301.31 P04 (CES)

Karnataka State of Environment Report and Action Plan

Biodiversity Sector

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In collaboration with

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ENVIS Technical Report No. 16

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December 2004

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1. Current status of the sector

One of the fascinations of life is its incredible variety. The Indian tradition estimates this variety at 84 lakh different types, the sequence of births through which humans must pass before being united with Brahma, the ultimate. Remarkably enough, this is right on target, for modern science estimates that there are somewhere between 80 to 120 lakh different species of living organisms on the earth today. But the bulk of this diversity of life is in the form of fungi and smaller animals that are yet to be described by scientists. Only about 16 lakh species are known to science, and India with a land area of 2.2% of the earth as a whole harbours over 1.2 lakh or more than 7.5% of the world's known species. This is why India ranks amongst the world's top twelve megadiversity countries.

The state of Karnataka is a part of the highly biodiversity rich regions of India. The state boasts of a great diversity of climate, topography, soils. It spans the sea coast with its corals and mangrove swamps at the mouths of estuaries. It harbours verdant rain forests, paddy fields and coconut and arecanut orchards on the narrow coast flanked by the hills of Western Ghats. It bears deciduous woods and scrub jungles, and the sugarcane, cotton, groundnut, ragi and jowar fields of the Deccan plateau. The different environmental regimes support their own characteristic set of plants and animals. The lion tailed macaque and the racket-tailed drongo are characteristic of the rain forests, the blackbuck and the Great Indian Bustard of the grasslands and scrub jungles of the Deccan plateau.

How many different species of living organisms are there in Karnataka? We know that there are about 1,20,000 such species described from all over India, while four lakhs is a good estimate of the number of species of such animals, described and undescribed that our country harbours. The fraction of these occurring in Karnataka is also unknown. Roughly 25% of the 17,500 species of flowering plants of India occur in Karnataka; but over 40% of the 1228 species of the more mobile birds do so. The fraction of smaller animals present is likely to be closer to that for plants, since they too are not very mobile. So Karnataka probably harbours some 22,000 known and 100,000 total species of little known organisms. The number of species in other groups are better known, and our state probably boasts of around 4500 species of flowering plants, around 500 species of birds, about 120 species of mammals ,about 160 species of reptiles (turtles, snakes, lizards and crocodiles), about 70 species of frogs, and about 800 species of fish.

We are justly proud that Karnataka is beginning to play a significant role in the emerging information age on the global stage. Yet, we are very poorly equipped with information and institutions to manage our ecological resources. Medicinal plants are one of the most important of these. About 300 species of such plants are in commercial use in Karnataka today, yet neither the Forest Department, nor the industry has any detailed, reliable information on the stocks of these species, the extent to which they are being depleted (as is believed to be the case for many of the species), the causes of depletion, and options for sustainable use. All that the Forest Dept records is the Forest Range-wise amounts for auctions for rights to collect some 26 out of these 300 species. Since prices and bidding fluctuates greatly, this provides only very limited information on the stocks of these species; there is no quantitative information whatsoever for the remaining 274 species. The industry knows that broad regions from which the supplies have been coming have been shifting, the levels of availability have often been changing and that in response the prices have also been changing; but has no really detailed information at its disposal. The only reliable information on these issues, albeit limited to their own localities, resides with forest produce collectors who are employed by agents of pharmaceutical companies, or with folk practitioners of herbal remedies. Similarly, there is no organized information on the status of the indigenous fish fauna of our freshwaters. Yet such fish constitute an important source of protein, especially for the weaker sections of the society. Again the only source of information on this issue, albeit limited to their own localities, is with our native fisher-folk. Nor do we possess any detailed information on the genetic diversity of cultivated plants and domesticated animals still being maintained under field conditions by farmers and herders. We are, therefore, constrained to make only qualitative statements about this important sector.

Ours is still a biomass-based civilization; many of Karnataka's citizens cultivate a wide range of species and varieties, consume wild fruit and fish, use fuel-wood to cook their meals and grass to thatch their huts and cowsheds, extensively employ herbal remedies and worship peepal trees and hanuman langurs. We are also a state rich in knowledge of uses of our living resources, ranging from the classical traditions of Ayurveda, Siddha and Yunani, to folk medicinal practices and uses of vegetable perfumes, cosmetics and dyes. But Karnataka's ecological resource base is under threat, with extensive destruction of natural habitats, widespread degradation of agro-ecosystems and a growing burden of pollution. Simultaneously, Karnataka's knowledge base of uses of biodiversity is also being eroded, with the younger generation becoming increasingly alienated from the natural world.

This is happening at a time when technological advances have greatly enhanced the potential of uses of biodiversity. We can now transfer genes across organisms, so that goats may be made to produce spider silk that is stronger than a steel fiber of the same diameter. Spiders also produce neurotoxins that may find application in treatment of nervous disorders. All of this means that organisms thus far considered beneath our notice may turn out to be of considerable applied value. Such organisms may be present anywhere, even in highly degraded habitats.

The wealth of strains of domesticated plants and animals on our farms and in the camps of our cowherds and shepherds also holds much promise. The hill chain of Western Ghats has a greater diversity of wild relatives of cultivated plants than any other region of comparable size in the world. Much of this diversity of domesticated organisms and their wild relatives is also being rapidly lost.

Life in Karnataka's rivers, lakes, estuaries and the seas is under even greater stress than that on the land. With all attention focused on culturing of a few species of economic interest like carps and tiger prawns, there has been little thought devoted to conservation and prudent use of the sate's aquatic biodiversity. Yet this loss is occurring at a time when pharmaceutical companies are focusing their attention on marine organisms as the greatest, and as yet little explored treasury of bioactive compounds on the earth.

It is clear that we need to look after the ecological well being of Karnataka's lands and waters, not only of the few remaining natural habitats, but also of farm lands and irrigation tanks, of overgrazed pastures and eroded hill slopes. We need to carefully plan on conserving, sustainably using and restoring the biological diversity across the length and breadth of the state. We also need to conserve and benefit from the knowledge of uses and the traditions of conservation of this biological diversity. Finally the state must ensure that benefits flowing from our heritage of biodiversity and related folk knowledge percolate down to the people at the grass-roots.

This formidable challenge can be addressed only through making conservation, sustainable use and equitable sharing of benefits of biodiversity a people's movement. For biological diversity can be cared for only with the co-operation of masses of the people, many of whom still depend on it for their day-to-day sustenance. Equally importantly, much of the knowledge of the status and dynamics of this biodiversity resides with these same people. Karnataka has played a leading role in involving its population in the democratic process through its Panchayati Raj institutions. It has also been in the forefront of programmes of participatory resource management such as Watershed Development and Joint Forest Planning and Management. India's new Biological Diversity Act has opened up important opportunities for taking good care of the state's rich heritage of biodiversity in partnership with its people. This thematic report attempts to provide concrete suggestions on how to set about this task.

This report draws on extensive inputs from a variety of sources. It uses all the inputs developed through the two year Karnataka State Biodiversity Strategy and Action Plan process that involved working with hundreds of school students and teachers, respondents to a series of radio broadcasts and newspaper articles, public hearings, case studies and expert group reports. The State of Environment report added to this background extensive discussions in five grama sabhas on the basis of on-going People's Biodiversity Register exercises, series of discussions involving officials and NGOs in ten districts, discussions with officials at the state level, and inputs from the Karnataka State Biodiversity Strategy and Action Plan Working Group.

Box 1: Biological Diversity Act

The Biological Diversity Act, passed by the Parliament in December 2002, and signed by the President in February 2003, aims to promote conservation, sustainable use and equitable sharing of benefits of India's biodiversity resources. With this in view it provides for the establishment of a National Biodiversity Authority, State Biodiversity Boards and Biodiversity Management Committees at the level of Panchayats and Municipalities.

Objectives:

Overall

Devise strategies, plans and programmes for conservation, sustainable use and equitable sharing of benefits of India's biodiversity resources (including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and micro-organisms) at a whole hierarchy of levels; namely, national, state, and local bodies (Municipalities and City Corporations, Zilla, Taluk and Gram Panchayats).

For this purpose promote, at all levels, good documentation of biological diversity, its uses and associated knowledge.

Conservation of biodiversity resources

Promote *in situ* and *ex situ* conservation of biological resources

Undertake identification and monitoring of areas rich in biological resources

Undertake selection, management and conservation of heritage sites

Undertake selection, preservation and rehabilitation of threatened species

Knowledge associated with biodiversity

Undertake to respect, protect (possibly through a *sui generis* system), and register (chronicle) at local, state or national levels knowledge of local people relating to biological diversity

Regulation of access to biodiversity, associated knowledge and benefit sharing

Examine, and decide on requests for accessing biological resources or knowledge associated thereto for research, or for commercial utilization, or for bio-survey or for bio-utilization, in consultation with the concerned Biodiversity Management Committees

Decide on levying of collection fees for accessing biological resources from within the jurisdiction of Biodiversity Management Committees at the level of local bodies

Ensure equitable sharing of benefits arising out of the use of accessed biological resources, their by-products, innovations and practices associated with their use and applications and knowledge relating thereto in accordance with mutually agreed terms and conditions between the persons applying for such approval, local bodies concerned and the benefit claimers

Intellectual Property Rights and benefit sharing

Examine, and decide on requests for Intellectual Property Rights based on any research or information on biological resource of Indian origin, prescribing, as appropriate, benefit sharing fees or royalty or conditions for agreeing to intellectual property rights claims

Ensure appropriate transfer of technology, appropriate location of production, research and development units, and appropriate association of Indian scientists, benefit claimers and local people with research and development in bio-resources, their bio-survey and bio-utilization

Research, education and awareness

Provide incentives for research, training and public education to increase awareness with respect to biodiversity

Monitor results of on-going research relating to biological resources and any transfer of results of such research

Examine, and decide on requests for collaborative research projects

Designate repositories of biological resources

Planning

Ensure integration of biodiversity considerations into relevant sectoral or cross-sectoral plans, programmes and policies

Ensure integration of biodiversity considerations into assessment of environmental impact of projects with appropriate public participation

Regulate, manage or control the risks associated with use and release of living modified organisms

CHAPTER III NATIONAL BIODIVERSITY AUTHORITY	
8. *(1)* With effect from such date as the Central Government may, by notification in the Official Gazette, appoint, there shall be established by the Central Government for the purposes of this Act, a body to be called the National Biodiversity Authority. *(2)* The National Biodiversity Authority shall be a body corporate by the name aforesaid, having perpetual succession and a common seal, with power to acquire, hold and dispose of properly, both movable and immovable, and to contract, and shall by the said name sue and be sued. *(3)* The head office of the National Biodiversity Authority shall be at Chennai and the National Biodiversity Authority may, with the previous approval of the Central Government, establish offices at other places in India. (4) The National Biodiversity Authority shall consist of the following members, namely:— (a)a Chairperson, who shall be an eminent person having adequate knowledge and.experience in the conservation and sustainable use of biological diversity and in matters relating to equitable sharing of benefits, to be appointed by the Central Government; *(b)* three *ex officio* members to be appointed by the Central Government, one representing the Ministry dealing with Tribal Affairs and two representing the Ministry dealing with Environment and Forests of whom one shall be the Additional Director General of Forests or the Director General of Forests; *(c)* seven *ex officio* members to be appointed by the Central Government to represent respectively the Ministries of the Central Government dealing with— *(I)* Agricultural Research and Education; *(ii)* Biotechnology; *(iii)* Ocean Development; *(iv)* Agriculture and Cooperation; *(v)* Indian Systems of Medicine and Homoeopathy; *(vi)* Science and Technology; *(vii)* Scientific and Industrial Research; *(d)* five non-official members to be appointed from amongst specialists and scientists having special knowledge of, or experience in, matters relating to conservation of biological diversity, sustainable use of biological resources and equitable sharing of benefits arising out of the use of biological resources, representatives of industry, conservers, creators and knowledge holders of biological resources.	Establishment of National Biodiversity Authority.
9. The term of office and conditions of service of the Chairperson and the others members other than *ex officio* members of the National Biodiversity Authority shall be such as may be prescribed by the Central Government.	Conditions of service of Chairperson and Members.

