, deserts (ranging from sandy salt to cold) and permanently snow-bound areas. Within each of these, there is an immense diversity.

India has a rich variety of wetland and marine habitats, ranging from small streams and village ponds through large lakes and reservoirs, some of the longest rivers in the world, coastal lagoons, estuaries and backwaters, the unique Rann of Kachchh, coral reefs and mangroves, to open coastal and oceanic waters. To this must be added the numerous human-made wetland water bodies like reservoirs behind dams and impoundments, salterns and aquaculture ponds. Notwithstanding this enormous variety, India's wetlands can be grouped, based on salinity, into two major categories – marine, and brackish or freshwater, within each of which there are several distinct ecosystems. **Sub-section 4.1.1.2** describes these in detail.

About 45,000 to 47,000 plant species are reported to occur in India, representing 11% of the known world flora. Nearly 90,000 species of fauna have been reported, a little over 7% of the world's reported animal diversity. **Sub-section 4.1.2** focuses on *Wild Plant, Animal and Micro-organism* taxa. Patterns of species richness, endemism and the diversity of different plants groups, viz. angiosperms, gymnosperms, pteridophytes, lichens, bryophytes, algae, and fungi are discussed. Faunal species richness and endemism have been elaborated on. Aquatic species profiles for both marine and freshwater ecosystems are described. Micro-organisms are ubiquitous in distribution. They represent the earliest life forms, i.e. 3.6 to 4.0 billion years on the earth. Available information on micro-organisms is presented.

From the desert ecosystem of Rajasthan in the West to the flood plain systems of Bengal in the East, from the mountain agriculture of the Himalayas to the wetland ecosystem of Kerala, from the semi-arid rainfed ecosystems in the Deccan plateau to the highly developed terraces of Northeast India, the wide-ranging agro-ecosystems in India offer a mind boggling variety. They also represent a fascinating array of practices which embody a vast expanse of agriculture related knowedge systems of local rural communities. **Section 4.1.3** describes these systems. **Section 4.1.3.1** focuses on the agroclimatic zones of India. These include Humid Western Himalaya; Humid Bengal-Assam; Humid Eastern Himalayan Region and Bay Islands; Sub-Humid Satluj Ganga Alluvial Plains; Sub-Humid to Humid Eastern and South Eastern Uplands; Arid Western Plains; Semi-Arid Lava Plateaus and Central Highlands; and the Humid to Semi-Arid Western Ghats and Karnataka Plateaus.

**Section 4.1.4** describes Domesticated Plant/Animal Taxa and Cultured Micro-organisms. At least 166 species of crops (6.7% of total crop species in the world) and 320 species of wild relatives of cultivated crops are believed to have originated in India. These spread across the entire range of crops known to humans: cereals, millets, legumes, vegetables, fruits, oilseeds, forages, fibres, sugar yielding plants, condiments, spices, medicinal and aromatic plants, and others. Crops with high diversity include *Rice*: 50,000 varieties (although a disputed figure), *Mango*: 1000 varieties, *Sorghum*: 5000 varieties, *Pepper*: 500 varieties. **Sub-section 4.1.4.1** looks at this agricultural diversity.

India also has the distinction of having among the widest range of animal breeds within each species, representing a significant percentage of the world's domesticated livestock diversity. The diverse cultures, agro-ecological zones, and social and economic practices in the country directly account for the rich livestock diversity. These breeds have been developed and evolved over hundreds of years to suit the different production goals and requirements of different classes of livestock owners. **Sub-section 4.1.4.2** discusses this diversity.

**Section 4.2** deals with importance and uses of biodiversity in India. The vast diversity of species and ecosystems contribute to the richness and beauty of life on Earth. Human beings constitute only one of the millions of species that inhabit the earth. Each species is unique and was created as a consequence of evolutionary processes, without human intervention. Therefore every species has a natural right to exist. It is this understanding and appreciation of the inherent value of each and every life form that constitutes the "ethical" value of biodiversity. **Sub-section 4.2.1.** discusses the ethical value of biodiversity.

There is growing awareness about the importance of maintaining a high level of biodiversity in terrestrial and aquatic habitats in the context of what is referred to as "ecosystem benefits". Ecosystem benefits are generated as a result of interaction and exchange between biotic and abiotic components of ecosystems. These include numerous invisible but essential services, viz., soil formation and fertility generation, reduction of soil salinity, decomposition and waste dissipation, productivity, carbon sequestration and atmospheric gases balance, stabilization of climate and mitigation of climatic change, nutrient cycling, maintenance and raising of water table, enhancement of water and air quality, flood and drought control, and many more. **Sub-section 4.2.2** discusses the value of biodiversity within this context.

In India biodiversity supports the livelihoods of millions of ecosystem people. Around 70% of the Indian population depends on land-based occupations, forests, wetlands and marine habitats and are thus dependent on the local ecosystems for their basic subsistence requirements with regard to water, food, fuel, housing, fodder and medicine. Around 10,000 species of plants, and a few hundred animal species, are involved in this direct relationship of biodiversity and livelihood. **Sub-section 4.2.3** looks at the vital link between livelihoods and biodiversity.

Empirical evidence reveals that the largest use by communities of ecosystem resources (8000 species of plants and a few hundred species of animals) is for maintaining "health security" of human, livestock and plants (biopesticides and bio-fertilizers). A considerable part of daily food intake of rural (especially tribal) communities also comes from the wild. Cultivated diversity is also a critical part of health and food security. Traditionally communities have preferred a diverse range of foods from their fields, pastures, wetlands, and forests, to the extent possible. In particular, many traditional crops like millets, which have been increasingly replaced by wheat and rice, have been favoured. **Sub-section 4.2.4** discusses the health and food security value of biodiversity.

The global economic value of ecosystem benefits and components of biodiversity, as estimated by Constanza (1997), amounts to US$33 billion, which is around 1.8 times the world's GNP. There is only indicative information on the economic values of biodiversity, particularly in countries like India. But even these indicative estimates are adequate to point to the immense economic values of biodiversity. The **Sub-section 4.2.5** discusses some of these.

It is well known that nature is a major source, inspiration and subject of scientific thought. The mainstream sciences as well as the several non-mainstream indigenous sciences are all centrally concerned with the understanding of nature. Thus biodiversity which constitutes the whole of "living" nature has a profound and intrinsic "scientific value" in all cultures. **Sub-section 4.2.6** discusses some aspects of this value of biodiversity.

**Sub-section 4.2.7** traces the intricate link that exists between culture and biodiversity in India, with its many different communities and their traditions. This includes the cultural value for agricultural biodiversity. Culture is an often forgotten and neglected part of cropping practices. But for farmers, especially women, culture has been an inalienable part of their decision to raise diverse crops on their lands.

Nature has an aesthetic value that is "experienced" by human beings when they are in natural surroundings. Growing up in degraded environments can result in the implantation of negative attitudes in human populations. **Sub-section 4.2.8** looks at the aesthetic value of biodiversity.

## Chapter 5: Causes for the Loss of Biodiversity

Significant erosion of India's biodiversity at the ecosystem, species and genetic level has already taken place. This chapter describes the causes of this erosion in two parts: first, the proximate causes, or factors that can be pinpointed as the direct and immediate ones causing the loss; and second, the root causes, or factors that are indirect and often hidden, and which in the first place give rise to the proximate causes.

**Section 5.1** describes the **proximate causes of the loss of biodiversity**. For natural ecosystems and wild taxa, these are habitat destruction and degradation; hunting, exploitation, collection and fishing; the introduction of exotics; and others like accidental mortality, human-induced disasters, and climate change. Habitat destruction and degradation have resulted in the loss of forests, grasslands, marine areas, freshwater habitats, etc due to many factors like diversion of forest land for non-forest purposes; official programmes that converted natural mixed forests into plantations or those that planted trees on grasslands; pollution of aquatic ecosystems due to industrial effluents and pesticide use; extractive processes like mining, and so on. Hunting and poaching, often combined with habitat loss, have threatened several species. In the marine ecosystem, over-harvesting has begun to deplete the stock of many species of fishes, following the introduction of mechanised technologies. The impact of exotics has been poorly documented, though freshwater fishes have been perhaps the most affected by this. There is increasing incidence of accidental mortality of animals belonging to endangered species, due to a variety of reasons such as electrocution, train hits, road kills and trawlers. Recent research on climate change indicates possible shifts in vegetation type boundaries and consequent impacts on biodiversity.

The proximate causes of the loss of biodiversity in agricultural ecosystems and domesticated taxa are habitat destruction; the introduction of exotics and hybrids; the homogenisation of ecosystems; and others like the loss of wild relatives, and market orientation. In India over 50% of agricultural land faces moderate to severe degradation, resulting in the loss of traditional agro-ecosystems, which harbour high levels of crop and livestock diversity. Loss of pastures due to developmental projects and agricultural expansion (e.g. after irrigation was introduced into the semi-arid zone of western India) has adversely affected indigenous livestock breeds. Studies in North-east India, have shown a whole range of `minor' cultivated and semi-cultivated varieties as threatened because their areas of cultivation are losing out to non-agricultural land uses. However the biggest factor in the decline of both cultivated plants and domesticated animals (at the species and genetic levels) is the recent large-scale introduction of exotics and modern cross-breeds. Modern agricultural fields stress single crop productivity as against the traditional multi-cropping patterns, and hence such homogenisation has resulted in the loss or reduction of area of some crops like pulses, sorghum, millets, and their replacement by to a handful of varieties of rice and wheat. Crop and perhaps livestock (including poultry) genetic diversity has possibly also been affected by the loss of wild relatives of crops, as also natural pollinators and dispersal agents. The loss of some indigenous varieties of crops, like some of the small millets, is also due to a preference of cash crops over food crops.

The **Root Causes** of the loss of biodiversity described in **Section 5.2** are qualitative in nature, and their impacts are felt through a complex interplay of different site-specific social, economic and environmental factors. One major root cause is the **model of development** that India has followed, which has centred on large-scale industrial expansion, commercial (monocultural) agricultural production, and increasing the consumption of goods and services through exploiting natural resources, with scant regard for sustainability. Abundant evidence is now available of the negative impacts of this development model on natural and agricultural ecosystems, habitats and species, as well as ecosystem based livelihoods and socio-economic equity.

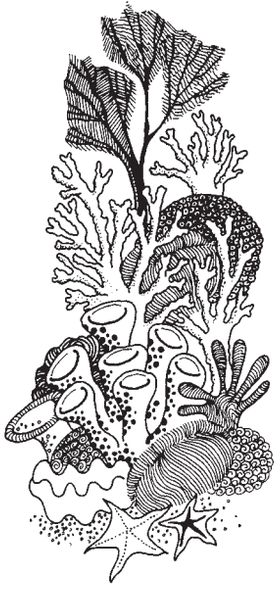
The **erosion of customary rights and traditional management** regimes over forests, pastures and common lands and water bodies, which were attuned to ecosystem specific natural resources, has also led to the loss

of biodiversity. Starting in the colonial period and extending to beyond Independence, common property rights of communities were replaced by state owned rights, or state administered individual (private) rights. Many tenurial conflicts are rooted in such blanket processes of state acquisition of forest and revenue lands as well as communal water management systems, without detailed surveys of existing uses and users. Past and continuing confusion in official land records has left hundreds of thousands (possibly a few million) of forest dwellers without land titles, labeled as 'encroachers', often leading to their displacement, and forcing them to clear new land. Unsustainable and reckless harvesting from forests, wetlands, and other ecosystems, has ensued partly due to such processes. This is aggravated by a severe lack of inter-departmental coordination, enabling vested interests to occupy biodiversity-rich areas (the real encroachment), allowing mining and other destructive activities in natural areas, and encouraging inappropriate land/water uses by a range of line agencies.

**Increasing social, political, and economic inequities** pervade both rural and urban, and traditional and modern India. Inequities between land-owning peasants and forest-dwellers in the past have, for instance, often led to severe deforestation. The ongoing process of market driven economic liberalization and globalisation, leading to intense competition for the country's bio-diverse resource base, poses special challenges for the state to protect the resource rights of the less privileged communities. Unequal political power and elite influence over state policies and programmes, are leading to over-exploitation of natural resources for unsustainable consumerism by elite groups while leading to displacement from basic survival resources of tribal, pastoral, fisher and other ecosystem dependent communities. Caste-based, class-based and also gender inequities in access and control over natural resources have also been among the root causes of biodiversity loss, e.g. through encroachment of pasture lands by powerful landlords.

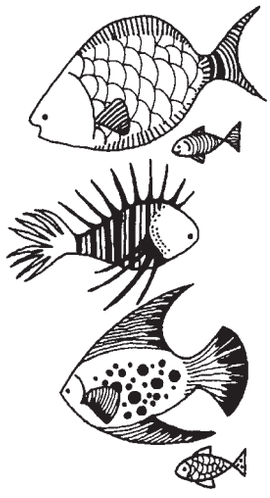
**Changes in cultural, ethical and moral values**, have also led to biodiversity loss through the following: the alienation of local communities from natural resources; the spread of homogenous attitudes such as the notion that wheat and rice are the only grains worth eating; the devaluation of traditional/indigenous knowledge; displacement of local communities due to large-scale development projects with inadequate or non-existent rehabilitation measures; and urban consumerist lifestyles, which are largely bereft of cultural or ethical links with biodiversity that often set the model for rural and semi rural areas.