10. The Chairperson shall be the Chief Executive of the National Biodiversity Authority and shall exercise such powers and perform such duties, as may be prescribed,	Chairperson to be Chief Executive of National Biodiversity Authority
CHAPTER IV FUNCTIONS AND POWERS CF THE. NATIONAL BIODIVERSITY AUTHORITY	
18. *(1)* It shall be the duty of the National Biodiversity Authority to regulate activities referred to in sections 3, 4 and *6* and by regulations issue guidelines for access to biological resources and for fair and equitable benefit sharing. *(2)* The National Biodiversity Authority may grant approval for undertaking any activity referred to in sections 3, 4 and 6. *(3)* The National Biodiversity Authority may— (a) advise the Central Government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilisation of biological resources; *(b)* advise the State Governments in the selection of areas of biodiversity importance to be notified under sub-section *(1)* of section 37 as heritage sites and measures for the management of such heritage sites; *(c)* perform such other functions as may be necessary to carry out the provisions of this Act. (4) The National Biodiversity Authority may, on behalf of the Central Government, take any measures necessary to oppose the grant of intellectual property rights in any country outside India on any biological resource obtained from India or knowledge associated with such biological resource which is derived from India.	Functions and powers of National Biodiversity Authority
CHAPTER VI STATE BIODIVERSITY BOARD	
22. *(1)* With effect from such date as the State Government may, by notification in the Official Gazette, appoint in this behalf, there shall be established by that Government for the purposes of this Act, a Board for the State to be known as the ____(nameof theState) Biodiversity Board. *(2)* Notwithstanding anything contained in this section, no State Biodiversity Board shall be constituted for a Union territory and in relation to a Union territory, the National Biodiversity Authority shall exercise the powers and perform the functions of a State Biodiversity Board for that Union territory: Provided that in relation to any Union territory, the National Biodiversity Authority may delegate all or any of its powers or functions under this sub-section to such person or group of persons as the Central Government may specify. *(3)* The Board shall be a body corporate by the name aforesaid, having perpetual succession and a common seal, with power to acquire, hold and dispose of property, both movable and immovable, and to contract, and shall by the said name sue and be sued. (4) The Board shall consist of the following members, namely:—	Establishment of State Biodiversity Board

(a) a Chairperson who shall be an eminent person having adequate knowledge and experience in the conservation and sustainable use Of biological diversity and in matters relating to equitable sharing of benefits, to be appointed by the State Government; *(b)* not more than five *ex officio* members to be appointed by the State Government to represent the concerned Departments of the State Government; *(c)* not more than five members to be appointed from amongst experts in matters relating to conservation of biological diversity, sustainable use of biological resources and equitable sharing of benefits arising out of the use of biological resources. *(5)* The head office of the State Biodiversity Board shall be at such place as the State Government may, by notification in the Official Gazette, specify.	
23. The functions of the State Biodiversity Board shall be to— (a) advise the State Government, subject to any guidelines issued by the Central Government, on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of the benefits arising out of the utilisation of biological resources; *(b)* regulate by granting of approvals or otherwise requests for commercial utilisation or bio-survey and bio-utilisation of any biological resource by Indians; *(c)* perform such other functions as may be necessary to carry out the provisions of this Act or as may be prescribed by the State Government.	Functions of State Biodiversity Board
24. *(1)* Any citizen of India or a body corporate, organisation or association registered in India intending to undertake any activity referred to in section 7 shall give prior intimation in such form as may be prescribed by the State Government to the State Biodiversity Board. *(2)* On receipt of an intimation under sub-section *(1)*, the State Biodiversity Board may, in consultation with the local bodies concerned and after making such enquires as it may deem fit, by order, prohibit or restrict any such activity if it is of opinion that such activity is detrimental or contrary to the objectives of conservation and sustainable use of biodiversity or equitable sharing of benefits arising out of such activity: Provided that no such order shall be made without giving an opportunity of being heard to the person affected. *(3)* Any information given in the form referred to in sub-section *(1)* for prior intimation shall be kept confidential and shall not be disclosed, either intentionally or unintentionally, to any person not concerned there to.	Power of State Biodiversity Board to restrict certain activities violating the objectives of conservation, etc

CHAPTER X BIODIVERSITY MANAGEMENT COMMITTEES	
41. *(1)* Every local body shall constitute a Biodiversity Management Committee within its area for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and micro organisms and chronicling of knowledge relating to biological diversity. *Explanation.*— For the purposes of this sub-section,- (a) "cultivar" means a variety of plant that has originated and persisted under cultivation or was specifically bred for the purpose of cultivation; *(b)* 'folk variety" means a cultivated variety of plant that was developed, grown and exchanged informally among farmers; *(c)* "landrace" means primitive cultivar that was grown by ancient farmers and their successors. *(2)* The National Biodiversity Authority and the State Biodiversity Boards shall consult the Biodiversity Management Committees while taking any. decision relating to the use of biological resources and knowledge associated with such resources occurring within the territorial jurisdiction of the Biodiversity Management Committee. *(3)* The Biodiversity Management Committees may levy charges by way of collection fees from any person for accessing or collecting any biological resource for commercial purposes from areas falling within its territorial jurisdiction.	Constitution of Biodiversity Management Committees
CHAPTER XI LOCAL BIODIVERSITY FUND	
42. The State Government may, after due appropriation made by State Legislature by law in this behalf, pay to the Local Biodiversity Funds by way of grants or loans such sums of money as the State Government may think fit for being utilised for the purposes of this Act.	Grants to Local Biodiversity Fund
43. *(1)* There shall be constituted a Fund to be called the Local Biodiversity Fund at every area notified by the State Government where any institution of self-government is functioning and there shall be credited thereto— *(a)* any grants and loans made under section 42; *(b)* any grants or loans made by the National Biodiversity Authority; *(c)* any grants or loans made by the State Biodiversity Boards; (d) fees referred to in sub-section *(3)* of section 41 received by the Biodiversity Management Committee; *(e)* all sums received by the Local Biodiversity Fund from such other sources as may be decided upon by the State Government.	Constitution of Local Biodiversity Fund

44. *(1)* Subject to the provisions of sub-section *(2)*, the management and the custody of the Local Biodiversity Fund and the purposes for which such Fund shall be applied in the manner as may be prescribed by the State Government. *(2)* The Fund shall be used for conservation and promotion of biodiversity in the areas falling within the jurisdiction of the concerned local body and for the benefit of the community in so far such use is consistent with conservation of biodiversity.	Application of Local Biodiversity Fund
45. The person holding the custody of the Local Biodiversity Fund shall prepare, in such form and during each financial year at such time as may be prescribed, its annual report, giving a full account of its activities during the previous financial year, and submit a copy thereof to the concerned local body.	Annual report of Biodiversity Management Committees
46. The accounts of the Local Biodiversity Fund shall be maintained and audited in such manner as may, in consultation with the Accountant-General of the State, be prescribed and the person holding the custody of the Local Biodiversity Fund shall furnish, to the concerned local body, before such date as may be prescribed, its audited copy of accounts together with auditor's report thereon.	Audit of accounts of Bio-diversity Management Committees.
47. Every local body constituting a Biodiversity Management Committee under sub-section *(1)* of section 41, shall cause, the annual report and audited copy of accounts together with auditor's report thereon referred to in sections 45 and 46, respectively and relating to such Committee to be submitted to the District Magistrate having jirisdiction over the area of the local body.	Annual report, etc., of the Biodiversity Management Committee to be submitted to District Magistrate.

Box 2: People's Biodiversity Register

The various authorities set up under the Biological Diversity Act would need to be supported by a well-designed Biodiversity Information System (BIS). Such a BIS may be visualized as a meta-database linking together a number of existing data bases as well as those that will be newly developed. It will have to be organized as a decentralized, networked system to reflect the tremendous heterogeneity in the distribution and uses of biodiversity, and the significant role of local level Biodiversity Management Committees. The component of the Biodiversity Information System appropriate to the local level has been termed as "*People's Biodiversity Register (PBR*)". PBRs should be visualized as continually up-dated data bases integrated into the BIS, rather than just as printed documents. A variety of reports can, of course, be produced on the basis of these local databases, but their real value lies in being a part of a larger system.

PBRs may be expected to serve the following functions:

- Help local community arrive at management decisions on their own, e.g., on regulating grazing on community grazing lands, or, in cities, deciding on maintenance of lake or riverside vegetation
- Help local bodies propose development schemes, e.g., to take up plantations in the catchment of an irrigation pond using multiple species of local choice
- Help people access information of significance in management of their crops and livestock, e.g. on outbreaks of pests and diseases in neighbouring localities,
- Help people access information on availability of seeds of various traditional crop cultivars in different regions, and special properties of these cultivars,
- Help people widely share their special knowledge of uses and management of biodiversity resources, for instance, use of catch crops in pest management
- Help local people access information on technologies of relevance to better management of biodiversity resources, e.g. technologies of harvesting honey from wild honeybee hives without undue destruction of the bee colony, or in cities, technologies of developing terrace gardens

- ❖ Help local people access information on prices and on marketing opportunities for their biodiversity resources
- ❖ Help ascertain people's perceptions relating to specific management issues, e.g., on how to regulate destructive fishing practices such as dynamiting. This could help draft suitable regulatory measures at the state level on the basis of the Explosives Control Act
- ❖ Help continuation of traditional practices of conservation and sustainable use of biodiversity by facilitating their recognition and incorporation in the Biodiversity Management Plans of local BMCs
- ❖ Help empower women and other weaker sections of communities intimately linked to biodiversity by involving them in the process of documentation and development of the Biodiverstiy Management Plans of of local BMCs
- ❖ Help preserve the biodiversity related knowledge of people for the posterity through its codification and recording
- ❖ Help people publicise the nature of their special knowledge without disclosing full details, thereby opening avenues for arriving at contractual agreement with commercial enterprises interested in access to such knowledge
- ❖ Help local communicates claim rewards in national conservation programmes, e.g. of on-farm maintenance of crop genetic diversity
- ❖ Feed in good information from the local level to contribute to the broader information base, e.g., facilitate collating information on status of a species of medicinal plant from a number of villages from different eco-regions to assess its status over a larger region
- ❖ Information on prevalent prices and quantities of that species being brought to markets in different towns would help estimate the level of commercial demand for the species

The People's Biodiversity Register exercise will require the involvement of a wide range of agencies, and individuals. These may be thought of as belonging to the following six groups: [1] Technical experts in the area of life sciences and resource management, [2] Technical experts in the area of information management [3] School and college teachers and students, [4] Government functionaries, [5] Workers with Non-governmental Organizations [6] Community members, especially those active in Community-based Organizations such as Youth Clubs or Self-help groups and knowledgeable individuals such as dispensers of herbal medicines, and other active members of communities. Karnataka leads the country in the experiment of preparation of People's Biodiversity Registers, having initiated pilot projects along these lines beginning with 1996. As a part of this esperience 49 High Schools and Junior Colleges have prepared School Level Biodiversity Registers. The schools involved were spread over 13 districts of Karnataka (Daskhina Kannada, Udupi, Uttara kannada, Belgaum, Kodagu, Shimoga, Chikamagalur, Hassan, Tumkur, Davanagere, Mandya, Koppala, Raichur) Of these 35 Schools took up a thematic study on medicinal plants. Between them they came up with good locality level information on 259 medicinal plant species.

2. Key Environmental Problems

Biodiversity is being eroded in all the major ecosystems of the Karnataka state, in coastal and marine tracts, in streams, rivers, lakes and reservoirs, in protected areas, as also in humid and dry forests outside protected areas, in agro-ecosystems, and in urban ecosystems. This erosion may be traced to four significant environmental problems, namely, (a) non-sustainable harvests of living resources, (b) Habitat destruction and fragmentation, (c) Impacts of pollutants, and (d) Competition with colonizing, often exotic, invasive species.

2.1 Non-sustainable harvests of living resources

Non-sustainable harvests have been a significant cause of depletion of biodiversity. These may be illegal, and involve poaching, or may be legal, but involve excessive harvests either by the official machinery, or by private parties. Poaching has affected a variety of organisms, such as Turtles breeding along sea beaches including the Olive Ridley, or otters breeding along riverbanks. There have been endemic people-wild life conflicts, especially in relation to elephants raiding crops and killing people. This has been accompanied by extensive poaching of male elephants and many other wild mammals.

Box 3: Elephant Mortality in Karnataka

	Poaching	**Natural**	**Conflict**	**Accident**	**Unknown/Unclear**	**Total**
1997	20	56	20	8	19	123
1998	32	54	8	9	29	132
1999	22	80	8	7	26	143
2000	18	31	10	4	14	77
2001	6	1	5	1	0	13
Total	98	222	51	29	88	488

Instances of non-sustainable harvests under supervision by the official machinery include harvests of natural vegetation to supply forest based industry, as well as to meet urban fuel-wood needs, at least through 1980s. This has led to the elimination of many of the commercially most valuable species, in particular, those with poor coppicing powers, such as *Myristica malabarica*. There has also been a substantial diminution of genetic resources of wild relatives of cultivated plants. Thus, populations of wild jasmine species have been depleted by the climber cleaning operations prescribed in Forest Working Plans. These processes have adversely affected several species dependent on large tracts of forests such as the Malabar and the Pied Hornbills.

Fish landings from in-shore waters, largely by private parties, have remained largely stagnant, or actually declined over the last decade even as the number of mechanized fishing crafts has been going up. The composition of the catch has been changing, with choice species such as shark, kingfish, pomphret, mackerel and prawns decreasing in size and abundance and being replaced by less preferred species such as *Squilla.* Non-sustainable use by pharmaceutical and allied industry has led to substantial depletion of medicinal plant and other non-timber forest resources, *Rouwolfia serpentina* and *Gloriosa superba* being two well-known examples. Wild honey-bee populations have been decimated, because of the loss of nesting trees and sources of pollen and nectar, and use of pesticides in orchards and plantations

2.2 Habitat destruction and fragmentation

Habitat destruction and fragmentation has plagued all of the state's ecosystems. Naval exercises have reportedly seriously affected off-shore islands like Netrani and Anjadiv that are rich in coral beds, algae, and form breeding grounds for fishes as well as birds like the white-bellied sea eagle. Gallery forests lining stream and river banks have been almost entirely eliminated outside the protected areas. This not only means a loss of stream bank biodiversity, but a major impoverishment and change in the aquatic communities due to the loss of important food supplies from the canopy of the gallery forests. The riverine ecosystems of Karnataka have been extensively modified by the construction of reservoirs leading to major changes in the regimes of river flow. This has meant

the loss of certain special habitats such as spray zones of waterfalls. One of the few reported extinctions of a plant species from Karnataka is that of the grass, *Hubbardia heptaneuron*, known from the spray zone of the Jog falls prior to the construction of the Linganamakki reservoir on the Sharavathy river. These changes have also affected the movements of fish along rivers and streams, for instance, the upstream migrations of fish to spawn during the monsoon leading to a loss of fish diversity. A series of sacred stretches of rivers and streams used to serve as major refugia of aquatic biodiversity, including fish like mahseer; a number of these no longer serve this function. The humid forests of Karnataka have been subjected to severe habitat fragmentation, by large scale river valley projects, by mining for iron and manganese ores, and by encroachments for cultivation; on a large scale by coffee plantations as in Chikamagalur district or on a small scale for rubber, arecanut, paddy cultivation everywhere. Large tracts of forests have also been converted to monoculture plantations of teak, *Eucalyptus, Casuarina equisetifolia* and *Acacia auriculiformis.* These processes have led to the loss of many special habitats such as *Myristica* swamps and high altitude grasslands. In the dry zone, they have adversely affected several species dependent on large tracts of scrub such as the wolf and the Great Indian Bustard. The simultaneous extension of agriculture has led to a loss of grassland and scrub savanna habitats and erosion of species such as partridges and quails dependent on them. The processes of commercialization of agriculture have prompted the liquidation of sacred groves and traditionally protected species such as banyan, peepal and other *Ficus* species, peafowl and monkeys that were a characteristic feature of the traditional agricultural landscape. Open areas in urban ecosystems are also shrinking. So are the old irrigation tanks that constitute urban wetlands. Many have been drained, others are highly polluted and eutrophicated, resulting in a loss of their biota, including indigenous fish communities and migratory waterfowl.

2.3 Impacts of pollutants

The manifold pollution problems impacting Karnataka's biodiversity include industrial effluents, that may contain heavy metals like mercury, untreated sewage from towns and cities, and bio-medical wastes from hospitals. There has been a report that certain stocks of exported sea-food have been rejected as containing unacceptably high levels of antibiotics. Agricultural intensification has also meant high levels of use of pesticides, bioaccumulation of the pesticides such as BHC and DDTand consequent erosion of biodiversity. Thus, cotton growing tracts of Gulbarga and Raichur districts, and river command areas of Kabini, Kaveri and Ghataprabha have witnessed sharp reduction in populations of bird species, including beneficial insectivorous birds like drongos, as well as honeybees. Even the house sparrows are gone from Bangalore. Although we have no specific evidence for the causes of decline of the house sparrow, the fact that several other insectivorous birds such as ioras, shrikes and tree-pies have also declined points to the possibility of pesticide accumulation being an important contributory factor. Given the high levels of air pollution, only a few species of lichens persist on the tree trunks in urban areas. Thus a comparison of the lichen flora of the garden Lalbagh in Bangalore revealed that 18 of the 22 species noted in 1980 were no longer present in 1997, with most of the fruitcose (lichens with small fruitlets) and foliose (leafy) species gone, and replaced by a smaller number of pollution tolerant crust-like forms.

2.4 Exotic invasive species

Exotic species have impacted the biodiversity of all the various fresh-water and terrestrial ecosystems of Karnataka. Spread of exotic fishes like *Tilapia* and, more recently, the African Catfish has contributed to an erosion of indigenous fish biota. The weedy water hyacinth is choking many of the wetlands. Large tracts of forests have been invaded by the weedy *Eupatorium*, they have also been converted to monoculture plantations of exotic species such as *Acacia auriculiformis, A. mangium, Eucalyptus species* and *Casuarina equisetifolia*. The Ranebennur Sanctuary, primarily meant to conserve blackbuck and the Great Indian Bustard has suffered in this fashion from the plantation of *Eucalyptus* trees. *Parthenium* has come to cover many scrublnds and grasslands. Even in the cities, plant life largely persists in the form of a small number of mostly exotic ornamental plant species along avenues and in the gardens. Monoculture plantations, such as those of *Acacia auriculiformis* characterize many of the institutional areas in the cities, such as the campus of Bharat Electronics.

Box 4: African Catfish

The African catfish (*Clarias gariepinus)* is an extremely hardy, fast growing and highly carnivorous fish, that has been surreptitiously introduced into India through Bangladesh. It is banned by Government of India, which has instructed all State Governments to totally prohibit its culture in ponds and tanks. In conformity with this directive, Andhra Pradesh Fisheries Department has taken drastic actions to destroy all its stocks. But in Karnataka, no action has been taken yet to prevent its culture and it has reportedly entered the Kaveri river system. There are serious risks that this cannibalistic fish will seriously affect the biodiversity of the freshwaters of the state.

3. Trends

By and large, Karnataka's biodiversity scenario is characterized by downward trends. There have however been important initiatives to combat these trends. Thus there is no longer any pressure of commercial exploitation on the evergreen forests of Karnataka. The total forest area of the state has in fact been on increase in recent years. Numbers of important flagship species like the elephant and the tiger have also shown an upward trend in the last few years. Hopefully, implementation of CRZ regulations will result in better protection of beaches and mangrove forests, and of inter-tidal biodiversity in the coming years.Initiatives such the constitution of a **Wetlands Authority** and an **Aquaculture Board** may also reverse some of the trends of depletion of fresh-water biodiversity. Mechanisms are being put in place to promote on-farm conservation of crop and livestock genetic resources such as the incentives proposed in the **Protection Of Plant Varieties and Farmers' Rights Act**. It is, however, as yet unclear as to how these provisions will be operationalized, and the extent to which they will change the influence the on-going trends. The erosion of traditionally protected species and habitats such as sacred groves, often on private lands is likely to accelerate further. Again the provisions of the **Biological Diversity Act** may counteract these trends by creating positive incentives for maintenance of biodiversity. At the same time the shift towards more sustainable agricultural practices may gain ground in the coming years and help reduce the pace of the on-going processes of erosion of agro-biodiversity. The negative trends are, however, likely to be strengthened with rapid growth of urban population and growing demands for urban land as well as the rapidly expanding highway network.