**Lack of recognition of the full values of biodiversity** is one of the root causes of unsustainable exploitation of biological resources. There has been *an ethical and cultural undervaluation,* as is evident in the rapid decline in the protection being accorded to sacred groves and landscapes, and to species. Farmers across the country have lost their cultural links with the land, as agriculture has become more market oriented. *Productivity undervaluation* has occurred because of the myth that traditional cultivars, which are essential for a diverse cropping system, are low yielders (ignoring the overall superior input-output ratio, energy, efficiency, and overall biomass output of such agriculture). Non-appreciation of water and other ecosystem benefits provided by biodiversity, has led to critical ecosystems often being diverted for 'developmental' purposes. Modern India's health policies and programmes have consistently ignored the *health value* that elements like medicinal plants and traditional crops have provided. Agricultural policies and programmes do not even acknowledge the role of agro-biodiversity in nutrition and health. Economic planning and budgeting in India has not taken adequate account of the enormous *economic value* of biodiversity. If ecosystem benefits like water security and soil productivity, survival and livelihood contributions to hundreds of millions of people, health services to the majority of rural and a significant proportion of urban population, were to be provided for through technological means, the cost to the economy would be colossal and unaffordable.



**Some inappropriate, inflexible, weak, and contradictory laws and policies** have also been a root cause for biodiversity loss, specifically due to: contradictions between polices and laws relating to environment on the one hand, and those relating to industrial development, commerce, and welfare on the other; lack of an adequate integration of biodiversity concerns into most policies and laws, including many of the 'environmental' ones; centralising tendency of some laws; weak enforcement, and in cases, lack of implementation of existing laws that have the potential to create a positive impact on conservation of biodiversity and related livelihoods; inadequate

empowerment of citizens, especially biodiversity-dependent communities, to use the existing policies and laws or to challenge them when inimical to biodiversity conservation; and no holistic land use plan and policy that can specify fragile areas as being off-limits to destructive development processes .



**Some demographic changes** have also contributed to the pressures on biological resources: the growth in population since the time of Independence; the localized demographic movements, of which the most dramatic, yet least recognised, has been the movement of persons (several million) displaced by large development projects, including large dams; illegal immigration from within and outside the country; and unrecognised refugees of policies that have forced people off the land.

In India a number of biodiversity elements have been subjected to impacts of **inappropriate trade systems:** for example, the sheer increase in the quantum and scale of demand on specific biological resources, as more consumers are able to access them; and national and international markets being usually much more 'homogenising', in that they demand standardised, "quality-controlled" products, in contrast to local markets which are content with a diversity of produce. Impacts on biodiversity from trade are likely to significantly increase in the next few years, with India's acceding to the World Trade Organisation's treaties. For instance, export policies that spread monocultures and export oriented cash crops are being encouraged, at the cost of biodiverse farming systems.

## Chapter 6: Ongoing Initiatives and Their Major Actors

This chapter describes current and past initiatives related to the conservation of wild and domesticated biodiversity. The initiatives described are only indicative. There is no attempt to be comprehensive, nor is each initiative described in great detail. The description of current and past initiatives is followed by major gaps in each of the subsections. Also, there is only brief coverage of state government activities; these would be better described in individual state BSAPs, prepared as part of the NBSAP process. Local and ecoregional activities would also be described in more detail in the local and ecoregional BSAPs.

The chapter is divided into four sections:

- **Section 6.0** looks at ongoing initiatives on overall planning and governance.
- **Section 6.1** looks at initiatives related to wild biodiversity.
- **Section 6.2** describes efforts related to domesticated biodiversity.
- **Section 6.3** deals with work linking wild and domesticated biodiversity.

Each of these sections looks at government, NGOs, and the community as well as initiatives by other actors such as corporate sector, armed forces, academic and research institutions, media, and others.

### 6.0 Initiativs on Overall Planning and Goverance

In **Section 6.0**, it is pointed out that the conservation of biodiversity and use of biological resources is dependent on the overall structure of planning and governance in India. A substantial part of the country's biodiversity is on lands (and in waters) that are state-owned. But there are also significant parts that are in the hands of communities and individuals. Generally, decisions regarding the conservation, use, and distribution of biodiversity and biological resources, are currently within the broader framework of India's political decision-making process. This process has emphasised representative democracy, in which elected representatives from village to national level take decisions and cause them to be implemented. The process has also stressed that planning and management be done by specialised agencies, e.g. the Forest Department for forests (and 'forest lands', a legal category which also includes non-forest ecosystems). Over the last few years, greater focus is being put on decentralised governance of resources and other aspects of village and city life.

This section also describes some crucial gaps in the current planning and governance of biodiversity, some of which include:

- India still does not have a comprehensive national land and water use plan.

- Governance of biodiversity (and natural resources generally), remains highly centralised, and in the control of government agencies, though changes are slowly coming in.

## 6.1 and 6.2 Initiatives Relating to Wild and Domesticated Biodiversity

**Sections 6.1** and **6.2** are further divided into eleven sub-sections. Each subsection highlights innovative examples from various parts of the country. These include national level research activities, existing information sources, official and people's initiatives towards conservation, sustainable use, and the equitable sharing of benefits. The sub-sections are described below:

### 6.1.1 and 6.2.1 Understanding and Information

In spite of the several decades of research by various government organizations and university departments, our understanding of the multitude of India's natural ecosystems, their species diversity and the constraints in their sustainability still remains fragmented and localized. Even as basic a thing as an inventory of faunal and floral elements is not comprehensive. Sustainable utilization and management fronts fare no better. These lacunae have been recognized, and several initiatives, on governmental and non-governmental levels, are in place to cover them. **Section 6.1.1** reviews some of the major ongoing initiatives on understanding and conservation of India's biodiversity. Some key gaps in such initiatives are:

- Baseline data on species and genetic diversity, particularly intra-specific genetic diversity and their micro and macro habitats, is inadequate.
- There are serious gaps in knowledge with relation to marine biodiversity and resources.
- Identification of indicator species, which serve as early warning signs of habitat change, is lacking.
- There is very little understanding of the links between wild and agricultural biodiversity.
- There is inadequate monitoring of wildlife populations takes place as an explicit activity of management.
- There is a lack of studies relating to biodiversity impacts of range of human activities, including of wildlife management practices themselves.
- Development of community-based M&E methodologies, and building capacity to use these, is weak.
- There is limited understanding of research initiatives taken up by communities, and of traditional forms of research and documentation.
- There is lack of understanding and valuation of ecosystem values of biodiversity.
- There is inadequate coordination amongst the various agencies undertaking research and monitoring.

The lack of understanding and information about biodiversity is especially acute with respect to domesticated biodiversity. On the other hand, Green Revolution technologies, which have promoted high yielding varieties and monoculture and have thus been instrumental in destroying agro-biodiversity, have long been defended. It is only in very recent years that some mention of agro-biodiversity is seen when references are made to pesticide use in agriculture and in discussions on transgenic crops. **Section 6.2.1** attempts to highlight some of the efforts in the understanding and research on agricultural and livestock diversity. Some key gaps include the following:

- There is no monitoring in agricultural areas for tracking diversity, and the impacts of various agricultural policies and programmes or of other developmental activities and cultural changes, on this diversity.
- Documentation of the innovative work on domesticated biodiversity is meagre.
- There is no comprehensive database on domesticated biodiversity.
- There is little understanding in the formal sector, of the links between domesticated biodiversity and culture.

### 6.1.2 and 6.2.2 *In Situ* Conservation

Conservation *in situ* is the conservation of ecosystems and species in their natural surroundings. Such conservation not only ensures the continuation of the full range of conditions needed for ecosystems and species to thrive, but also provides for the elements of evolution to continue. India has taken several critical steps towards *in situ* conservation of wild biodiversity, some of which are highlighted, in **Section 6.1.2.** Some key gaps in such efforts are:

- The current PA network does not adequately cover many biotic provinces over states and biogeographic regions.

- Measures to tackle threats to PAs have been inadequate.
- Little attention has been paid to the conservation of plants in general and lower groups of plants and animals in particular.
- Conservation policies and programmes (both government and non-government) have alienated local people and have not recognized the potential of community-based conservation.
- Biodiversity conservation in forestry, fisheries and grassland management programmes is weakly integrated.
- Issues relating to human-wildlife conflict are not being adequately addressed.

It is only in the recent past that agricultural scientists and others have acknowledged what farmers and pastoralists all along knew, that the best way to conserve agro-biodiversity is to continue to grow it in the fields and raise it in pastures. In this sense, *in situ* conservation of crop and livestock diversity is its continued presence in farming and animal husbandry practices. Unfortunately, most of the formal sector agro-biodiversity initiatives have been restricted to *ex situ* conservation after collecting from farmers and pastoralists. Increasingly, there is a realisation that this needs to change, and that the future of this diversity is largely in *in situ* conditions, where not only can continued diversification take place, but evolutionary forces are also allowed full play. **Section 6.2.2** highlights some of these efforts. Some key gaps are:

- Very few governmental organisations and agricultural universities have a systematic programme on *in situ* conservation.
- Most official and NGO propagated agriculture and animal husbandry practices actively discourage the use of indigenous varieties and breeds.
- There is a serious lack of financial support for maintenance and use of indigenous varieties.
- Much of the *in situ* conservation efforts of communities remain unreported, undervalued and at serious risk.
- There are a few efforts focusing on the conservation of agro-biodiversity significant areas.

### 6.1.3 and 6.2.3 *Ex Situ* Conservation

Given the sad but undeniable reality that there are simply not enough spaces left for the full range of *in situ* conservation initiatives to be put into place, and that at least for the forseeable future natural habitats are going to continue being under threat, there is an urgent need for conservation initiatives outside natural habitats also. Such *ex situ* conservation includes zoological parks (for animals), botanical gardens (for plants), and culture collections (for micro-organisms). **Section 6.1.3** describes the range of initiatives being taken in India for such conservation. Some key gaps are:

- Facilities for the *ex situ* conservation of biodiversity are limited and inadequate for the range of biodiversity that needs to be conserved.
- There is a lack of overall vision and direction linking *ex situ* to *in situ* conservation, including systematic planning on captive breeding and cultivation for reintroduction into the wild.
- There is a lack of a central database with full information on all zoological parks and botanical gardens, especially on pedigree lines, genealogies, exchanges and so on.
- There is a lack of financial, technical and legal support for non-governmental and community efforts.

Given the rapid erosion of agro-biodiversity in the fields and pastures of India, there is a critical need for a back-up reservoir of indigenous crop, livestock, and pet diversity. This is, in a very limited manner, possible in *ex situ* conditions, such as gene banks and breeding centres. Such facilities can never conserve the vast diversity that is in *in situ* conditions, but could provide critical repositories of important germplasm that could be re-utilised if the *in situ* stocks diminish. India has a strong *ex situ* conservation programme for domesticated biodiversity. Some of these initiatives are described in **Section 6.2.3.** Some key gaps are:

- Large-scale loss of genetic diversity makes it difficult to locate and use, for *ex situ* breeding purposes, traditional livestock varieties.
- There is a lack of financial, policy and infrastructure support to community gene and grain banks.
- So far, the major emphasis was on collecting germplasm of important cultivated crops and limited to selected areas. Unfortunately, similar attention is not paid to conservation of traditional landraces/breeds, particularly so in the case of animals, many of which are therefore being replaced by hybrid breeds.
- There is inadequate or no repatriation of seeds and livestock back from government *ex situ* collections to

farmers and pastoral communities.
- There is little official support or recognition to community gene banks.

### 6.1.4 and 6.2.4 Sustainable Use

Almost all the ecosystems, and a great proportion of species in India, are under some form of human use. While in the past a number of factors, including traditional restraints and customary practices, low population, and lifestyles that were not resource-intensive, contributed to the sustainability of this use, today's levels of utilisation are very often well beyond the capacity of the ecosystem or species to recuperate. Reaching sustainable levels of use is therefore a critical goal. Despite the fact that the concept of sustainability is a well established principle of management, its practice often poses problems. For some, it is the simple question: will the ecosystem or species being used be able to return to its original form or numbers, after use? For others, the question is more complicated: will the ecosystem or species not only return to its original form and numbers, but will it also retain the internal diversity and the relations with the rest of nature, after use? Will all the other elements of diversity that are dependent on the ecosystem or species in question, be able to continue meeting their needs born of this dependence?

The Convention on Biological Diversity defines sustainable use as "the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations".

In the absence of a clear national understanding on this issue, what is covered in this section, are thumb-rule measures such as whether the overall coverage of an ecosystem remains, or whether the overall numbers of a species remain at a viable level. It is quite clear that even using these somewhat simplistic parameters, resource uses in India are often well above sustainability levels. Some initiatives towards reaching sustainability are discussed in **Section 6.1.4.** Some key gaps are:
- There are clear gaps in the conceptual and empirical work on the definition of sustainability.
- Assessment (including M&E) of the sustainability of all existing resource uses by communities, industry, urban consumers, and others, remains extremely weak or even absent in cases.
- There is no comprehensive assessment of the extent and nature of the dependence of people's livelihoods on biological resources, the threats to these livelihoods and the changes they are undergoing due to the same.
- There are inadequate assessments and feasibility studies of the population and productivity of each species, in both terrestrial and aquatic ecosystems.
- There is limited acknowledgement and recognition of the fact that people dependent on biological resources have traditionally developed their own norms of sustainability, and limited understanding or documentation of how and why these norms are eroding.
- There are inadequate provisions in programmes, schemes, laws and policies to ensure sustainability in all forms of biological resource use.
- There are few efforts to explore and promote alternate livelihoods, where existing practices have become unsustainable and/or ecologically destructive practices have been adopted by communities.
- There are only scattered efforts to promote sustainable biodiversity-based enterprises to enhance the livelihoods of local communities dependent on biodiversity.