While Karnataka has on the whole been quite successful in maintaining, and even adding to the protected areas, there has been much less success in maintenance of other natural, biodiversity rich habitats adjoining the protected areas. As a result, pressures continue to mount on protected areas that are becoming increasingly isolated with loss of contiguous natural habitats. Another major issue is the long-term viability of many of the state's forest habitats. While mature forest tree stocks do survive, regeneration is often poor, because of a variety of factors such as fire, and extensive grazing.

3.1 Non-sustainable harvests of living resources

The pressure on off-shore deep water zone has been gradually increasing and is likely to continue to do so with greater intrusion of foreign fishing fleets and technological progress in off-shore drilling and mining activities. But, on land, with the exhaustion of the commercially most valuable plywood timber by 1980s, the excessive levels of harvests of natural forest vegetation have been brought under check through major policy changes. Poaching is, however, likely to continue, leading to further depletion in the populations of the larger birds, mammals and reptiles.

3.2 Habitat destruction and fragmentation

In coming years, the shallow coastal waters are likely to be severely stressed with increasing industrial activity in coastal regions. Losses are likely to continue to mount with increasing demands on water as a resource for irrigation, domestic and industrial uses, as well as a sink for pollutants. The proposed eastward diversions of west-flowing rivers (Ref: Two reports dated 23-3-2001 for assured supply of drinking water and for ground water recharge for drought affected ten districts of Central Karnataka- submitted to the secretary, water resources Dept. by G. S. Paramasivaiya, Chairman of the Committee under G O No NE 107 MBI 2000 Bangalore Under the Scheme For Diversion of Nethravathy River Water to East) may add qualitatively new impacts on fresh-water biodiversity, as has been the experience with the Periyar river, now almost devoid of all aquatic life in its dried up stretches in Kerala. The trend of a rapid loss of tanks as a major wetland habitat for indigenous biodiversity is likely to continue. The fragmentation of the forest ecosystems is likely to continue, albeit at a slower pace, thanks to the Forest Conservation Act of 1980 and other directives of the Supreme Court. There is likely to be further loss of natural habitats for mining and reservoirs. Natural humid forests and climax virgin evergreen forests of sharavathy valley are no longer being converted to monoculture plantations of teak, *Eucalyptus* and *Acacia auriculiformis*. However, degraded tracts of humid forests are still being converted to monoculture plantations, mostly of *Acacia auriculiformis*, and of drier forests to *Eucalyptus* and *Casuarina equisetifolia*. Losses of on-farm cultivated plant (e.g. Sooji Mallige jasmine, Nanjangud Bale plantain, Kodagu orange, and Appimidi mango) and domesticated animal (e.g. Malnad Gidda and Amrit Mahal cattle, Bannur sheep) genetic diversity, and of grassland and scrub savanna habitats are likely to continue in the coming years along with erosion of species such as wolves and partridges and quails dependent on them.

3.3 Impacts of pollutants

The pressures of pollutants, especially on aquatic biodiversity are likely to keep growing with technological progress in off-shore drilling and mining activities. At the same time, the shallow coastal waters are likely to be severely stressed

with increasing industrial activity in coastal regions. Losses are likely to continue to mount with increasing demands on water as a sink for pollutants, be they agro-chemicals, sewage, bio-medical wastes or industrial effluents.

3.4 Exotic invasives

Qualitatively new impacts may result from the introduction of genetically modified organisms (GMO). Migration of their genes into wild populations may severely deplete natural biodiversity by leading to the evolution of super-weeds and super-pests.

4. Causal factors

There are many-fold causes for the erosion of Karnataka's biodiversity. Aquatic biodiversity has suffered badly in the absence of a proper framework for its conservation, the focus of conservation efforts having been on the forest ecosystems and on the larger birds and mammals. The two major factors limiting the long-term efficacy of the protected areas system are a failure to mainstream biodiversity concerns in the developmental process and a failure to promote biodiversity friendly sustainable livelihoods for the rural populations. Another serious problem is the total exclusion of local communities from a partnership in management of protected areas. With nothing to gain from the protected areas, these people have been mounting increasing pressures of grazing and collection of fuel-wood and other forest produce on these areas. At the same time the extensive people-wildlife conflicts have been rather poorly managed, enhancing the alienation of local communities from the protected areas. The recent grave conflict in the Muthanga Wild life Sanctuary close to Karnataka border in neighbouring state of Kerala is symptomatic of the severe difficulties on this front throughout the country. The twin failures to mainstream biodiversity concerns in the developmental process and to ensure cross-sectoral co-ordination are also at the root of the substantial erosion of the forest tracts outside the protected areas system. The continuing growth of rural populations and livestock, coupled to the failure to create sustainable forest based livelihoods for rural populations has put tremendous pressure on these forest tracts for more land for cultivation, for grazing of livestock, and for collection of minor forest produce. At the same time, the forestry operations have failed to organize commercial harvests on a sustainable basis.

The failure to create sustainable biomass based livelihoods for rural populations has led to an exclusive focus on the intensification and extension of agriculture as the two planks of rural development. The focus of agricultural development strategy on enhancement of productivity by deploying a small number of high yielding plant and animal varieties has led to a serious erosion of agro-biodiversity. At the same time, the focus of land reform on distribution of revenue lands to landless households has led to a severe depletion of the natural biodiversity in the agro-ecosystems. The loss of traditional respect for nature has led to a liquidation of some of the most notable elements of the natural biodiversity in the agro-ecosystems, such as peepal and other trees of genus *Ficus*, an important keystone resource supportive of a wide spectrum of other biodiversity elements. The urban demands have influenced the agro-ecosystems, one of the most striking examples being the felling of peepal and other large trees to fuel the brick kilns. The growth of urban ecosystems is further supported by the high levels of subsidies, for instance, for water and cooking gas made available to urban populations. The lack of long-term planning of urban growth, waste disposal and transport infrastructure leads to a disruption of watersheds and deterioration of urban wetlands, as well as destruction of terrestrial biodiversity.

4.1 Non-sustainable harvests of living resources

The considerable pressure of mechanized fishing on the coastal and marine biodiversity is in part due to over-capitalization of industry. Mechanized fishing also leads to substantial levels of by-catch, i.e. aquatic organisms caught in the net, killed and discarded. These include dolphins and marine turtles. Recent decades have also witnessed a growing trend of employment of destructive fishing methods such as dynamiting leading to large-scale fish kills, including those of juvenile stages, and consequent elimination of several fish species. At the same time, the forestry operations having failed to organize commercial harvests on a sustainable basis, have had to be largely suspended.

Box 5: Destructive fishing methods

1.Dynamiting and poisoning: During low water levels in rivers, the fish congregate in pools and are killed by dynamiting or poisoning. 2. Closed-season and mesh regulation: Small-meshed nets operated almost everywhere destroy juveniles and immature fish. During monsoon, the fish breed, but gravid fishes are caught in the upper reaches when fresh water enters the reservoir. 3. Congregation of fishes near the dams: River fishes congregate at the foot of the dams when the reservoir overflows. Excessive harvests of these fishes deplete the stocks.

4.2 Habitat destruction and fragmentation

The growing demands for industrial and urban development, and major naval facilities in the coastal districts of Karnataka are putting pressure on the natural coastal habitats. The ever-growing demands for industrial development, the growth of urban centers and the on-going intensification of agriculture all call for larger and larger supplies of water, inevitably leading to destruction of natural aquatic habitats and an erosion of aquatic biodiversity. Disruption of migration routes of spawning fish and eels migrating to the sea has also contributed to the decline of

several fish species. There has been a spate of encroachment over water bodies for construction in growing urban centers and for cultivation in rural areas. Tanks have tended to become silted and dry up with a reduction in the inflow of water due to encroachments in the catchment areas.

There is a lack of commitment for maintenance of the integrity of the protected areas and the habitat continuity outside protected areas. This was reflected in the construction of the Kali Hydroelectric Project and establishment of several industries in the heart of the Dandeli Wildlife Sanctuary 40 years ago, and in the currently on-going mining activities in an enclave within the Kudremukha National Park. There are however hopeful signs that this mining will soon be phased out.

4.3 Impacts of pollutants

Pollution has a significant impact on biodiversity and the poor implementation of pollution control measures due to inadequacies of monitoring systems and a lack of public accountability has been a serious problem.

4.4 Exotic Invasives

Siltation and organic pollution have promoted rampant growth of exotic weeds like water hyacinth in freshwater ecosystems. Lack of sustainable management has opened forest, scrubland and grassland habitats to invasion by exotic weeds like *Eupatorium* and *Parthenium.* Other exotics like the fish *Tialpia,* forestry species like *Eucalyptus,* plantation crops like rubber, and field crops like sunflower have been deliberately introduced, as are the GMOs like *Bt* cotton.

5. Impacts

The area covered by the exclusive economic zone off the coast of Karnataka is extensive, indeed larger than the land area of the state, and clearly deserves attention. We have little good data on the biodiversity resources of this vast tract, although it is acknowledged that there has been degradation of beaches and mangrove forests along the coast, and over-fishing, pollution problems and serious disturbance of the sea bottom habitats through trawling in the sea. The erosion of coastal and marine biodiversity of Karnataka would lead to potentially significant losses of biodiversity from a global perspective since the Indo-Australian marine biogeographic region is the richest in the world. Marine organisms are now considered the most promising sources of bioactive compounds by the pharmaceutical industry. Since so little is known of our marine organisms, it is entirely likely that there are on-going extinctions of biodiversity resources of much economic potential, of which we are quite unaware.

The depletion of in-shore fish stocks, coupled to marketing of much of the catch in distant places has meant a drastic reduction in the availability of easily affordable protein sources for weaker segments of Karnataka's coastal population. There has also been a marked erosion of biodiversity in riverine and estuarine ecosystems of Karnataka. Some of the fish species that have thus become threatened include: *Labeo fimbriatus, L. calbasu, L. bata, L. porcellus, Puntius_pulchellus, P. carnaticus, P. dorsalis. P. narayani., P. puckelli, Gonoproktopterus curmuca, G .dubius, G.kolus, G.micropogon micropogon, G. thomassi, Mystus krishnensis, Neotropius khavalchor, Channa marulius,and C.striatus.* Other notable instances of erosion of aquatic biodiversity involve the near-extinction of flagship species like crocodiles and otters. Karnataka has some natural swampy habitats, but practically no natural lakes. Its extensive network of irrigation tanks, estimated at around 45000 was built between 13^{th} and 19^{th} centuries and had become major refugia for aquatic life and resident and migratory waterfowl. They had extensive vegetation in the catchment areas. Much of this biodiversity has eroded over the last half a century, especially outside the protected areas. Some of these constituted temple tanks with a strict protection for fish, turtles and other biota. Many of these sacred water-bodies are no longer protected. The larger reservoirs constructed over the last century are biologically impoverished. All such water-bodies have tended to be stocked by a small number of cultured fish species such as *Catla* and *Tilapia.*

The impacts of the protected areas system have been, up till the present time, quite positive, promoting the conservation of some of the flagship species such as tiger, panther, elephant and sambar, along with the moist deciduous forest biota. Since the highest levels of biodiversity reside in the more humid forests, this means that significant habitats such as *Myristica* swamps, as also scrub and high altitude grasslands such as Brahmagiri and Kudremukh have not found an adequate representation in the protected area system. Thus, given the limited focus, the positive impacts have not been as substantial as might have been hoped. More importantly, these efforts have not been wholly successful; and there has been substantial poaching and attrition of male flagship elephants , and of sandalwood. Most importantly, the whole protected area system is mired in severe people- conservation conflicts. These involve the insistence on removal of even tribal people from National Parks, and the difficulty of being properly compensated for damage from wild life. The worst damage is from wild pigs, a species in no danger of excessive reduction in the population. However, this species receives the same level of legal protection as the chital and sambar. Equally significantly, the people do not in any way share in the benefits from conservation efforts, as, for instance through eco-tourism. So, they have little motivation to support the protected areas system, leading to an escalation of conflicts.

Since the Western Ghats biogeographic province is one of the world's biodiversity hot-spots, the erosion of biodiversity in these humid forests would potentially lead to noteworthy loss of biodiversity from a global perspective. Significant in this context would be a loss of important genetic resources such as wild relatives of cultivated plants. The on-going erosion of the forest resources is resulting in an inadequate availability of biomass resources such as fuel-wood, bamboo, fencing and thatching material for rural population, notably for the rural artisans. The dry forest tracts of Karnataka have for long supported large numbers of pastoral communities, many of them nomadic shepherds. An erosion of the biodiversity resources of these tracts has meant serious shortages of fodder for their livestock.

At the time of independence, Karnataka, along with the rest of the country suffered from the lowest levels of per capita food availability in the recorded history. A series of droughts accompanied by serious food shortages characterized the early years of independence. The first response was the "Grow more food" campaigns of 1950s bringing in more land under cultivation. The 1960s saw the ushering in of the "Green revolution" dependent on intensification of inputs of canal irrigation and agro-chemicals. In Karnataka, the 1970s witnessed land reforms whose main plank was the distribution of waste-lands to the landless for cultivation. The 1980s saw extensive digging of bore-wells to tap ground water resources. The intensification of agriculture has resulted in very severe losses of on-farm cultivated plant and domesticated animal genetic diversity, with the replacement of the great

variety of local land races by a small number of high yielding varieties of a smaller set of crops, and of cattle and poultry. Of course, a significant fraction of these genetic resources has been preserved in national and international seed collections. This, however, does not permit continuation of the evolutionary processes. The last few years are, however, witnessing a move towards encouragement of more sustainable agricultural practices, including employment of *integrated pest management* techniques.

Urban settlements along with the transport network of highways connecting them constitute the most rapidly expanding ecosystem of the Karnataka state. Given the high value of the urban land, there is little scope for maintenance of natural biological communities within this ecosystems type. So the urban ecosystems are losing much of their biodiversity, including the communal roosts of birds like mynas and parakeets and fruit bats, who take shelter in urban areas, although they obtain most of their food in the surrounding rural hinterlands. In their structure, the urban ecosystems most resemble rocky cliffs and caves, and hence are now characterized by species like blue rock pigeons and house swifts that prefer these habitats. Indeed urban areas are losing much of their biota barring a few species like crows and cockroaches, rats and geckos, and stray dogs and feral cats. Some of the largest urban trees, often supporting communal roosts of birds and bats were the sacred peepal *Ficus religiosa* and atti *F. glomerata* trees with snake-stones under them, often near the temples. These too are disappearing. The bonnet macaque troupes, again often found around temples are being trapped and exported. The only animals that seem to be on the increase are the stray dogs.

A significant proportion of Karnataka's urban poor people cannot afford many basic necessities such as cooking energy and therefore, suffer from a scarcity of biomass resources, especially fuel-wood. Over all, the urban populations are subject to an increasing alienation from the natural world, which may have long term health impacts, and may lead to an increase in stress related disorders. There is also a possibility of a serious health hazard in the form of rabies with an increase in the population of the stray dogs.

Box 6: Kokrebellur Heronary

The village of Kokkarebellur (77°5' 25'' East and 12° 30' 31'' North) in Maddur taluk of Mandya district in Mandya district is amongst the five last breeding sites for the globally threatened bird species, the Spotbilled Pelican (*Pelecanus phillipensis*) in India. Consequently, Kokkare Bellur has been identified as one of the *Biodiversity Hotspots of Hope* in Karnataka State of Environment Report and Action Plan. The village also offers nesting niches for many other birds including Painted Storks, Little Cormorants, Little Egrets, Black Ibis, Grey Herons, Night Herons, Pond Herons and Glossy Ibis. This was the Pelicanary that was probably referred to by T C Jerdon in 1853. In modern times it was made widely known by Shri S G Neginhal, one of Karnataka's leading wild life experts and an officer of Indian Forest Service in 1976. He was also responsible for introducing the pioneering scheme of compensating the villagers for the economic benefits foregone and the protection afforded to the birds. This locality is a wonderful example of symbiosis of humans and birds. The villagers protecting the birds and in turn benefiting from the "guano" (bird droppings) rich in phosphorus and potassium that accumulates under the nesting trees that is used as manure.

Kokkarebellur lies just 800 m to the west of the Shimsha river and is notable for the presence of several large tanks such as, Tailur Kere, Maddur Kere, Sole Kere, in its vicinity. These water bodies provide sufficient food, fishes and shellfishes for pelicans and other birds. The landscape at Kokkarebellur that includes Ficus (*F religiosa, F bengalensis*) and Tamarind (*Tamarindus indica*) trees furnishes nesting sites for these birds.

The remarkable sight of these graceful birds nesting peacefully amidst the village setting has naturally become a major tourist attraction. This could contribute to enhanced support for conservation of these important wild life species, spread awareness of nature in the broader public and bring economic benefits to the villagers, who are, by and large, quite poor. Further development of tourism can therefore be quite welcome. However, this tourism will impinge on a complex and delicate natural ecosystem and therefore must be planned carefully in a holistic fashion.

Such a holistic action plan for Kokkare Bellur may subserve the following objectives:

- Sustaining the nesting of birds in decades to come
- Sustaining the centuries old co-operation of villagers in decades to come

❖ Providing good facilities and relevant information to the visitors

As the local villagers have provided ample protection for the birds since time immemorial, it would be appropriate to constitute a Village Forest Committee (VFC) to participate in the conservation effort. The VFC would manage the prevailing fragile ecosystem at Kokkarebellur and also cater to the tourists visiting Kokkarebellur. The committee may continue their age-old tradition of serving as guardians of the birds, but now in a more organized fashion, with financial support from the state Forest and Tourism Departments. A number of other Governmental agencies, such as Departments of Minor Irrigation and Fisheries, and the Zilla Panchayath could also play a significant role in long term conservation and development effort.

The respective roles of these various agencies may be visualized as follows:

The Village Forest Committee (VFC) would participate in the following activities:
Nesting sites: Ensuring the survival of existing nesting trees and growing new ones of the following genera: *Ficus, Tamarindus, Thespesia* and *Acacia*.
Sustaining the food supply for birds and chicks at Kokkarebellur.
Managing the guano (manure) from nesting birds for use by the villagers.
Providing security for the nesting birds from threats such as
Electrocution from the low electric lines.
Persecution by fishermen at the tanks because of competition for fish

The Karnataka Forest Department (KFD) may undertake the following activities:
Providing financial and technical support to the Village Forest Committee
Nesting sites: Ensuring the survival of existing nesting trees and growing new ones of the following genera: *Ficus, Tamarindus, Thespesia* and *Acacia* by creating incentives for villagers to maintain old nesting trees and planting new ones with a transparent system of deciding on and disbursal of adequate levels of incentives.

The Karnataka State Tourism Development Corporation (KSTDC) may support the following activities:
Providing a Matching Grant to supplement the support being provided by the Forest Department to the Village Forest Committee.
Ensuring security from disturbance by visitors that may increase chance of predation by crows, or force the abandonment of nests, through proper management of tourism facilities, including especially construction of watch towers that may become a serious disturbance.
Creating additional earning opportunities for villagers from visits by tourists through employment as guides, charging of parking fee for vehicles, camera fee, paid toilet, opportunity for running a restaurant or other tourist facilities.
Creating a good system of controlling generation of garbage by visitors and of the disposal of the garbage.
Supporting access to information on the birds and the ecosystem with the help of a good Interpretation Center.

The Mandya Zilla Panchayath may support the following activities:
Maintenance of attractive, hygienic environment in the village through creation of a good water supply and box drainage system.
Development of access to Kokkare Bellur and facilities for parking, food, water, toilet in collaboration with the local community.

The Department of Minor Irrigation and Department of Fisheries may support the following activities:
A set of tanks significant as food sources for the Kokrebellur birds should be identified for being earmarked for the primary purpose of biodiversity conservation. These may include Tailur Kere, Maddur Kere, Gollarashettikere and Sole Kere close to Kokrebellur, as also others such as Mandakalli, Karanji, Veerapura, Kukkarahalli, Lingambudhi tanks where pelicans have been frequently sighted. No commercial carp culture may be taken up in these tanks, but they may be restocked with indigenous species. Fishing activity in these

tanks may be limited to local subsistence fishing. Special care should be taken to desilt these tanks and to maintain adequate flows of clean, pollution free water into these tanks.

a.