In the case of domesticated biodiversity, *in situ* conservation and sustainable use are more or less synonymous as far as crop and livestock use is concerned. However, there are other aspects of agricultural sustainability, especially those related to land productivity and water use, which need to be considered. In the last few decades there has been an overall loss of agricultural productivity and sustainability. This is primarily due to soil loss, nutrient imbalance caused by excessive use of NPK fertilisers, chemicalisation and death of living matter in the soil, and waterlogging/salinisation. Attempts to offset this include changes in cropping patterns, better drainage, a switch to integrated systems using less chemicals, and so on. In addition, a critical consideration is the degree of self-sufficiency of the farmer, and the country as a whole. Increasing dependence on the market and the state has reduced the institutional sustainability of agriculture. **Section 6.2.4** describes some initiatives that focus on these issues. Some key gaps are:
- The rice-wheat based centralised Public Distribution System (PDS) has been a major factor in undermining

the once-biodiverse agriculture of the country. The PDS is not even appropriately linked to the nutritional requirements of people, since it has displaced or does not encourage the consumption of a number of nutritious traditional foods.

- Public Health programmes rarely integrate traditional nutritious foods, as preventive measures.
- There are very low incentives and very sporadic subsidies for organic farming, despite some encouraging recent programmes of the central and state governments. Marketing initiatives promoting organic agriculture are not yet widespread.
- There are few supplementary livelihood activities developed for people dependent on agriculture, leading to over-use or neglect of land.
- Traditional cultured fisheries, both inland and coastal, have been displaced and destroyed by many factors including commercial intensive aquaculture, depriving many people of their livelihoods and reducing the sustainability of the land/water.

**6.1.5 and 6.2.5 Equitable Access, Use and Sharing of Benefits**

One of the root causes of biodiversity destruction, and the loss of biodiversity-based livelihoods, has been a range of inequities in access to decision-making, resource use, and sharing of benefits. This is also within the context of the growing international discussion on access and benefit-sharing (ABS). The Preamble of the Convention on Biological Diversity (CBD) states that the contracting parties recognise "the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of it's components".

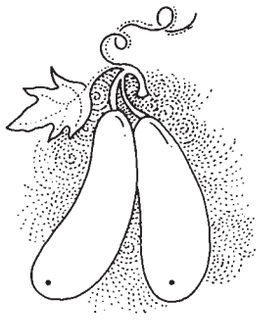
Article 8j of the CBD also requires equitable sharing of benefits with the holders of traditional knowledge and practices, and this would apply as much within India as outside. There continues to be discussion on the precise definitions of these terms, in particular the term "equitable"

For the purposes of this action plan, a broad concept of equitable access/use and benefit sharing has been used. This includes:

- The right of primary stakeholders such as local communities who depend on biodiversity, and other direct managers of natural resources, to access and protect biological resources and related knowledge essential for ecosystem benefits and livelihood security. Since such access is meaningless without reference to the lands and waters on which these resources exist, this should also include the right to access and protect land and water;
- The right of primary stakeholders, as also the country to which the resources belong, to an equitable share of the benefits being generated from access and use by others; in this case 'equitable' meaning that which is agreeable to all parties concerned with special focus on the needs of underprivileged sections such as women, 'lower' castes and classes, and *adivasis*;
- The responsibility of all such stakeholders to ensure the conservation of these resources, sustainable use, and in turn further equitable access and benefit-sharing from such use, and the perpetuation of related knowledge;
- The need to ensure the protection of traditional/indigenous/community knowledge related to biodiversity, and in particular to ensure that intellectual property regimes respect the rights of communities (and individuals within communities) to control such knowledge, and their rights to an equitable share of benefits being generated from the wider use of such knowledge.

The broad concept of equitable access, use and sharing of benefits would largely apply to wild as well as domesticated biodiversity. **Sections 6.1.5** and **6.2.5** describe some initiatives towards equitable access, use and sharing of benefits. Some key gaps include:

- A range of inequities continue in the control and the use of biodiversity in marine/coastal, forest, wetland, grassland and desert ecosystems. Centralised state control over large areas is compounded by the inequities within and between communities.
- The legal or institutional mechanism to secure improved commom property resource access for tribal and other forest dwellers remains inadequate, despite recent panchayat related legislation.
- In most states, the commitment to promoting 'Gram Swaraj' through gram sabha empowerment has pro-



gressed very slowly.

- In most states, marketable NTFPs have been treated as state property and the gatherers paid at best unskilled labour wages.
- Very few practical initiatives have been taken to acknowledge, value and protect the indigenous knowledge of NTFP gatherers or fisherfolk.
- Measures to protect traditional knowledge, and to ensure appropriate and equitable benefit-sharing from its wider use, are as yet almost non-existent.
- Land and water rights are still highly skewed, especially due to the failure of land reforms, and unchanged water ownership laws.
- Women's lack of independent land and resource rights has led to their disempowerment and marginalisation.

### 6.1.6 and 6.2.6 Capacity of Actors in Each Sector

All sections of society need to be involved in the colossal tasks of conservation, sustainable use, and ensuring equity. Yet, different sections have different skills and knowledge, and each has major gaps in the capability to handle the required tasks. Identifying these gaps, and what is needed to plug them, is a major challenge. **Section 6.1.6** looks at how capacity of various stakeholders can be built. This includes public functionaries and governance institutions, rural communities, NGOs, urban residents, workers/labour unions, judiciary, armed forces, police and customs, corporate/business sector, media, scientific community, religious institutions/leaders, and others. Some key gaps are:

- There is a marked decline in taxonomic expertise.
- There is serious lack of ecological orientation in sectors like lawyers, judges, economists, financial experts, custom officials, and line departments other than environment/forests.
- There is an inadequate capacity in current biodiversity related institutions to deal with new situations and challenges, e.g. participatory and joint management systems, socio-economic issues, climate change, decentralization, intersectoral integration and so on.
- Schools are presently not drawing upon the best available Environmental Education (EE) experiences in the country.
- The biodiversity component in various courses offered by universities and academic institutions is not holistic. It often tends to be technical, ignoring the practical and social aspects of conservation, sustainable use, and equity; even where the syllabus is adequate, the necessary expertise to teach it is limited.
- Serious erosion is taking place in non-formal and community forms of knowledge transmission, education, and training; everywhere in the country these means of education have been "devalued", considered irrelevant or primitive. Such being the case, the traditional institutions of learning are fast fading out.
- The urban community is strongly moving towards a global culture of consumerism, which further removes it from nature and ecological consciousness.

India has amongst the world's largest pools of biodiversity knowledge, including an immense range of traditional/indigenous knowledge and a huge modern scientific base. **Section 6.2.6** describes some of the key initiatives in increasing the biodiversity-related capacities of various sectors for domesticated biodiversity. Some key gaps are:

- There is a lack of training of agricultural extension workers, and workers at government-run agricultural establishments like the Krishi Vigyan Kendras, on agro-biodiversity issues.
- Agro-biodiversity information is missing or meagre in all educational curricula and related text books.
- Consumer awareness regarding the benefits of organic, biodiverse produce is still very inadequate, especially in cities.
- There are few efforts to document the revival agricultural diversity at local levels.

### 6.1.7 and 6.2.7 Inter-Sectoral Coordination

Biodiversity is affected by myriad human activities. Such activities are the domain of a variety of official and non-official 'sectors": ministries, departments, academic and other institutions, NGOs, and communities themselves. While rural communities often tend to integrate different aspects of their life in somewhat seamless ways, or at least did so traditionally, the state and academic formal institutions are more fragmented and compartmen-

talised. Water, land, forests, air, minerals, and the human agencies and facilities necessary to deal with these natural resources, are each the subject of a different department, or a different academic discipline. This results in two problems: (a) the lack of coordination amongst all these sectors, and, (b) the lack of integration of biodiversity into the non-environment sectors.

The realisation that this non-integration is one of the major causes of biodiversity loss (and more generally of the failure to achieve sustainable and equitable development and welfare) has prompted a number of initiatives to achieve inter and cross-sectoral integration. **Sections 6.1.7** and **6.2.7** describe some such initiatives for wild and domesticated biodiversity. Some key gaps are:

- There is a lack of guidelines and capacity-building on inter-sectoral coordination, for local, district, and state level decision-makers.
- There is no institutionalised, statutorily mandated process at state or national levels, of integrating biodiversity into all the sectors of planning, welfare, and development.
- Integration of agro-biodiversity into sectoral planning and processes is extremely weak, and most cases absent.
- There is a lack of documentation and learning from the successful formal and informal initiatives at achieving integration (such as those described in this section), and thereby inadequate upscaling and spreading of these initiatives.

### 6.1.8 and 6.2.8 Policy and Law

In recent times, attempts have been made to synergise the predominantly 'environmental' laws and policies with those dealing with human rights and welfare; as also to reconcile the serious differences that have conventionally existed between these two sets of statutes and those dealing with commercial and 'developmental' activities. India has one of the world's largest bodies of law and policy related to conservation of wild biodiversity, and an ancient history of customary law. Some of these are described in **Section 6.1.8**. Some key gaps are:

- Several of the existing laws and policies in the country are not oriented towards biodiversity concerns, or have a weak integration of these concerns.
- In many cases laws and policies of different sectors are in contradiction to each other.
- There is weak implementation of many relevant laws, which includes the lack of public empowerment and inadequate facilities/capacities of official agencies.
- There is inadequate recognition and encouragement given to customary laws.

There are a number of existing policies and statutes in India that have a bearing on the agricultural sector. Of these, the Central Government exercises its jurisdiction over a range of subjects, while some are essentially under the purview of the State Governments. **Section 6.2.8** briefly describes existing central legislation and policy including 'judge-made' law that has a bearing on aspects of the conservation of agricultural ecosystems and domesticated taxa. Some key gaps are:

- There is a lack of a comprehensive legal regime to prevent conversion of prime agricultural land for non-agricultural purposes and weak implementation of state laws relating to such conversion.
- All the national germplasm collection efforts have taken place without an access and benefit-sharing arrangement with the farmers and pastoralists from whom the material and related knowledge have been obtained. Such a regime is still not in place.
- The concept and practice of farmers' rights is weakly developed; some element of it has come into the Plant Varieties and Farmers' Rights Protection Act (2002), but here too it is weak and inadequate.

### 6.1.9 and 6.2.9 Financial Measures

Policy and programmatic changes are the most important measures for biodiversity, especially the integration of biodiversity into sectoral plans and programmes, and the reorientation of budgets towards greater ecological sensitivity. However there is an also a need for extra funds for a series of actions. There has been a consistent demand by environmentalists and others for increasing the amounts within government budgets, for biodiversity-related actions. **Section 6.1.9** looks at some schemes that finance wild biodiversity-related work. Some key gaps are:

- India has a repertoire of economic incentives with a bearing on utilisation of biological resources; however,

these traditional economic mechanisms are oriented more to 'revenue raising' and biomass augmentation, and are not necessarily oriented towards conservation.

- There is very little systematic work on the relationship between macro-economic growth measures and their precise environmental effects.
- Institutions at various levels of decentralised governance, are often not financially empowered. They do not often have the right to generate and control their own financial resources through the sustainable and equitable use of natural resources, the right to secure and control public funds, and the power to decide upon the priorities by which various line departments should spend their budgets in the area under their jurisdiction.

Although there are a few schemes that finance wild biodiversity-related work, financing in the domesticated sector has been largely directed towards increasing yields and production. Financial incentives and schemes are almost completely towards conventional, input-intensive, chemical-based farming, and hybrids in pastoralism. Some innovative schemes that reverse this trend by promoting biodiversity are described in **Section 6.2.9**. Some key gaps are:

- Central and state financial schemes to support agriculture are being implemented with limited evaluation of shortcomings or impact especially on agro-biodiversity and on biodiversity-related traditional knowledge.
- A series of perverse financial incentives, such as subsidies on chemical fertilisers and pesticides, are encouraging forms of agriculture that are destructive of biodiversity.
- There is continued undervaluation or neglect of the values of agro-biodiversity and of traditional farming/pastoral practices. Budgets do not reflect such values at all, and are not adjusted to reflect the enormous social, economic, and ecological costs of erosion in agro-biodiversity.
- There are few funds specifically earmarked for agro-biodiversity.

### 6.1.10 and 6.2.10 Technology

Lately there has been a growing emphasis on developing and using technologies which do not adversely effect the environment and are more socially acceptable as compared to the conventional technologies that have been/are in use. Environment friendly technologies can be classified as:

- Technologies that reduce environmental damage by reducing pollution through modifications in the process/products.
- Technologies that increase the efficiency of the production process, thereby reducing the amount of bioresource raw material used, or technologies that substitute threatened bioresources with alternatives.
- Technologies that turn waste into products that are not harmful to the environment.
- Technologies that increase the productivity of natural resources.

Broadly, there are two kinds of industries/processes that are relevant:

- Those that use bioresources as raw materials, e.g. pharmaceutical, agro-industries, tanneries, sugar mills, seed, NTFP-based, and so on.
- Those that do not use bioresources but impact on biodiversity, e.g. steel plants, electronic industries, dams, mines, and so on.