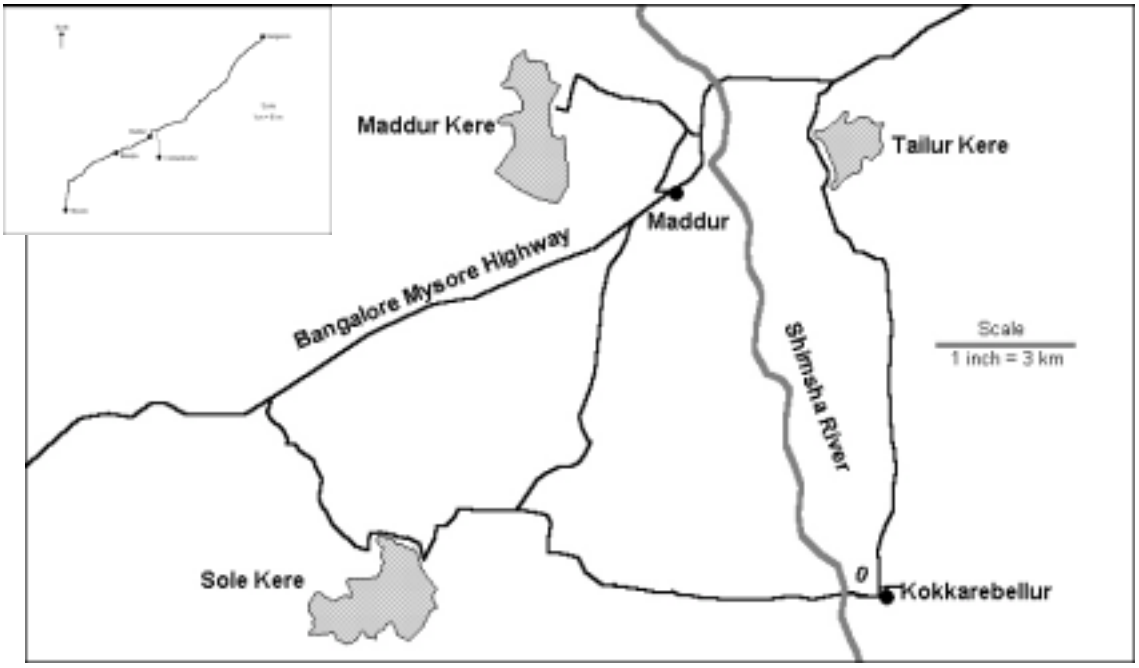


Figure 1: Location of Kokkarebellur
(Inset – Proximity to Bangalore – Mysore Highway)

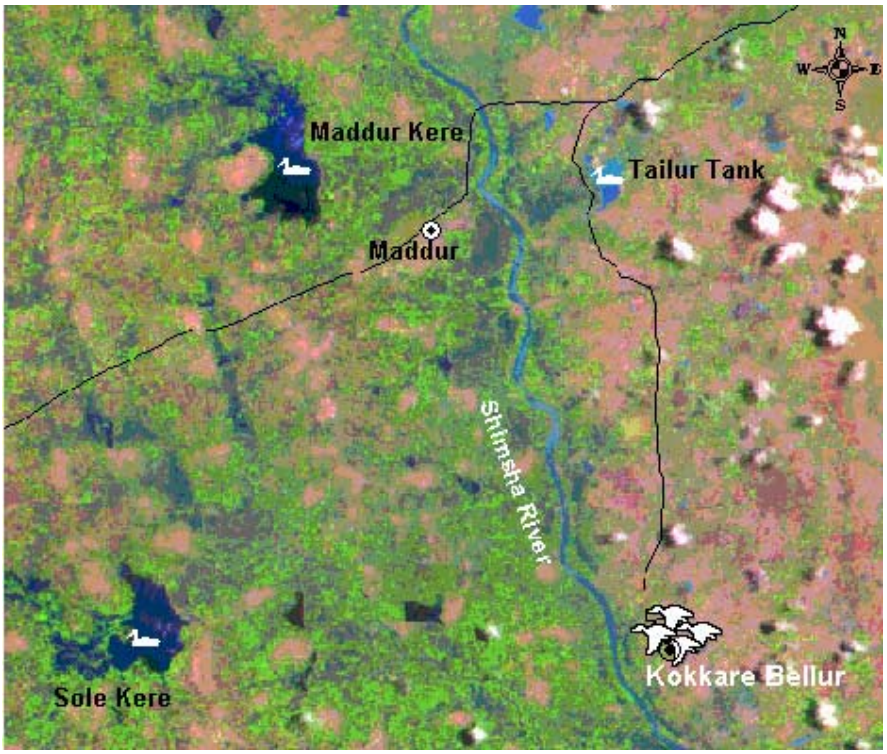


Figure 2: False Colour Composite(IRS-1C, LISS-III) of Kokkarebellur and its environs

5.1 Non-sustainable harvests of living resources

The depletion of in-shore fish stocks, coupled to marketing of much of the catch in distant places has meant a drastic reduction in the availability of easily affordable protein sources for weaker segments of Karnataka's coastal population. Decimation of indigenous freshwater fish populations, estimated by local people to have reached 25% of the original levels in interviews in many villages in Udupi and Dakshina Kannada districts, means a drastic reduction in the availability of easily affordable protein sources for weaker segments of the state's population, with manifold health impacts, although, this has been to an extent offset by the successful culturing of a few species of carps. However, these cultured carps are generally auctioned and not available to the poorer segments of the population as the indigenous fish are.

Non-sustainable harvests of forest resources have also impacted the weaker segments of the rural population. For instance, over-harvest of cane, including digging up of the rhizomes to supply walking sticks has led to large-scale decimation of this important forest resource that provided livelihood for large numbers of rural poor. A declining availability of medicinal plant resources has possible health implications for rural populations.

5.2 Habitat destruction and fragmentation

Fragmentation of forest habitats has exacerbated people- wild life conflicts, as when elephants attempt to move along their traditional migratory routes, and with traditionally protected species like peafowl and monkeys, as well as with others like wild pig and jackal. The loss of most of the grazing lands and other uncultivated lands that used to be a vital ingredient of Karnataka's agro-ecosystems has resulted in scarcities of biomass resources such as fuel-wood, fodder, bamboo, fencing and thatching material for the rural population, most notably for rural artisans.

Box 7: *Impact of HPCL Pipeline on Elephants and their habitat In Western Ghats*

Mumbai based Hindustan Petroleum Corporation Limited (HCPL) undertook a 364 km Mangalore-Bangalore Pipeline Project to transport petroleum products between 1998 and 2002. The dimension of the pipeline is 20/24 " and a strip of 18 meter width is retained as the right of corridor along the pipeline. As much as 18 km of the pipeline has cut across the Western Ghats, south of Charmadi Ghats, passing through 12 river systems, Balur and Dharmasthala Reserved Forests and also areas which are about 20 kms from Kudremukh Reserved Forest (KRF). The forest type within this belt includes tropical wet evergreen, semi-evergreen, mixed deciduous and grasslands. Some part of these forests and grasslands has been converted into cardamom, rubber, coffee, arecanut and banana cultivation. Paddy is also cultivated in some of these areas. Some of these cultivated crops, and the forest cover with bamboo, Baine, reeds (species not known) and grasslands, provide an ideal habitat for elephants. These state, reserved and private forest areas connect well-known elephant habitats of Bhadra and Pushpagiri Wildlife Sanctuaries. Some of these forests meet the seasonally changing, food, water, shade and other resources needs of elephants who migrate across the habitat. A survey on the impact of the project on elephants and its habitat was carried out, through visiting the villages located south, north, east and west of the pipeline area and those situated close to the state, reserved and private forests.

Within the private forests, Neriya (estate) private forest region (12 59 36.6 N, 75 31 11.1 E) is a very crucial elephant habitat, where concentration of elephants (number of elephant dung seen) was noticed to be very high. A series of disturbances, including felling of trees, movement of labor and machinery for creating the trench, welding and laying the pipes in the trench. Use of transport vehicles, welding machinery, cranes and back-filling after placement of the pipe have driven the elephants out of this area, some of which were sighted at Banjar in late 2002. There has been no restoration of vegetation along the pipeline and no recolonization of the area by elephants.

5.3 Impacts of pollutants

Given the substantial pollution loads in the sea, it is possible that fish and shellfish being consumed as food carry heavy metals, antibiotics and pathogens with significant health implications. Eutrophication of the water-bodies coupled to growth of weeds like the water hyacinth has led to an increase in the populations of vectors of diseases like the mosquitoes with negative health consequences. Extensive application of pyrethroid pesticides has led to a decimation of soil microbiota, reducing the fertility of farm soils. Pesticide residues in farm produced food too are probably a notable health hazard.

5.4 Exotic invasives

An opening up of the forest canopy in the more humid tracts has been followed by an explosion of the populations of the exotic weed *Eupatorium.* A rank growth of *Eupatorium* supports tick populations that have served as vectors for the deadly viral Kyasanur Forest Disease (KFD). In the drier tracts deforestation and overgrazing has been

followed by an explosion of the populations of the exotic weed *Parthenium*, with negative health impacts such as allergies. Finally, there are distinct possibilities of major losses of biodiversity from as yet little understood effects of the newly introduced GMOs.

6. Prioritization

	Environmental Problems	Impact on Public health	Loss of biodiversity	Impact on Vulnerable groups.	Productivity loss	Impact on Critical ecosystems	Reversibility	Urgency of the problem	Total
1.	Poor implementation of pollution control measures	5	5	5	5	5	5	5	35
2.	Increasing demands on fresh water as a resource, as well as a sink for pollutants.	5	5	5	5	5	5	5	35
3.	Eastward diversion of west-flowing rivers leading to qualitatively new impacts.	5	5	5	5	5	5	5	35
4.	Growing demands for industrial and urban development along sea coast	3	5	3	3	5	5	5	29
5.	Lack of commitment for maintenance of habitat continuity outside protected areas.	3	5	3	3	5	5	5	29
6.	Alienation of local communities from a partnership in management of protected areas.	3	5	5	3	3	3	5	27
7.	Poor management of people-wildlife conflicts	3	5	5	3	3	3	5	27
8.	Conversion of extensive areas to monoculture plantations of teak, *Eucalyptus* and *Acacia auriculiformis*	1	5	3	3	5	3	5	25
9.	Inadequate availability of biomass resources such as fuel-wood, bamboo, fencing and thatching material for rural population, and notably for rural artisans.	3	3	5	5	3	3	3	25
10.	Inadequate availability of fodder resources notably for pastoral communities.	3	3	5	5	3	3	3	25
11.	Encroachment over water bodies for construction and cultivation	3	3	3	3	3	5	3	23
12.	Drying up of water inflow due to encroachments in the catchment areas of tanks	3	3	3	3	3	5	3	23
13.	Eutrophication due to organic pollution	3	3	3	3	3	5	3	23
14.	Invasion by exotic weeds such as water hyacinth	3	3	3	3	3	5	3	23
15.	Substantial depletion of medicinal plant and other non-timber forest resources and of wild honey	5	3	3	3	3	3	3	23
16.	Failure to create a stake for rural population in the health of forest	3	3	5	3	3	3	3	23

	ecosystems								
17.	Introduction of GMOs may severely deplete natural biodiversity by leading to the evolution of super-weeds and super-pests.	3	3	3	3	3	3	5	23
18.	Pollution loads, including heavy metals in fish and shellfish, with significant health implications.	5	3	3	1	3	3	3	21
19.	Increase in vectors of diseases like mosquitoes.	5	1	3	3	3	3	3	21
20.	Failure to create sustainable forest based livelihoods for rural populations.	3	3	3	3	3	3	3	21
21.	Failure of systems for sustaining commercial harvests of forest produce	3	3	3	3	3	3	3	21
22.	Loss of people's knowledge of conservation and sustainable uses of biodiversity.	3	3	3	3	3	3	3	21
23.	Destructive effects of by-catch in mechanized fisheries	1	3	3	3	3	3	3	19
24.	Lack of a framework for conservation of aquatic biodiversity.	1	3	3	3	3	3	3	19
25.	Employment of destructive fishing methods such as dynamiting.	1	3	3	3	3	3	3	19
26.	Disruption of migration routes of spawning fish and eels.	1	3	3	3	3	3	3	19
27.	Substantial depletion of genetic resources of wild relatives of cultivated plants.	1	3	3	3	3	3	3	19
28.	Urban demand for bricks leads to the felling of trees and export of good soil from rural areas.	1	3	3	3	3	3	3	19
29.	Increasing pressure of mechanized fishing due to over-capitalization of industry.	1	3	3	3	3	1	3	17
30.	Almost total loss of gallery and lake-side forests outside of protected areas.	1	3	1	3	3	3	3	17
31.	Severe erosion in populations of water-birds.	1	3	1	3	3	3	3	17
32.	Indigenous vegetation and associated biota of scrub and high altitude grasslands being lost due to plantation activities.	1	3	1	1	5	3	3	17
33.	Loss of special habitats such as *Myristica* swamps and spray zones of waterfalls	1	3	1	1	5	3	3	17
34.	Loss of species dependent on large tracts of forests such as the Malabar and the Pied Hornbills	1	5	1	1	3	3	3	17