**Section 6.1.10** describes some innovative uses of technology in wild biodiversity conservation. Some key gaps are:

- There is comparatively less promotion for technologies that efficiently use natural/biological resources. There is little or no standardization in the use of these technologies.
- The dissemination of environmentally sensitive and socially acceptable technologies is very poor.
- Introduced technologies are rarely shared with local communities and their participation rarely sought, or they are often culturally in appropriate.

As in the case of wild biodiversity, there is much to learn from the traditional technologies even in agriculture. For centuries farmers have used biodiversity friendly technologies, which are also in tune with productivity. There has been a trend in the last few decades towards the increased mechanization and homogenization of agriculture in India, which has unfortunately led to the loss of traditional farming practices. The major technological advances during the last three decades have been accompanied by a large increase in the consumption of artif-

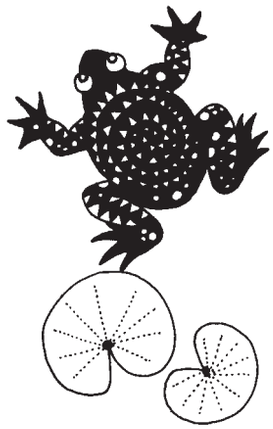
ical inputs like chemical fertilizers, pesticides, hybrids, and now, genetically engineered organisms. Though this trend continues to exist in policies and practice, there are several places in the country where biodiversity friendly agricultural technologies have been kept alive by communities, or innovated upon by government and non-governmental organizations. Increasingly, the government is also responding with larger policy and programmatic support to such technology. Some are described in **Section 6.2.10**. Some key gaps for this section are:

- There is little integration and mutual synergism of traditional and modern agro-technologies, by farmer-led or participatory R&D.
- There is a lack of promotion of agro-based resource/waste utilization as an alternative to the conventional technologies, hampering potential incentives to sustainable agriculture.

### 6.1.11 and 6.2.11 International Fora

Other countries and international institutions affect the biodiversity of India in myriad ways. **Section 6.1.11** and **6.2.11** concentrate on some of the multi-lateral agreements that India is a party to and that impact on India's wild and domesticated biodiversity. This includes environmental treaties such as the Convention on Biological Diversity, economic treaties such as those under the World Trade Organisation, and human rights treaties. Dimensions of the in-country implementation and effects of many of these agreements are covered elsewhere in this chapter. Some key gaps are:

- India has played an inadequate role in advocating conservation and sustainable use shared resources with neighbouring countries (both water and genetic resources) at South Asian fora like SAARC.
- There has been inadequate use of international human rights treaties and forums by India, to promote the cause of biodiversity and livelihood security.
- The links between human rights instruments and environmental treaties, as they impact on India, have not been clearly worked out.
- There are few safeguards in India regarding the ecological and social impacts of increasing trade in agricultural produce, especially the dumping of subsidized produce from outside and the conversion of small farmer oriented systems to capital intensive export and market-oriented ones.



## 6.3 Initiatives Linking Wild and Domesticated Biodiversity

Finally, **Section 6.3** describes the links between wild and domesticated biodiversity.

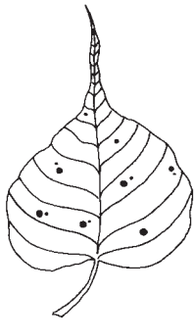
Human societies with their various forms of domestication have traditionally co-existed with natural ecosystems and wild species, sometimes in conflict, sometimes in harmony. Unfortunately, the myriad inter-relations between the two worlds have been poorly understood; much of the attention they have got has been restricted to the conflicts between wildlife and crops/livestock, or the damage caused to wilderness areas by agricultural extension and livestock.

However, it is clear that there are a range of positive links between the two. This includes: pollination of crops by wild animals, cross-breeding between crops/livestock and their wild relatives, the use of semi-domesticated or semi-wild species/breeds/varieties, the use of a wide range of wild plants for manure, pest control, and other uses in agriculture, the refuge and corridor service that certain forms of traditional agriculture provide to wildlife, traditional pastoral practices (including grassland management and nomadism) that favour wildlife, and the use of diverse wild foods in organic farms such as aquatic fauna in organic rice fields.

In India, there have been very few explicit attempts at encouraging such links. Some of the ones that have been tried are described in this section.

Some key gaps are:

- There are very few attempts at systematically linking natural and domesticated biodiversity in the country, either in understanding the links or in promoting the positive ones.
- There is very little documentation and dissemination of information about the few initiatives, which are currently underway.
- The practices by communities, which traditionally often integrated the wild and domesticated into a continu-



um, are not well-known in formal sector agencies, or encouraged by ongoing policies.
- There is no concerted effort to promote landscape or waterscape planning in the country.

## Chapter 7: Strategies and Actions

It is from an understanding of the causes for loss of biodiversity (**Chapter 5**), and the critical strengths and gaps in ongoing initiatives to address this loss (**Chapter 6**) that, a series of strategies and actions are recommended in **Chapter 7**. This chapter lays out, in detail, the strategies and actions required to achieve the three objectives of the NBSAP: conservation of biodiversity, sustainable use of biological resources, and equity in dealing with various aspects of biodiversity.

As in the case of **Chapter 6**, this chapter is divided into four sections, and emanates from the analysis of initiatives and gaps presented therein:
- **Chapter 7.0** looks at overall **planning and governance directions**, and lays out the broad framework within the context of which specific strategies and actions are to be seen.
- **Chapter 7.1** gives the strategies and actions for **wild biodiversity** (i.e., natural ecosystems and wild taxa);
- **Chapter 7.2** gives the strategies and actions for **domesticated biodiversity** (i.e., crops, livestock, and pets);
- **Chapter 7.3** gives the strategies and actions relating to the **links between wild and domesticated biodiversity**.

In each of these sections, there is a set of broad **strategies**, and within each strategy, specific **actions** that are required. Each action is accompanied by details on the *justification* for the action, the specific *steps* needed, the *agencies* recommended to be responsible for these steps, and the *time frame*. Also mentioned in many cases are ongoing initiatives that can be build upon or learnt from.

In the case of many of the actions, existing **Government of India schemes/programmes** that are relevant and could therefore provide support to these actions, are also mentioned in a box at the end.

*The above-mentioned details are not included in this summary; readers are requested to refer to the full document.*

A total of **101 strategies** and **345 actions** are recommended, with the following break-up:

- **Chapter 7.0** (Overall planning and governance) 2 Strategies, 2 Actions
- **Chapter 7.1** (Wild biodiversity): 65 Strategies, 250 Actions
- **Chapter 7.2** (Domesticated biodiversity): 34 Strategies, 89 Actions (it may be noted here that a number of strategies and actions listed in Ch. 7.1 are relevant to this section also, hence are not being repeated)
- **Chapter 7.3** (Links between wild and domesticated biodiversity): 4 Actions

### 7.0 Overall Planning and Governance

It is getting more and more clear that activities in one sector, or at one place, affect other sectors and places. There is growing recognition that India should have a long-term land/water use vision, plan, and policy, and that planning and management need to start at local levels and move towards much larger regional land/waterscapes. In addition, there is recognition that appropriate institutional structures for natural resource governance at all levels, from local to national, have to be empowered. Such governance needs to begin with and build on a fully empowered local community unit, where all members can, conveniently and in an informed manner, take part in decision-making. Ecological sustainability and social justice can only be striven for with a change from 'representative' forms of democracy to 'participatory' forms (such that people are able to take part in decisions that affect them), and where the State becomes a facilitator rather than a ruler.

The key strategies and actions include:

**Strategy 7.0.1:** Adopt a land/waterscape or ecoregional approach to planning

*Actions*

1. Formulate a National Policy and Perspective Plan on Land and Water Use
2. Provide legal backing to the national land/water use plan

**Strategy 7.0.2:** Strengthen a decentralised natural resource governance structure

## 7.1 Wild Biodiversity: Strategies and Actions

### 7.1.1 Understanding and Information

There is a need to significantly increase our understanding and information levels on biodiversity, and on human interaction with biodiversity. The key strategies and actions are:

**Strategy 7.1.1.1:** Consolidate, increase and update the knowledge on ecosystems and taxa

*Actions*

1. Undertake a comprehensive inventory and status survey of taxonomic groups
2. Monitor the status of representative ecosystems across the country
3. Conduct research on the structure, function, and interactions amongst and within ecosystems
4. Study ecosystem benefits provided by biodiversity
5. Conduct research on links between natural and domesticated ecosystems and taxa
6. Determine sustainable use levels and practices for ecosystems and taxa, keeping in mind diverse local contexts
7. Enhance the understanding and use of community traditions, knowledge, practices, and livelihoods related to biodiversity, amongst other sectors
8. Initiate and strengthen research on biodiversity impacts of climate change
9. Integrate monitoring and evaluation into ongoing schemes, projects, and processes
10. Encourage the widespread use of community methods and techniques for information generation
11. Spread the use of new information generation methods and technologies and dovetail these with traditional community methods

**Strategy 7.1.1.2:** Create a multi-layered database and information regime

*Actions*

1. Create an Indian Biodiversity Information System (IBIS)
2. Prepare a Biodiversity Conservation Atlas of India
3. Digitise and photograph all existing specimens in herbaria, museums, and other collections (governmental and private)
4. Encourage community maintenance of biodiversity-related community knowledge repositories, and database of formal scientific information, in appropriate forms including oral, written, visual, audio, and electronic media.
5. Set up regional biological diversity repositories or museums

**Strategy 7.1.1.3:** Enhance knowledge of the links between cultural and biological diversity

### 7.1.2 *In Situ* Conservation

Given the continued erosion of wild biodiversity across India, the most critical need is to enhance conservation of biodiversity *in situ*, i.e. in its natural or near-natural state. Key strategies and actions are:

**Strategy 7.1.2.1:** Strengthen and expand the official protected areas network

*Actions*

1. Review currently prevalent management practices, from the point of view of biodiversity, and prepare comprehensive management plans
2. Improve the effectiveness of protected area management
3. Settle rights of people inside protected areas (PAs)
4. Take action to tackle threats to PAs, based on a full review of their current status

5. Take special measures for PAs and other sensitive ecosystems affected by armed conflicts
6. Manage buffer areas around PAs as ecologically sensitive areas, within a landscape/seascape approach.
7. Move towards a system of joint or participatory management
8. Analyse the current protected area coverage and suggest changes/additions to make it representative of India's biodiversity
9. Expand and modify the protected area network as per the suggestions from the above actions

**Strategy 7.1.2.2:** Strengthen and support community conservation areas (CCAs), including sacred sites

*Actions*

1. Review the current status of CCAs, and strengthen them through appropriate means including legal declaration
2. Protect, revive, and revitalise sacred sites
3. Undertake an assessment of the biogeographic coverage, and ecological values of CCAs.
4. Expand the network of CCAs (including in 'hotspot' areas, and to cover 'hotspecks')
5. Assess the experience of CCAs for lessons to be applied to PAs, and vice versa
6. Facilitate a national CCA network

**Strategy 7.1.2.3:** Strengthen conservation outside PAs and CCAs, across the entire rural land/waterscape

*Actions*

1. Strengthen and encourage community-based species conservation
2. Provide a range of incentives for community-based conservation across the land/waterscape
3. Conserve and sustainably manage critical ecosystems outside the PA and CCA network
4. Integrate biodiversity into organised bioresource use activities, e.g. commercial forestry and JFM, NTFP, fisheries, plantations, medicinal plants, marine bioresource use, and coastal management plans.
5. Conserve biodiversity in areas under armed forces' jurisdiction
6. Conserve biodiversity in areas under the corporate sector
7. Conserve biodiversity in areas controlled by religious/spiritual institutions
8. Conserve biodiversity in educational and research institutional areas, including agricultural university campuses, and set up demonstration centres for conservation
9. Conserve biodiversity in other government institution lands, such as railway line strips and colonies

**Strategy 7.1.2.4:** Conserve threatened, endemic, and other species of conservation significance

*Actions*

1. Develop conservation plans and projects for each of the seriously threatened, prioritised endemic, and other species of conservation significance, with special attention to hitherto neglected species/taxa
2. Update the schedules of the Wild Life (Protection) Act, to include all threatened and endemic species, and the species they are dependent on.
3. Step up anti-poaching and anti-trade measures
4. Reintroduce, translocate, rehabilitate, and/or enhance the populations of, seriously threatened species/taxa

**Strategy 7.1.2.5:** Conserve biodiversity in urban areas

**Strategy 7.1.2.6:** Tackle 'non-utilisation' threats to natural ecosystems and species

*Actions*

1. Take preventive and ameliorative measures relating to 'natural' disasters
2. Minimise the impacts of alien invasive species
3. Tackle pollution
4. Predict, and take pro-active steps to counter, the impacts of climate change

**Strategy 7.1.2.7:** Regenerate and restore degraded ecosystems

*Actions*

1. Regenerate and restore degraded common lands; review 'wasteland' development programmes from the

biodiversity point of view
2. Restore mined lands
3. Regenerate and restore degraded inland water bodies, coastal areas and marine ecosystems

**Strategy 7.1.2.8:** Prevent and mitigate human-wildlife conflicts

**Strategy 7.1.2.9:** Strengthen trans-boundary cooperation for conservation

*Actions*

1. Identify critical trans-boundary sites for priority action, and negotiate conservation action, including "Peace Parks", with neighbouring countries
2. Strengthen international measures to combat trans-boundary poaching and wildlife trade in other areas
3. Tackle other trans-boundary threats such as pollution, dams, erosion, and illegal immigration

### 7.1.3 *Ex Situ* Conservation

Complementary to *in situ* conservation, there is an important role for *ex situ* measures, i.e. away from the natural habitats. This could be particularly relevant for threatened and endemic species, whose survival in the wild is uncertain. The following key strategies and actions are recommended:

**Strategy 7.1.3.1:** Strengthen and enhance the role of zoological parks, aquariums, and other wild animal breeding facilities

*Actions*

1. Enhance and expand captive conservation breeding of threatened and endemic species
2. Breed aquatic and other wild animals that are legitimately and without cruelty used in medicine or trade

**Strategy 7.1.3.2:** Strengthen and enhance the role of botanical, herbal and home gardens, and other *ex situ* plant collections

*Actions*

1. Enhance and expand the cultivation of threatened and endemic plant species
2. Promote the use of home/terrace/kitchen/institutional gardens to cultivate threatened wild plants
3. Strengthen the use of botanical gardens, and other *ex situ* repositories, as seed banks for various biogeographic regions

**Strategy 7.1.3.3:** Strengthen culture collections of micro-organisms

*Actions*

1. Consolidate information on existing culture collections, strengthen these, and carry out further collections
2. Set up new culture collection centers

### 7.1.4 Sustainable Use

Given the considerable over-exploitation of many biological resources in India, there is an urgent need to ascertain levels of sustainability, and take regulatory and incentive measures to achieve these levels. For this, the following measures are recommended (building on strategy 7.1.1.1):

**Strategy 7.1.4.1:** Integrate sustainability principles into all resource use policies, laws, and programmes

*Action*

1. Ensure legal backing to sustainable and equitable use

**Strategy 7.1.4.2:** Ensure sustainability of aquatic biological resource uses

*Actions*

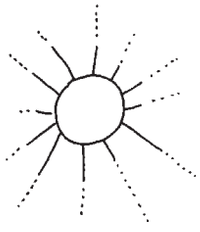
1. Reassess fishery and non-fishery aquatic stocks
2. Develop harvest strategy for non-conventional and deep-sea fishery resources, based on stock assessment
3. Upgrade traditional fishing gear with appropriate technology
4. Revise existing fishing regulations and initiate innovative implementation
5. Regulate over-capitalization

6. Enforce a uniform ban on monsoon marine trawling, while monitoring its efficacy
7. Ensure the sustainability of aquaculture
8. Add value to catch and by-catch
9. Move all freshwater wetlands towards 'wise use'

**Strategy 7.1.4.3:** Ensure sustainability of terrestrial biological resource uses

*Actions*

1. Ensure that all official forestry management practices integrate biodiversity concerns
2. Ensure that biodiversity concerns are built into community uses of forests and other natural ecosystems
3. Assist private owners of natural forests to manage their forests sustainably
4. Ensure that biodiversity concerns are integrated into tree plantation activities

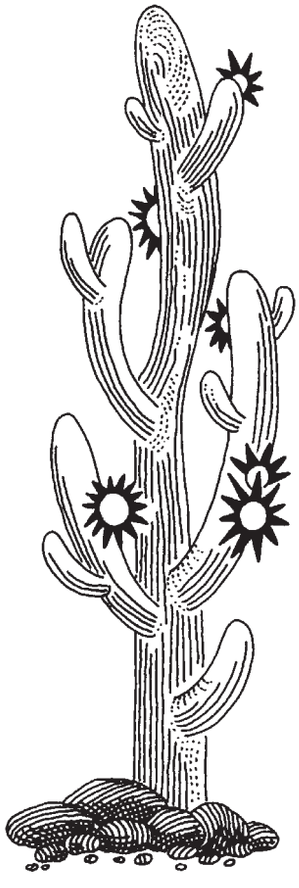


**Strategy 7.1.4.4:** Ensure and facilitate sustainable livelihoods

*Actions*

1. Carry out national survey of biodiversity-based livelihoods and traditional practices of sustainability
2. Encourage and facilitate traditional sustainable livelihoods
3. Facilitate appropriate adaptations in the case of traditional livelihoods that have become unsustainable but can be brought back to sustainability
4. Explore and introduce alternative livelihoods where regaining sustainability for an existing livelihood is not possible
5. Strengthen biodiversity-based artisanal (including medicinal plant-based) livelihoods
6. Introduce or strengthen bioresource-based enterprise amongst local communities
7. Enhance use of under-valued bioresources used traditionally, while ensuring their sustainability

**Strategy 7.1.4.5:** Ensure that tourism and pilgrimage are ecologically and socially sensitive, in both existing and new areas.



*Actions*

1. Draft guidelines and spread awareness towards the promotion of sensitive tourism and pilgrimage
2. Build capacity of stakeholders to work within the philosophy of sensitive tourism
3. Work towards a tourism policy that is both ecologically and socially sensitive
4. Ensure that local communities are the primary beneficiaries and managers of tourism to their traditional sites
5. Ensure that tourism and pilgrimage activities achieve the above objectives

### 7.1.5 Equity

As outlined in Chapters 5 and 6, inequities between communities and the state, amongst communities and their members, between men and women, and so on, are often at the root of the ecological crisis. Tackling such inequities therefore becomes a critical aspect of conservation and sustainable use. For this, the following are the key strategies and actions:

**Strategy 7.1.5.1:** Secure community tenure over natural resources

*Actions*

1. Establish secure common property rights of traditional marine communities
2. Establish secure common property rights for freshwater wetland users including fisherfolk
3. Establish secure common property rights for traditional users of terrestrial ecosystems and their resources
4. Establish secure tenurial rights over forest lands traditionally used by communities
5. Develop a land classification system which records and considers ecosystems and the biodiversity harboured by them as well as the customary and current user groups and their livelihood systems
6. Endow ownership over NTFPs to communities, with conservation responsibilities and equitable rights

**Strategy 7.1.5.2:** Develop a socially and ecologically sensitive process for dealing with disputed claims and 'encroachments' on 'forest' lands

*Actions*

1. Prepare accurate database and maps of the legal status of notified forest lands and 'encroachments' on them according to official records
2. Tally Forest and Revenue Department land records
3. Complete survey and settlements for all forest lands yet to be demarcated or finally notified
4. Initiate systematic addressal of disputed claims and encroachments on lands finally notified as forest lands
5. Reclassify long-standing, traditional shifting cultivation lands as forest fallows
6. Use the database and mapping generated above, to 'freeze' any further illegal incursions into forests
7. Ensure secure land tenure to forest villages

**Strategy 7.1.5.3:** Ensure equity in ongoing ecosystem management initiatives

*Actions*

1. Ensure that socio-economic and gender equity is mainstreamed into JFM, Community Forest Management (CFM), watershed management, and Forest Development Agencies (FDAs)
2. Initiate Participatory or Joint Protected Area Management
3. Integrate principles and practices of socio-economic and gender equity into all other community-based natural resource management programmes

**Strategy 7.1.5.4:** Protect traditional knowledge, and ensure equitable benefits from its wider use

*Actions*

1. Build capacity of communities to value and protect their knowledge
2. Use traditional knowledge in biodiversity management programmes
3. Carry out community-based documentation of traditional knowledge
4. Create a network of traditional knowledge holders and databases at district, state, and national levels
5. Develop community-based intellectual rights systems
6. Ensure equitable sharing of benefits from the use of traditional knowledge
7. Develop and apply a code of ethics for researchers using traditional knowledge

**Strategy 7.1.5.5:** Ensure equitable sharing of benefits from the use and marketing of community-managed or developed resources

### 7.1.6 Education, Awareness, Training

The lack of awareness and training about complex biodiversity issues is one of the biggest stumbling blocks to conservation, sustainable use, and achievement of equity. To overcome this, the following key strategies and actions are recommended:

**Strategy 7.1.6.1:** Build capacity of public functionaries and governance institutions to address biodiversity issues

*Actions*

1. Build capacity of officials from all line departments
2. Build capacity of political leaders at state and national levels
3. Build capacity of planners at district, state, and national level
4. Increase the capacity of Panchayati Raj institutions to conserve and manage biodiversity
5. Increase the capacity of urban authorities and municipal ward committees to conserve and manage biodiversity

**Strategy 7.1.6.2:** Strengthen nature awareness and interpretation facilities at key biodiversity sites

*Actions*

1. Enhance the use of existing interpretation facilities, and create new ones
2. Develop site-specific awareness material for diverse sectors, and enhance usage of existing material

**Strategy 7.1.6.3:** Strengthen capacity of NGOs

*Actions*

1. Orient NGOs in aspects of both wild and domesticated biodiversity

**Strategy 7.1.6.4:** Integrate biodiversity into the formal education system, convert it into "learning for life"

*Actions*

1. Enhance biodiversity-related education in the formal school system
2. Enhance biodiversity related education in the formal college system
3. Integrate biodiversity into existing vocational courses, introduce biodiversity-related vocational courses, and link biodiversity education with relevant jobs
4. Develop specialised educational inputs for ecosystem and biodiversity-based communities
5. Integrate biodiversity into adult and continuing education programmes

**Strategy 7.1.6.5:** Strengthen non-formal education on biodiversity, including through folk media

*Actions*

1. Maximise opportunities for non-formal education on biodiversity
2. Maximise the use of traditional and folk media
3. Build capacity of communities to handle new media technologies, and control local media networks

**Strategy 7.16.6:** Spread biodiversity awareness amongst urban residents

*Actions*

1. Enhance the educational role of municipal authorities and urban NGOs
2. Enhance the networking and functioning of urban nature clubs
3. Use creative methods to spread biodiversity awareness amongst urban populations, especially of their consumerism impacts

**Strategy 7.1.6.7:** Build capacity of scientists and other academics

**Strategy 7.1.6.8:** Build capacity of workers and labour unions

*Action*

1. Organise orientation and training sessions for workers and worker unions

**Strategy 7.1.6.9:** Build capacity of the judiciary and legal functionaries

*Actions*

1. Increase the capacity of the judiciary and legal functionaries to deal with biodiversity related and environmental justice issues
2. Set up Biodiversity Law Resource Centres at the Supreme Court, High Courts, and District Courts
3. Introduce the system of Law Clerks for Judges of the Supreme Court and High Court

**Strategy 7.1.6.10:** Orient financial institutions to support biodiversity activities

*Action*

1.Orient financial institutions for better support to biodiversity related activities

**Strategy 7.1.6.11:** Build capacity of the armed forces, police, and customs

*Actions*

1. Strengthen current programmes and design new ones to orient the Armed Forces towards biodiversity conservation
2. Orient and strengthen capacity of police and customs, towards biodiversity conservation activities

**Strategy 7.1.6.12:** Build capacity of the corporate and business sector

*Actions*

1. Design programmes and packages to orient industries to biodiversity related issues
2. Promote responsible advertising by the corporate and development sector

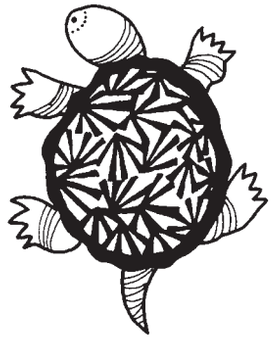
**Strategy 7.1.6.13:** Build capacity of the media
*Actions*
1. Orient journalists to biodiversity related issues
2. Integrate biodiversity into journalism schools
3. Provide incentives to media persons for better coverage of biodiversity issues
4. Sensitise newspaper and magazine publishing houses, and radio/television companies, towards biodiversity issues

**Strategy 7.1.6.14:** Build capacity of religious and spiritual leaders and institutions

**Strategy 7.1.6.15:** Strengthen information dissemination systems
*Actions*
1. Ensure proactive and strategic information dissemination through the existing environmental information systems, merge them into an Indian Biodiversity Information System (IBIS)
2. Bridge the information and capacity gap in critical areas like taxonomy
3. Integrate biodiversity into district gazetteers, and formulate district environment/biodiversity gazetteers
4. Make creative use of public transport as an educational tool

### 7.1.7 Inter-Sectoral Coordination and Integration

The neglect of biodiversity concerns in most sectors of economy and society, especially in development sectors, is a cause for serious erosion of biodiversity and disregard of biodiversity-based livelihoods. Measures of the following kind are therefore needed to ensure that there is inter-sectoral and cross-sectoral integration of biodiversity:



**Strategy 7.1.7.1:** Integrate biodiversity concerns through inter-sectoral coordination, at all levels of planning
*Actions*
1. Formulate guidelines for inter-sectoral integration of biodiversity at local to national levels
2. Ensure inter-sectoral integration of biodiversity at local settlement level
3. Ensure inter-sectoral integration of biodiversity at district level
4. Ensure inter-sectoral integration of biodiversity at state and central levels
5. Move towards ecoregional planning
6. Create state and national level institutional structures for inter-sectoral integration
7. Build capacity of officials, at all levels of governance, to integrate biodiversity concerns
8. Integrate funding for biodiversity concerns into each government agency's budget

**Strategy 7.1.7.2:** Integrate biodiversity into water planning
*Actions*
1. Ensure that national and state water programmes integrate biodiversity concerns and values
2. Move away from mega-projects to decentralised water harvesting schemes