35.	Loss of grassland and scrub savanna habitats and erosion of species dependent on them such as the wolf and Great Indian Bustard.	1	3	1	1	5	3	3	17
36.	Very severe loss of on-farm cultivated plant and domesticated animal genetic diversity.	1	5	1	1	3	3	3	17
37.	Possible extinction of marine biodiversity resources of economic potential, especially for the pharmaceutical industry.	1	3	1	1	3	3	3	15
38.	Loss of sacred water bodies, sacred groves and traditionally protected species such as banyan, peepal and other *Ficus* species, peafowl and monkeys	1	3	1	1	3	3	3	15
39.	Loss of much of the biota barring a few species like crows and rats from many urban areas.	3	3	3	1	1	1	3	15
40.	Poaching, notably of male elephants and sandalwood	1	1	1	1	3	3	3	13
41.	Prevalence of a small number of mostly exotic ornamental plant species along avenues and in gardens.	1	3	1	1	1	1	3	11

7. Hotspots

One may visualize two kinds of hotspots, those of hope, still rich in biodiversity and excellent sites for focusing on-going and future conservation efforts, and those of despair, subject to extensive degradation, and therefore sites which should become a focus of restoration efforts. The details of these two kinds of hotspots identified for the state are provided in Annexures B and C respectively. Annexure D furnishes details regarding specific biodiversity elements of significance.

Summarized below is a district by district picture of the hotspots thus identified.

SlNo	District	Hotspots of Hope	Hotspots of Despair
1	Uttara Kannada	39	17
3	Dakshina Kannada	8	17
2	Mysore	8	0
4	Udupi	7	13
7	Belgaum	6	1
6	Kodagu	6	2
5	Tumukur	6	2
8	Bangalore-Rural	5	4
9	Chikmagular	5	1
10	Shimoga	5	4
11	Mandya	3	1
12	Bellary	2	0
13	Chamarajanagar	2	0
14	Dharwad	2	1
15	Bagalkot	1	0
16	Bangalore-Urban	1	6
17	Bijapur	1	0
18	Davangere	1	2
19	Hassan	1	0
20	Haveri	1	1
21	Kolar	1	0

* Figures do not tally with Annexure B and C as hotspots overlap across districts.

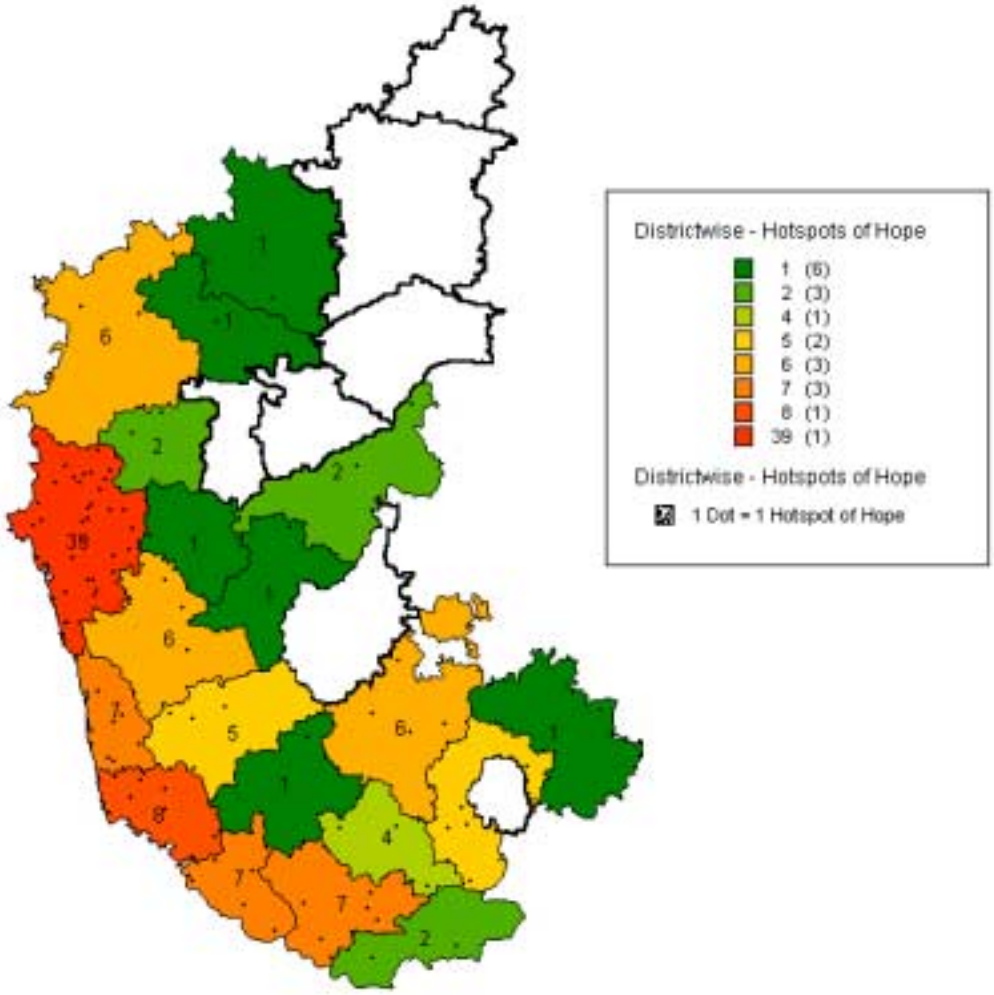


Figure 1: Hotspots of Hope in Karnataka – District wise

* Figures do not tally with Annexure B and C as hotspots overlap across districts.

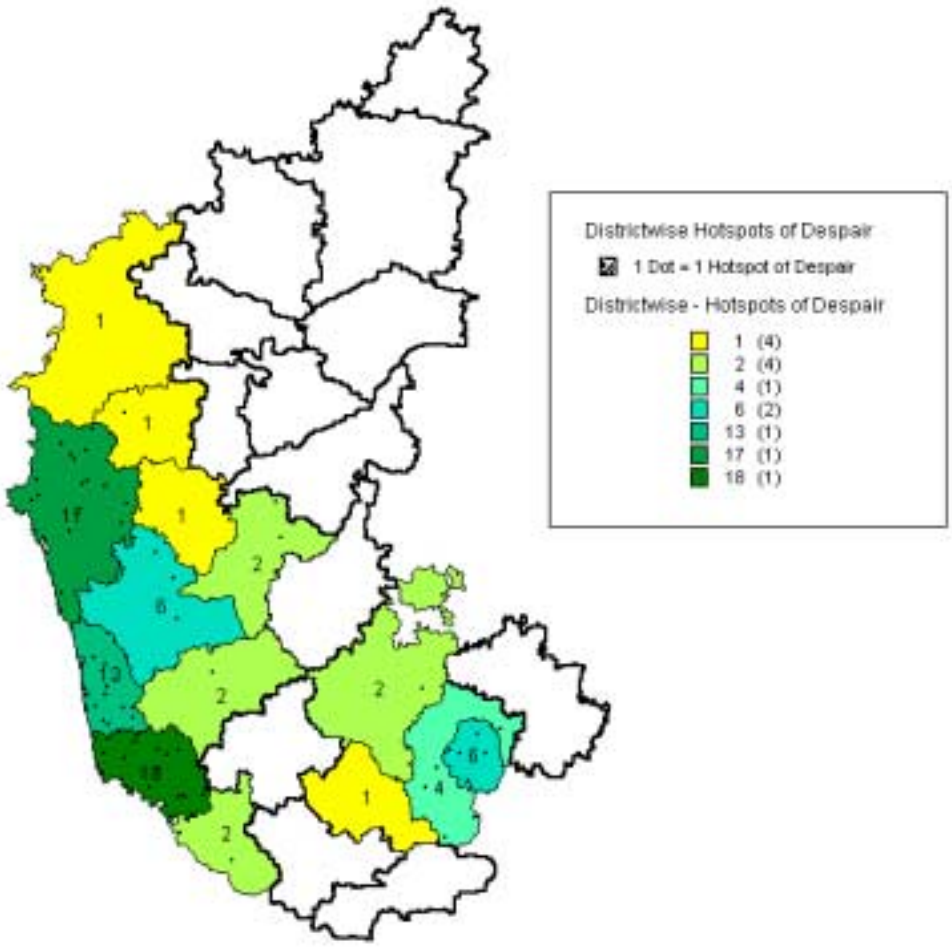


Figure 2: Hotspots of Despair in Karnataka – District wise

* Figures do not tally with Annexure B and C as hotspots overlap across districts.