**Strategy 7.1.7.3:** Integrate biodiversity into energy and infrastructure planning
*Action*
1. Ensure that all energy and infrastructure development is respectful of biodiversity concerns

**Strategy 7.1.7.4:** Integrate biodiversity into the mining sector
*Actions*
1. Taken general measures to ensure that mining is not detrimental to biodiversity
2. Enhance and expand the process of environmental clearances for mining projects
3. Enhance and expand the process of clearance of mining projects under the Forest (Conservation) Act, 1980
4. Ensure ecologically sensitive restoration and mine closure

**Strategy 7.1.7.5:** Ensure integration of biodiversity concerns in international relations

*Actions*

1. Ensure that all external aid to India integrates biodiversity concerns
2. Ensure that all foreign investment in India integrates biodiversity concerns
3. Ensure that all bilateral and multi-lateral agreements India enters into, integrate biodiversity concerns

### 7.1.8 Policy and Legal Measures

India has a wide range of policies and laws relating to biodiversity, some of them very progressive. However, as noted in earlier chapters, there remain a number of deficiencies and contradictions that undermine efforts relating to biodiversity. To deal with these, the following key strategies and actions are recommended:

**Strategy 7.1.8.1:** Integrate biodiversity into existing policies

*Actions*

1. Review and amend national and state level policies to integrate biodiversity
2. Reconcile laws and policies which are incompatible with each other and with principles of conservation, sustainable use, and equity

**Strategy 7.1.8.2:** Formulate new policies for aspects that have not been dealt with at a policy level so far

*Actions*

1. Formulate a Wetlands Policy
2. Formulate a Marine Areas Policy
3. Formulate a National Urban Environment Policy

**Strategy 7.1.8.3:** Integrate biodiversity into existing statutes and asociated rules, regulations and notifications

*Actions*

1. Integrate biodiversity into the Constitution of India
2. Review, amend, and strengthen national laws to integrate biodiversity
3. Strengthen the Environment Impact Assessment procedure
4. Frame rules to strengthen conservation, sustainable use, and equity under the Biological Diversity Act 2002

**Strategy 7.1.8.4:** Formulate new acts for missing elements

*Actions*

1. Enact a Wetlands (Conservation, and Sustainable and Equitable Use) Act
2. Enact a Marine Areas (Conservation, and Sustainable and Equitable Use) Act
3. Enact an Urban Natural Heritage Act
4. Enact a Traditional Knowledge Protection Act, or Traditional Knowledge Protection Rules under the Biological Diversity Act

**Strategy 7.1.8.5:** Integrate biodiversity and equity into panchayat legislation, and make it effective and accountable

*Actions*

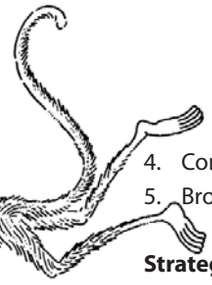
1. Integrate biodiversity and equity responsibilities into the central and state Panchayat laws, and the Representation of the People Act
2. Empower gram sabhas or appropriate village level institutions to implement laws
3. Build in customary governance structures into Acts in Sixth Schedule Areas

**Strategy 7.1.8.6:** Strengthen Customary Law

**Strategy 7.1.8.7:** Strengthen/create mechanisms for implementing existing legislation

*Actions*

1. Set up participatory monitoring mechanisms at centre and state level
2. Set up Environment Courts or Environment Benches in existing courts, and strengthen other infrastructure for legal action
3. Review citizens' locus standi provisions, and make laws more accessible to local communities



4. Compile and assess court orders related to biodiversity, and use the lessons learnt
5. Broad-base membership of bodies set up under laws or by courts

**Strategy 7.1.8.8:** Make publicly accessible all governmental information and records on biodiversity

*Actions*

1. Integrate right to information in biodiversity-related laws
2. Use the Freedom of Information Act to take measures for public provision of information

### 7.1.9 Financial Measures

Appropriate funding mechanisms are critical for biodiversity, but current arrangements are either acting as a disincentive, or are thoroughly inadequate. To change this situation, the following key strategies and actions are recommended:

**Strategy 7.1.9.1:** Review macro-economic policies, programmes, and incentive systems, from the biodiversity point of view

*Actions*

1. Assess macro-economic measures from the biodiversity and livelihoods perspective
2. Phase out perverse subsidies
3. Introduce new, or widen existing, financial/fiscal incentives for biodiversity

**Strategy 7.1.9.2:** Reorient national and state budgets

*Actions*

1. Assess central and state budgets from biodiversity and livelihoods perspective, and introduce the necessary changes
2. Introduce natural resource accounting/budgeting into the national and state budgets
3. Enhance the biodiversity budgets at centre and state
4. Integrate a biodiversity budget line into each ministry/department
5. Provide special budgetary consideration for ecologically fragile or critical areas
6. Provide special funds for preventing and compensating wildlife-related damage
7. Advocate the above changes at political levels

**Strategy 7.1.9.3:** Financially empower institutions of local governance

*Action*

1. Financially empower governance institutions at community level

**Strategy 7.1.9.4:** Generate new and innovative financial resources for biodiversity

*Actions*

1. Introduce an ecosystem service tax in urban areas
2. Introduce an industrial tax for biological resource and ecosystem use
3. Introduce a tourism tax for biological resource and ecosystem use
4. Forge agreements amongst states and regions within states, to pay appropriate compensation to each other for ecosystem benefits and for ecological damage caused
5. Introduce innovative funding and fund management mechanisms
6. Encourage banks and banking institutions to generate funds for biodiversity
7. Encourage insurance companies to provide cover to biodiversity-friendly livelihood activities
8. Encourage the corporate sector to generate funds for biodiversity
9. Encourage public charities, foundations, and religious institutions to generate funds for biodiversity
10. Encourage NGOs, academic institutions, and other citizens' organisations to generate funds for biodiversity
11. Mobilise external funding on indigenous terms
12. Set up dedicated biodiversity funds at local, state, and national levels

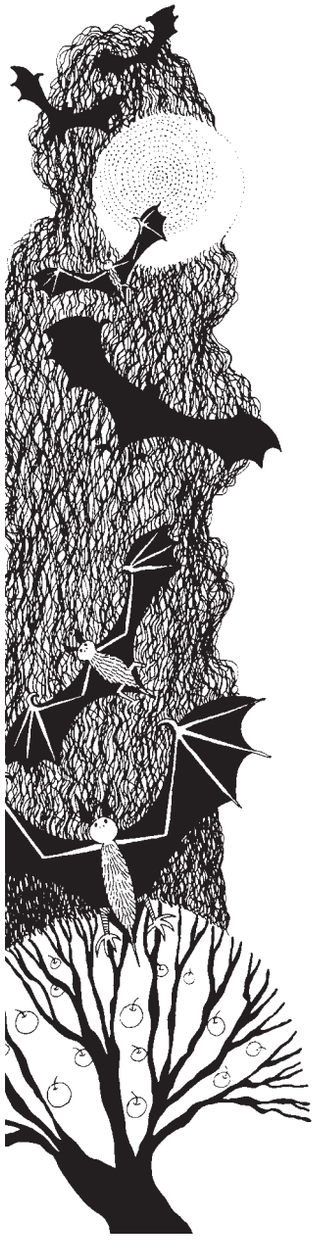
### 7.1.10 Technology

Inappropriate technologies in a whole range of activities, directly or indirectly cause biodiversity loss through pollution, inefficient and wasteful use of natural resources, and other such factors. Hence there is an urgent need for a series of technological measures. The following are some key strategies and actions recommended:

**Strategy 7.1.10.1:** Make existing technologies biodiversity-friendly, and introduce new eco-sensitive technologies

*Actions*

1. Introduce/enhance materials efficiency in all existing technologies, especially to promote sustainability of resource use
2. Reduce, and where possible eliminate, pollution from existing technologies
3. Find and enhance the use of alternative raw materials, especially in cases where the materials are currently coming from natural ecosystems
4. Promote a range of non-conventional and alternative energy sources
5. Promote alternative and localised technologies in construction
6. Promote alternative, decentralised water harvesting systems in villages and cities
7. Promote biodiversity-friendly alternative products, recycling, and waste reduction



**Strategy 7.1.10.2:** Introduce new conservation technologies, and enhance the use of available ones

**Strategy 7.1.10.3:** Promote traditional biotechnologies and ensure that new biotechnologies are safe

### 7.1.11 International Fora

India has generally taken a pro-active role in international agreements relating to environment, and those with a bearing on environment. This role needs to be enhanced, in the following ways:

**Strategy 7.1.11.1:** India to advocate strengthening of biodiversity integration into all environment-related agreements

**Strategy 7.1.11.2:** India to advocate biodiversity integration into non-environment related agreements

**Strategy 7.1.11.3:** Enhance civil society networking and participation relating to international issues and agreements

**Strategy 7.1.11.4:** Encourage joint use of international human rights and environmental instruments to further environment/biodiversity and livelihoods agendas

**Strategy 7.1.11.5:** Use other international forums and processes to further environment/ biodiversity and livelihoods agendas

*Action*

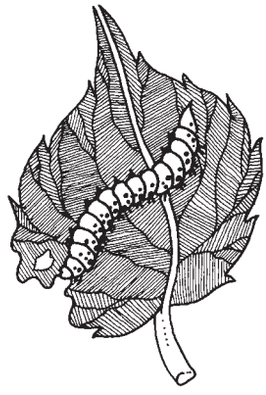
1. Join and influence the Global Biodiversity Information Facility

## 7.2 Domesticated Biodiversity: Strategies and Actions

### 7.2.1 Understanding and Information

Knowledge and information on the extent and dynamics of domesticated biodiversity is poor in India, with the formal sector lacking an understanding of indigenous or traditional farming and pastoral systems, and communities having inadequate understanding of the impacts of external policies and processes on domesticated biodiversity. A great deal needs to be done to enhance this understanding, amongst all sectors. The following key strategies and actions are recommended:

**Strategy 7.2.1.0:** Strategies adapted from **Section 7.1.1**, on Databases, and on Cultural and Biological Diversity.



**Strategy 7.2.1.1:** Consolidate, increase, and update knowledge on domesticated biodiversity
*Actions*
1. Undertake comprehensive surveys of domesticated biodiversity
2. Document and disseminate indigenous knowledge, practices, and technologies relevant to domesticated biodiversity
3. Expand knowledge on the dynamics of crop and animal genetic diversity systems
4. Identify, map, and study hotspots of domesticated biodiversity and critical cultivated landscapes
5. Asess the value provided by indigenous domesticated biodiversity, to the agricultural, health, and livelihood security of the country
6. Assess the possible impacts of climate change on domesticated biodiversity, and the role of such diversity as a coping strategy

**Strategy 7.2.1.2:** Monitor the status of domesticated biodiversity across India
*Action*
1. Monitor the status of domesticated biodiversity at the village level

### 7.2.2 *In Situ* Conservation

As in the case of wild biodiversity, the continuing decline of domesticated biodiversity requires very urgent steps to conserve it *in situ*, i.e. on farmers' fields, pastoralists' ranges and homesteads, home gardens, and so on. For this, the following key strategies and actions are recommended:

**Strategy 7.2.2.1:** Conserve biologically diverse cultivated and husbanded landscapes and sites
*Actions*
1. Declare and conserve domesticated landscapes and agro-biodiversity hotspots (Agro-Protected Areas)
2. Conserve outstanding sustainable farms as "agro-biodiversity hotspecks"
3. Promote use and conservation of uncultivated foods
4. Create a National Network of Domesticated Biodiversity Conservation Initiatives

**Strategy 7.2.2.2:** Conserve and re-introduce threatened domesticated biodiversity
*Actions*
1. Conserve and re-introduce threatened indigenous taxa of crops
2. Conserve threatened livestock (including poultry) breeds
3. Conserve threatened domesticated pet breeds

**Strategy 7.2.2.3:** Promote *in situ* conservation through participatory crop and livestock development
*Action*
1. Promote participatory crop and livestock development

**Strategy 7.2.2.4:** Revive domesticated biodiversity and regenerate diverse agro-ecosystems where they have eroded
*Action*
1. Repatriate indigenous crop varieties and livestock breeds to places where they were once found

**Strategy 7.2.2.5:** Promote home and kitchen gardens
*Actions*
1. Document and encourage existing home garden initiatives or networks
2. Facilitate new home gardens across India

**Strategy 7.2.2.6:** Tackle 'non-utilisation' threats to indigenous domesticated biodiversity
*Actions*
1. Tackle invasive alien species that invade and affect crop land, pasture land, and wetlands in use for agricul-

ture or pastoralism
2. Tackle serious diseases, especially when they affect already threatened species/varieties/breeds

### 7.2.3 *Ex Situ* Conservation

Conservation and propagation of domesticated biodiversity outside of their growing sites, in controlled conditions, is an important complementary activity to *in situ* conservation. This is especially so in a situation of continued erosion of biodiversity from fields and pastures, and destruction of the very conditions in which domesticated biodiversity can thrive. The following key strategies and actions relating to *ex situ* conservation are recommended:

**Strategy 7.2.3.1:** Create a network of gene banks and breeding centres
*Actions*
1. Create and strengthen community gene banks
2. Create and strengthen state, agro-ecozonal, and national gene banks
3. Create and strengthen a network of domesticated animal breeding centers

**Strategy 7.2.3.2:** Integrate domesticated biodiversity into existing zoological and botanical gardens
*Actions*
1. Expand the scope of botanical gardens in each region, to include valuable and unique agicultural diversity
2. Expand the scope of zoological parks in each region, to include indigenous livestock and poultry

### 7.2.4 Sustainable Use

The survival of domesticated biodiversity is critically dependent on the sustainability of agriculture and pastoralism, which has been severely threatened over the last few decades by ecological degradation, chemical poisoning, reduction in the genetic base, the spread of monocultures, the shrinking of pastures, and so on. Large-scale efforts are therefore needed to bring agriculture and pastoralism back on to a sustainable footing. For this, the following strategies and actions are recommended:

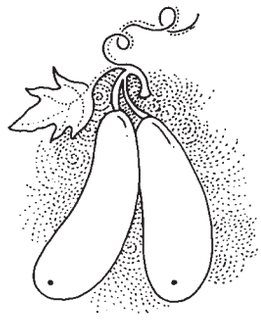
**Strategy 7.2.4.1:** Use the public distribution system (PDS) to relate agro-biodiversity to food, nutrition, and livelihood security
*Action*
1. Integrate agro-biodiversity and related livelihoods into the Public Distribution System

**Strategy 7.2.4.2:** Integrate agro-biodiversity into health and food related programmes
*Actions*
1. Integrate locally available foods into the Food for Work programme
2. Integrate locally available foods into *balwadis*, *anganwadis*, mid-day meals, and other such governmental programmes
3. Integrate nutritionally superior local foods into public health programmes

**Strategy 7.2.4.3:** Ensure the sustainability of agricultural and pastoral lands
*Actions*
1. Regenerate, maintain, and enhance the sustainable productivity of agricultural land
2. Ensure water security for agriculture through decentralised means
3. Ensure fodder security for pastoral and agricultural communities
4. Facilitate the availability of adequate organic manure and draft power

**Strategy 7.2.4.4:** Encourage sustainable pisciculture, apiculture, sericulture, and supplemental agriculture-based livelihoods
*Actions*
1. Facilitate agro-biodiversity-based enterprise and livelihoods
2. Promote sustainable cultured fisheries
3. Promote sustainable apiculture

4. Promote sustainable sericulture
5. Promote sensitive tourism based on agro-biodiversity



**Strategy 7.2.4.5:** Promote organic consumer networks and markets
*Actions*
1. Promote organic food and agro-produce markets
2. Encourage organic consumer networks

### 7.2.5 Equity

Inequities in the control over, access to, and benefits from, domesticated biodiversity (and the related land/water), is one of the root causes of the erosion of such biodiversity. India has traditionally had significant inequities in land-holding and other critical aspects of agriculture, and these have of late been increased by the models of agricultural development used. It is therefore important to move towards the achievement of equitable arrangements in a range of situations. The following key strategies and actions are recommended:

**Strategy 7.2.5.0:** Strategies adapted from **Section 7.1.5.2** on Encroachment, **7.1.5.3** on Equity in Ecosystem Initiatives, **7.1.5.4** on Traditional knowledge, and **7.1.5.5** on Equitable benefit-sharing.

**Strategy 7.2.5.1:** Ensure secure tenure to farmers, pastoralists, artisans and fisherfolk, over land/water.
*Actions*
1. Clarify and update land records
2. Provide secure and clear tenure based on the above update
3. Remove encroachments by vested interests on grazing lands, make legal land classification compatible with actual uses, and develop a pasture land policy

**Strategy 7.2.5.2:** Move towards land redistribution for disprivileged sections.
*Action*
1. Redistribute surplus lands amongst landless and marginal farmers

**Strategy 7.2.5.3:** Integrate gender equity into agriculture.
*Actions*
1. Introduce women's perspectives on yield and biodiversity into agricultural extension and information dissemination work
2. Move towards women occupying at least half the agricultural extension personnel positions
3. Integrate gender aspects squarely into the national and state level policy and strategy documents
4. Secure land and water rights for women
5. Provide incentives to women for maintaining agro-biodiversity
6. Establish rural enterprises based on traditional crops
7. Take culturally and ecologically appropriate measures to reduce drudgery of agricultural practices

**Strategy 7.2.5.4:** Enhance livelihood security of nomadic pastoralists.
*Actions*
1. Ensure secure access to resources (pasture land and drinking water)
2. Review existing breeding policy through a consultative process involving all stakeholders
3. Develop role model facilitation for Government functionaries
4. Provide recognition and rewards for conservers of local breeds
5. Bring changes in the educational system
6. Enhance networking, documentation and dissemination

**Strategy 7.2.5.5:** Clarify ownership of seed collections, and ensure equitable benefit-sharing from their wider use.
*Actions*
1. Repatriate information on *ex situ* accessions to the communities of origin

2. Clarify ownership of the genetic material in *ex situ* collections, and ensure equitable benefit-sharing

### 7.2.6 Education, Awareness, Training

As in the case of wild biodiversity, there is a dire need for enhancing the capacity of all sectors to understand the issues relating to domesticated biodiversity. For this purpose, the following key strategies and actions are recommended:

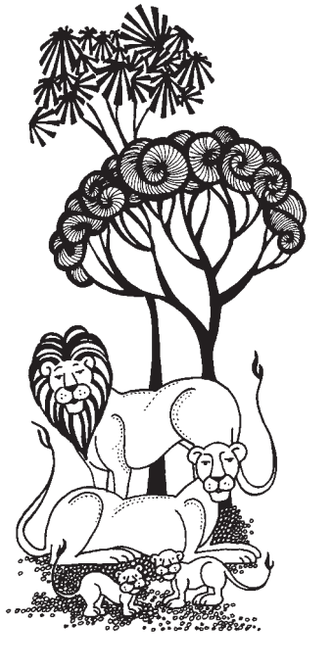
**Strategy 7.2.6.0:** Strategies adapted from Section 7.1.6.1 on Public Functionaries and Governance Institutions, 7.1.6.3 on NGOs, 7.1.6.4 on Formal Education System, 7.1.6.5 on Non-formal Education, 7.1.6.6 on Urban Residents, 7.1.6.8 on Workers and Labour Unions, 7.1.6.9 on Judiciary and Legal Functionaries, 7.1.6.10 on Financial Institutions, 7.1.6.11 on Armed Forces, Police, and Customs, 7.1.6.12 on Corporate and Business Sector, 7.1.6.13 on Media, 7.1.6.14 on Religious and Spiritual Leaders and Institutions, and 7.1.6.15 on Information Dissemination through Public Transport.

**Strategy 7.2.6.1:** Build capacity of scientific community to address domesticated biodiversity issues.
*Actions*
1. Make necessary modifications to the curriculum of all courses in agricultural and health education
2. Build capacity of agricultural extension workers

**Strategy 7.2.6.2:** Build capacity of rural communities to address domesticated biodiversity issues.
*Actions*
1. Enhance awareness of larger biodiversity issues amongst local communities
2. Organise local, state, and national biodiversity festivals
3. Promote the documentation and revival of traditional knowledge through agro-biodiversity contests
4. Document traditional knowledge through Community or People's Biodiversity Registers (CBRs)

### 7.2.7 Inter-Sectoral Coordination and Integration

Since agriculture and pastoralism are an integrated part of larger land/waterscapes, their harmonious linkages with other aspects of land and water use are critical in ensuring the survival of domesticated biodiversity. A lack of inter-sectoral and inter-departmental coordination in the past has meant that many developmental activities have ended up eroding domesticated biodiversity and sustainable farming or pastoral systems. Hence the need for steps to integrate domesticated biodiversity into different sectors. The following key strategies and actions are recommended:



**Strategy 7.2.7.0:** Strategies adapted from **Section 7.1.7.1** on Inter-sectoral Coordination, **7.1.7.2** on Water Planning, **7.1.7.3** on Energy and Infrastructure Planning, **7.1.7.4** on Mining, and **7.1.7.5** on International Relations.

**Strategy 7.2.7.1:** Integrate domesticated biodiversity into relevant sectoral plans and programmes.
*Actions*
1. Integrate agro-biodiversity into watershed development
2. Integrate agro-biodiversity into horticultural programmes

### 7.2.8 Policy and Legal Measures

Domesticated biodiversity suffers from a serious lack of policy and legal coverage, much more so than wild biodiversity. High priority needs to be given to this gap. For this, the following strategies and actions are recommended:

**Strategy 7.2.8.0:** Strategies adapted from **Section 7.1.8.5** on Panchayat Laws, **7.1.8.6** on Customary Laws, **7.1.8.7** on Implementing Existing Laws, and **7.1.8.8** on Right to Information.

**Strategy 7.2.8.1:** Integrate domesticated biodiversity into existing policies.
*Actions*
1. Integrate domesticated biodiversity into policies relevant to agriculture

2. Introduce reforms in forest and wildlife related policies to protect the agricultural livelihoods of tribal and other forest-dwelling communities, and in agricultural policies to conserve forests, wetlands, and their wildlife
3. Reorient Water Policy 2002 towards domesticated biodiversity and decentralised water harvesting/use

**Strategy 7.2.8.2:** Formulate new policies for aspects not yet covered at policy level
*Actions*
1. Formulate a comprehensive policy on domesticated biodiversity
2. Formulate a National Grazing Policy

**Strategy 7.2.8.3:** Integrate domesticated biodiversity into laws and associated rules, regulations and notifications
*Actions*
1. Review and revise laws relevant to agriculture, to integrate agro-biodiversity into them
2. Integrate agro-biodiversity into EIA and clearance procedures
3. Make EIAs relating to agro-biodiversity mandatory for agricultural projects and processes
4. Provide legal protection to agro-biodiversity rich areas, including hotspots and hotspecks
5. Enhance biodiversity and farmers' rights protection in the Plant Varieties and Farmers' Rights Protection Act 2002 and Geographical Indications Act 1999

**Strategy 7.2.8.4:** Formulate new acts for missing elements
*Action*
1. Enact legislation on protection of domesticated biodiversity

### 7.2.9 Financial Measures

Even more than in the case of wild biodiversity, there are thoroughly inadequate financial resources going to domesticated biodiversity; indeed, most funding to agriculture is oriented towards activities that further erode this diversity. Financial reforms and changes, and generation of additional funds, both for biodiversity purposes, are therefore very necessary. Some key strategies and actions that are recommended are:

**Strategy 7.2.9.0:** Strategies adapted from **Section 7.1.9.1** on Macro-economic Policies, **7.1.9.2** on Re-orienting Budgets, **7.1.9.3** on Financially Empowering Local Institutions, and **7.1.9.4** on Generating New Resources.

**Strategy 7.2.9.1:** Re-orient credit and lending policies in agriculture
*Actions*
1. Re-orient public sector lending to agriculture and animal husbandry
2. Provide crop and livestock insurance for organic, biodiverse farming and sustainable pastoralism
3. Introduce micro-credit schemes to encourage biodiverse farming

**Strategy 7.2.9.2:** Provide financial incentives to biodiverse farming
*Actions*
1. Provide financial incentives for sustainable and biodiverse farming
2. Explore domestic and international markets for organic, biodiverse agricultural produce, keeping in mind ecological and equity imperatives

**Strategy 7.2.9.3:** Set up agro-biodiversity funds
*Actions*
1. Create Domesticated Biodiversity Promotion Funds
2. Create a shifting cultivation and nomadic pastoralism fund

### 7.2.10 Technology

While many traditional technologies relating to agriculture and animal husbandry have been pushed out, or are in the current context ineffective, there has not been adequate replacement by culturally appropriate, ecologically sensitive technologies for farmers and pastoralists. There is therefore a need for exploring and spreading

the use of appropriate technologies to help in moving towards sustainable, biologically diverse farming and pastoralism. The following key strategies and actions are recommended:

**Strategy 7.2.10.0:** Strategies adapted from **Sections 7.1.4.4** on Agro-biodiversity Based Enterprise, **7.1.7.3** on Energy and Infrastructure Projects, and **7.1.10.1** on Eco-sensitive and Alternative Technologies.

**Strategy 7.2.10.1:** Promote technologies for organic and biodiverse agriculture

*Actions*

1. Promote organic and biodiverse agricultural technologies

**Strategy 7.2.10.2:** Ensure that genetic engineering products and processes do not cause adverse impacts to biodiversity, health, and livelihoods

*Action*

1. Ensure that genetically engineered or modified organisms used in agriculture and health, are safe for biodiversity and human health

### 7.2.11 International Fora

As in the case of wild biodiversity, India has been fairly pro-active in various international forums relevant to agriculture and agro-biodiversity. However, in some cases it has not adequately pushed the cause of sustainable agriculture and of the rights of small-scale farmers, pastoralists, and fisherfolk. To enhance its role at international forums, the following key strategies and actions are recommended:

**Strategy 7.2.11.0:** Strategies adapted from **Section 7.1.11.3** on Civil Society Networking; and **7.1.11.4** on Using Human Rights and Environment Instruments.

**Strategy 7.2.11.1:** India to advocate strengthening of biodiversity integration into agriculture-related agreements and forums

**Strategy 7.2.11.2:** India to advocate integration of biodiversity concerns into non-agricultural agreements and forums

## 7.3 Positive Links Between Wild and Domesticated Biodiversity

Considering that most of India's landmass is under some kind of domestication, and that even "wilderness" areas have considerable interspersal of domesticated landscapes and species, it is critical that positive links between the wild and the domesticated are encouraged. This is a seriously neglected arena of research, action, and policy-making. The following actions are suggested:

*Actions*

1. Study the positive relationships between wild and domesticated biodiversity
2. Provide incentives to farmers and pastoralists that have pro-wild biodiversity practices
3. Generate awareness amongst different sectors of the actual and potential synergism between wildlife and agriculture
4. Conserve the wild relatives of crops and livestock

## 7.4 Prioritisation of Strategies

Since it is not possible for all the strategies in the National Action Plan to be taken up simultaneously or with equal resources, an exercise has been done to prioritise them. For this, the following three criteria have been used:

- **Urgency,** denoting the immediacy of the strategy, including strategies that need immediate initiation even if their execution may take long;
- **Overall impact,** denoting the level to which the strategy will have a significant, national-level impact, including localised impacts of national significance, such as the conservation of a highly endemic species;
- **Current neglect,** denoting the adequacy or inadequacy with which the strategy is currently being addressed.

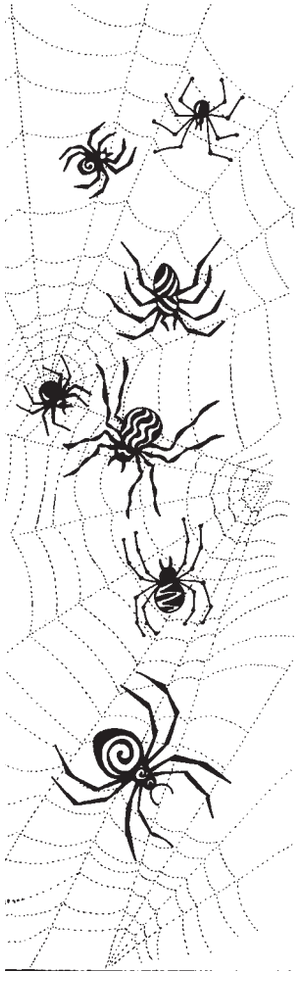
**Based on this, the following strategies are considered to be the highest priority:**

7.0.1 Adopt a Landscape/Waterscape or Ecoregional Approach to Planning
7.1.1.3 and 7.2.1.4 Enhance Understanding of Links between Cultural (Including Linguistic) Diversity and Biological Diversity
7.1.2.3 Strengthen Conservation outside PAs and CCAs, across the Entire Rural Land/Waterscape
7.1.4.1 Integrate Sustainability Principles into all Resource Use Policies, Laws, and Programmes
7.1.4.4 Ensure and Facilitate Sustainable Livelihoods
7.1.5.4 and 7.2.5.0 (iii) Protect Traditional Knowledge, and Ensure Equitable Benefits from its Wider Use
7.1.6.1 and 7.2.6.0 (i) Build Capacity of Public Functionaries and Governance Institutions to Address Biodiversity Issues
7.1.6.10 and 7.2.6.0 (viii) Orient Financial Institutions to Support Biodiversity Activities
7.1.6.11 Build Capacity of the Armed Forces, Police, and Customs
7.6.1.12 Build Capacity of the Corporate and Business Sector
7.1.6.13 and 7.2.6.0 (xi) Build Capacity of the Media
7.1.6.14 and 7.2.6.0 (xii) Build Capacity of Religious and Spiritual Leaders and Institutions
7.1.7.1 and 7.2.7.0 (i) Integrate Biodiversity Concerns through Inter-Sectoral Coordination, at All Levels of Planning
7.1.7.2 and 7.2.7.0 (ii) Integrate Biodiversity into Water Planning
7.1.7.3 Integrate Biodiversity into Energy and Infrastructure Planning
7.1.7.4 Integrate Biodiversity into the Mining Sector
7. 1.9.1 and 7.2.9.0 (i) Review Macro-economic Policies, Programmes, and Incentive Systems from the Biodiversity Point of View
7.1.9.2 and 7.2.9.0 (ii) Re-orient National and State Budgets
7.2.1.2 Monitor the Status of Domesticated Biodiversity across India
7.2.2.1 Conserve Biologically Diverse Cultivated and Husbanded Landscapes and Sites
7.2.2.3 Promote *In Situ* Conservation through Participatory Crop and Livestock Development
7.2.2.4 Revive Domesticated Biodiversity and Regenerate Diverse Agro-Ecosystems where they have Eroded
7.2.4.1 Use the Public Distribution System (PDS) to Relate Agro-biodiversity to Food, Nutrition, and Livelihood Security
7.2.4.2 Integrate Agro-biodiversity into Health and Food related Programmes
7.2.6.0 (iii) Adapted from 7.1.6.4 (Formal Education System)
7.2.6.2 Build Capacity of Rural Communities to address Domesticated Biodiversity Issues
7.2.7.1 Integrate Domesticated Biodiversity into Relevant Sectoral Plans and Programmes
7.2.8.0 (i) Adapted from 7.1.8.5 (Panchayat Laws)
7.2.8.3 Integrate Domesticated Biodiversity into Existing Laws and Associated Rules, Regulations and Notifications
7.2.9.1 Re-Orient Credit and Lending Policies in Agriculture
7.2.9.2 Provide Financial Incentives to Biodiverse Farming
7.2.11.2 India to Advocate Integration of Biodiversity Concerns into Non-Agricultural Agreements and Forums
7.3 Strengthen the Positive Links between Wild and Domesticated Biodiversity

**In addition, a second list of high priority strategies (which scored just below the ones above) is as follows:**

7.0.2 Strengthen a Decentralised Natural Resource Governance Structure
7.1.I.I Consolidate, Increase and Update the Knowledge on Ecosystems and Taxa
7.1.2.2 Strengthen and Support Community Conservation Areas, including Sacred Sites
7.1.2.4 Conserve and Rehabilitate Threatened, Endemic, and other Species of Conservation Significance
7.1.2.6 Tackle 'Non-Utilisation' Threats to Natural Ecosystems and Species
7.1.4 2 Ensure Sustainability of Aquatic Biological Resource Uses
7.1.4 3 Ensure Sustainability of Terrestrial Biological Resource Uses
7.1.4.5 Ensure that Tourism and Pilgrimage are Ecologically and Socially Sensitive
7.1.5.1 Secure Community Tenure over Natural Resources
7.1.5.2 and 7.2.5.0 (i) Develop a Socially and Ecologically Sensitive Process for Dealing with Disputed Claims and 'Encroachments' on 'Forest' Lands
7.1.5.3 and 7.2.5.0 (ii) Ensure Equity in Ongoing Ecosystem Management Initiatives
7.1.5.5 and 7.2 5.0 (iv) Ensure Equitable Sharing of Benefits Arising from the Use and Marketing of Community-

Managed or Developed Resources
7.1.6.4 Integrate Biodiversity into the Formal Education System, Convert it Into "Learning for Life"
7.1.6.6 and 7.2.6.0 (v) Spread Biodiversity Awareness amongst Urban Residents
7.1.6.9 Build Capacity of the Judiciary and Legal Functionaries
7.1.7 5 Ensure Integration of Biodiversity in all International Relations
7.1.8.2 Formulate New Policies for Aspects that have so far not been dealt with at a Policy Level
7.1.8 3 Integrate Biodiversity into Existing Statutes and Associated Rules, Regulations, and Notifications
7.1.8 4 Formulate New Acts for Missing Elements
7.1.8.5 Integrate Biodiversity and Equity into Panchayat Legislation, and make it Effective and Accountable
7 1.8.6 Strengthen Customary Law
7.1.8.7 Strengthen/Create Mechanisms for Implementing Existing Legislation
7.1.9.3 and 7.2.9.0 (iii) Financially Empower Institutions of Local Governance
7.1.11.2 India to Advocate Biodiversity Integration into Non-Environment Related Agreements
7.2.2.2 Conserve and Re-introduce Threatened Domesticated Biodiversity
7.2.4.3 Ensure the Sustainability of Agricultural and Pastoral Lands
7.2.5.1 Ensure Secure Tenure to Women & Men Farmers, Pastoralists, Artisans and Fisherfolk over Land/Water
7.2.5.2 Move towards Land Consolidation and Redistribution for Disprivileged Sections
7.2.5.3 Integrate Gender Equity into Agriculture
7.2.5.4 Enhance Livelihood Security of Nomadic Pastoralists
7.2.6.0 (iv) Adapted from 7.1.6.5 (Non-formal Education)
7.2.6.0 (x) Adapted from 7.1.6.12 (Corporate and Business Sector)
7.2.6.0 (xiii) Adapted from 7.1.6.15 (Information Dissemination through Public Transport)
7.2.7.0 (iii) Adapted from 7.1.7.3 (Energy and Infrastructure Planning)
7.2.8.1 Integrate Domesticated Biodiversity into Existing Policies
7.2.8.4 Formulate New Acts for Missing Elements
7.2.8.5 Strengthen/Create Mechanisms for Implementing Legislation
7.2.9.0 (iv) Adapted from 7.1.9.4 (Generating New Resources)
7.2.10.0 (i) Adapted from 7.1.4.4 (Agro-biodiversity-based Enterprise)
7.2.10.0 (ii) Adapted from 7.1.7.3 (Energy and Infrastructure Projects)
7.2.10. 1 Promote Technologies for Organic and Biodiverse Agriculture



## Chapter 8:
## Implementation Mechanism for NBSAP

Implementing this action plan is going to require the sustained effort of all sections of Indian society. Specific responsibilities are stated in the case of each strategy/action in the preceding chapter. However, there is a need for an overall implementation mechanism, which could help to facilitate and coordinate the actions being taken. Necessarily, and leading on from the recommended Planning and Governance structure proposed in **Chapter 7.0**, this implementation mechanism needs to be rooted in ground-level institutions and processes of participatory decision-making.

This chapter gives a suggested implementation mechanism for the NBSAP. It incorporates the institutional structures proposed by the Biological Diversity Act 2002 (BD Act), and adds to it some other institutional mechanisms to ensure the participation of as widespread a section of India's population as possible.

Implementation is suggested at the following levels:

### 1. Local Level Implementation

Primary implementation of several strategies and actions will need to be done by local level bodies. These would include Gram Sabhas or corresponding bodies in tribal areas, or Biodiversity Management Committees proposed under the BD Act (with the clear proviso that such committees should be set up by Gram Sabhas or full village councils, and not by outside agencies or even by panchayats). Also important here would be larger land/waterscape institutions or district level bodies such as District Planning Committees, to ensure coordinated action by

the local level bodies, as suggested in **Chapter 7.0.2**.

## 2. State Level Implementation

It is suggested that at the state level, implementation is coordinated through State Biodiversity Boards (SBBs). SBBs have also been recommended as coordinating bodies in the BD Act.

## 3. Ecoregional (Inter-State) Implementation

It is suggested that there be inter-state Ecoregional Authorities (EAs) with representatives of Biodiversity Management Committees or other village-level institutions (especially from communities residing near the state border or those migrating back and forth between relevant states), State Biodiversity Boards (SBBs), NBSAP executing agencies, and others.

## 4. National Level Implementation

### 4.1 National Biodiversity Authority (NBA) and NBSAP Implementation Committee

The BD Act proposes that the coordination and regulation of biodiversity-related work in the country be done by the NBA. It is suggested that the same authority also be responsible for the implementation of NBSAP through a NBSAP Implementation Committee set up for the purpose, consisting of representatives of communities and people's networks that have taken initiatives in biodiversity, relevant ministries, state governments by rotation, the Planning Commission, selected NBSAP nodal agencies and coordinators, representatives of the Indian Board for Wildlife and other relevant national boards/committees. Its composition should ensure a balanced representation of officials, NGOs/institutions, community members, and other sectors.

### 4.2 Government of India Ministries

To ensure that inter-sectoral coordination is taking place, it is essential that all the relevant Ministries also be involved in the process. Specifically, it is recommended that each ministry appoint a high-level officer to deal with biodiversity issues as relevant to the subject of the ministry.

### 4.3 Planning Commission

It is suggested that a separate Working Group on Biodiversity be set up within the Planning Commission, with a mandate to ensure implementation and revisions relating to biodiversity in the 10th Five Year Plan (2002-2007), and work towards fuller integration of biodiversity issues in the 11th Five Year Plan.

## 5. State and National Biodiversity Networks

There now exists an extensive informal network created as a result of the NBSAP process, at local, state, and national levels. Many of the NBSAP executing agencies and participants have time and again requested that this network be recognised, sustained, and involved in the implementation of NBSAP. It is suggested that this entity, titled the National Biodiversity Network (NBN), function as an independent but complementary and linked body to the NBA. Its major mandate should be to facilitate, and act as a lobby and watchdog for, the implementation of NBSAP by the proposed Implementation Committee of NBA.

## 6. Implementation Indicators and Monitoring

The proposed NBSAP Implementation Committee of NBA and the National Biodiversity Network should jointly prepare a series of implementation indicators, for the purpose of monitoring the success (or otherwise) of implementation measures. Some suggested indicators are quantum of research and documentation, area brought under effective conservation, number of relevant institutions set up, level of integration of biodiversity into various economic sectors, level of involvement of disprivileged sections in relevant programmes, quantum of budgets dedicated to biodiversity, and so on.

Of the various measures that would facilitate the implementation of the NBSAP, one of the more powerful would be the Biological Diversity Act. In turn, the NBSAP would help to carry out the provisions of the BD Act. This chapter gives the key points of  inter-face points between the two.