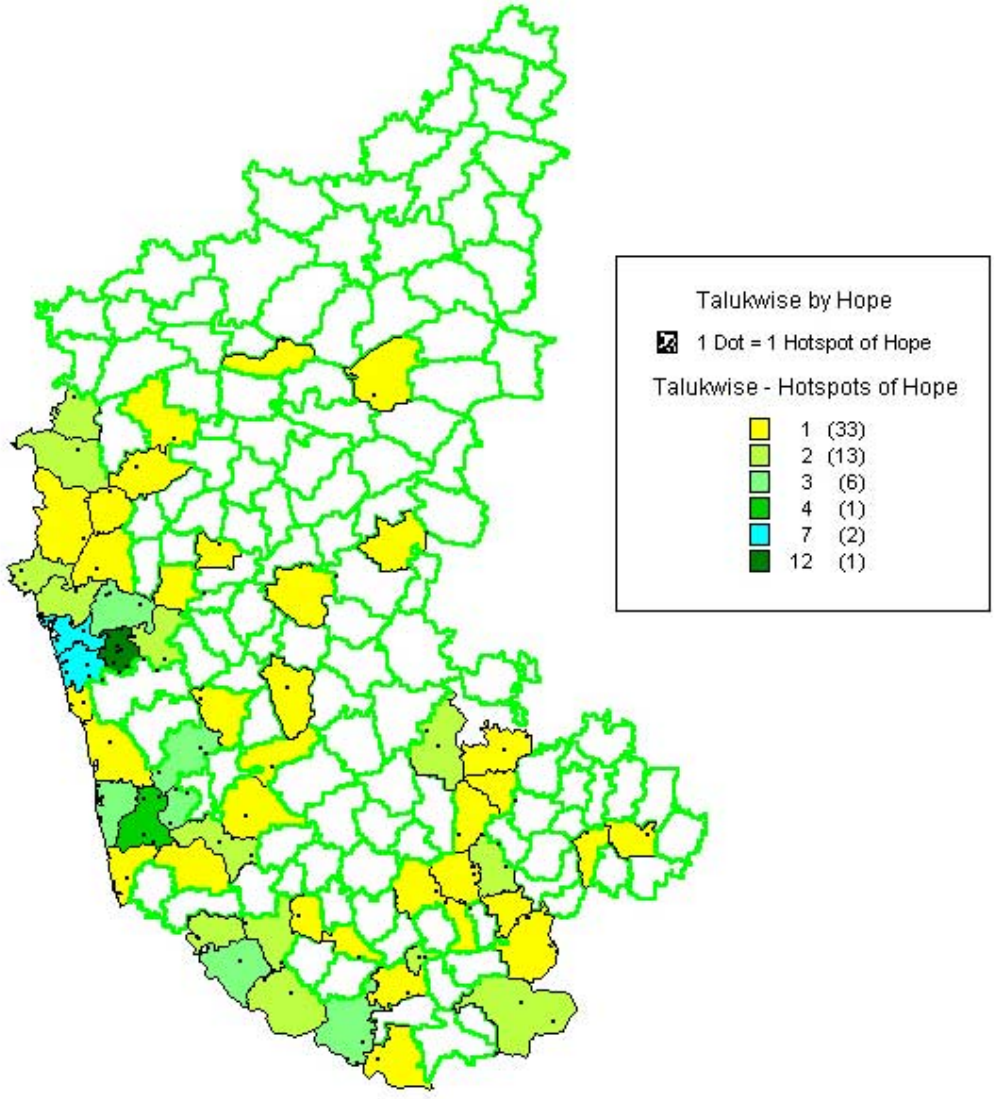


Figure 3: Hotspots of Hope – Taluk wise

* Figures do not tally with Annexure B and C as hotspots overlap across districts.

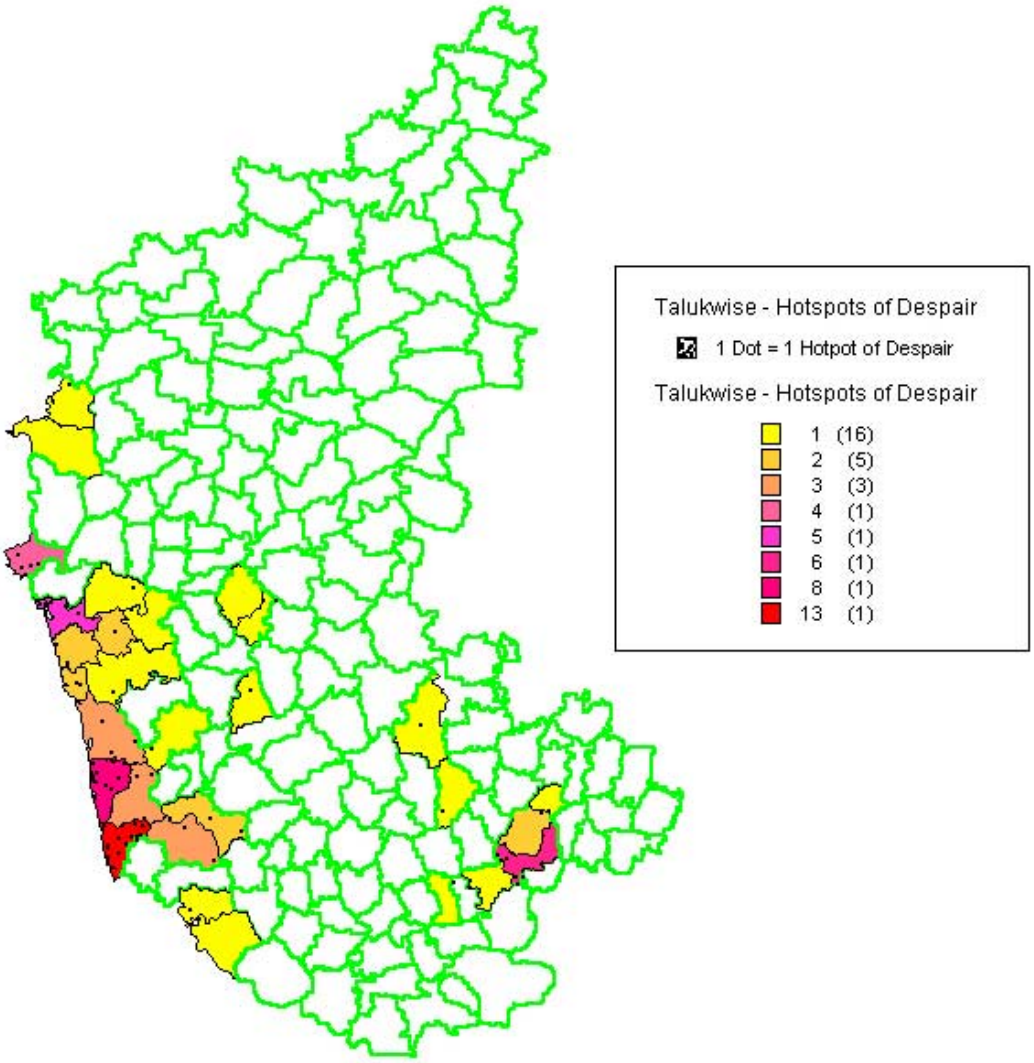


Figure 4: Hotspots of Despair – Taluk wise

* Figures do not tally with Annexure B and C as hotspots overlap across districts.

8. Policies and institutions

A number of policy and institutional initiatives could greatly enhance Karnataka's capabilities of addressing the problems relating to conservation, sustainable use and equitable sharing of benefits of its rich heritage of biodiversity resources. These steps would have to confront a number of fundamental weaknesses.

- We possess a highly inadequate base of information on environment, on ecosystem services and on biodiversity.
- Karnataka's educational system imparts little understanding of the state's environment, including biodiversity.
- The result is widespread environmental illiteracy amongst all sectors of the population, especially the urban decision-makers.
- This is reflected in a failure to mainstream biodiversity concerns in the developmental process, these remaining an isolated activity of a specialized wing of the government.
- The result is a failure to ensure cross-sectoral co-ordination.
- The Environmental Impact Assessment exercises, meant as a tool to ensure cross-sectoral co-ordination are, by and large, very inadequate. Moreover, they look at projects one by one, there being no provision to examine cumulative impacts in the absence of an assessment of overall carrying capacity.
- There are no concerted attempts to combine conservation and sustainable use approaches, given the limited focus of biodiversity conservation efforts on flagship species and areas under control of Forest Department, especially Protected Areas.
- The policy instruments, used in efforts directed at biodiversity are, by and large, restricted to regulatory measures. This implies a failure of the biodiversity focused efforts to contribute to the enhancement of quality of life of the broader masses of people, especially the women and the weaker segments of the population – through empowerment; participation in planning, implementation and monitoring; through social recognition; through promoting sustainable livelihoods, through economic incentives. This ensures that biodiversity concerns receive little broad-based support.
- An important long-term consequence of the current trends, apart from the erosion of biodiversity and the attendant ecosystem services, is a loss of people's knowledge and traditional practices of conservation and sustainable uses of biodiversity.

Broadly, we may conceive of the following measures:

1) Organize new inter-disciplinary, multi-scale, multi-agency initiatives towards inventorying biodiversity and associated knowledge as an on-going programme incorporating periodic monitoring. Such a programme should focus, not just on biodiversity rich or protected areas, but on the entire landscape and waterscape. It would need to involve a number of scientific and technical agencies such as forest-fishery- agriculture departments; Botanical and Zoological Surveys, Universities, Agricultural Universities and pertinent research institutions. This scientific effort will have to be complemented by Community Based Inventories involving schools and colleges, local knowledgeable individuals, community leaders, Village Forest Committees, and Panchayat institutions. These Community Based Inventories may focus on organisms and issues familiar to people such as on medicinal plants, fish and shellfish, sacred groves, ponds and other sacred sites, sacred trees such as *Ficus* and sacred animals like monkeys, crop genetic diversity, especially of fruit trees such as jackfruit, mango, *Garcinia*, tamarind, and sustainable use practices, such as protection to fishes migrating upstream for spawning. Special efforts will have to be put in develop the capacity of tribals, fisher folk, farmers, pastorals, vaidus and other folk ecologists who have significant stocks of knowledge on local biodiversity resources to contribute to community based biodiversity inventorying and monitoring as also conservation and sustainable use efforts. New bridges will have to be built for the technical experts involved in scientific inventories interacting with school and college teachers, and community members to link the scientific and community based inventories. All this information will have to be organized as a computerized, distributed information system with regulated access to safeguard intellectual property rights concerns. It will also be appropriate to initiate studies on social motivation for continuation, or revival and the forces promoting dissolution of traditional conservation-sustainable use practices in the context of **c**hanging religious beliefs, community structure, and market forces. The People's Biodiversity Registers visualized as a part of the follow-up to the Biological Diversity Act could serve as useful instruments in this context.

2) Good management of biodiversity is vitally dependent on proper management of habitats. Currently scant attention is paid to the important issues of quality and connectivity of habitats. We need to identify and monitor appropriate indicators of quality of different habitat types, e.g. birds and butterflies as indicators of quality of forest habitats, or aquatic micro- and macro-invertebrates and fishes as indicators of quality and level of pollution in aquatic habitats. Proper databases need to be created on degradation and fragmentation of habitats, with a focus on key habitats such as

forests and wetlands. These should put to good use the Indian Remote Sensing Satellite imagery linking it to a Geographical Information System. This information base should in turn be linked to the scientific and community based inventories of biodiversity.

3) Current Environmental Impact Assessment procedures are inadequate in many ways. They do not pay attention to the broader spectrum of biodiversity and do not consider issues relating to habitat connectivity. This needs to be remedied. We also need to ensure independent selection of organizations undertaking EIA by some authority such as the State Biodiversity Board, ensure independent peer review of EIAs by some authority such as the State Biodiversity Board and create institutional mechanisms to monitor proper implementation of EIA based recommendations, for instance through authorizing district level environmental watch dog organizations, such as Paryavaran Vahinis, to do so.

4) The current procedures of pollution control need reconsideration. We need to implement the " polluter pays" principle, scaling penalties to the level of pollution damage as well as creating positive incentives for good performance. Monitoring of pollution levels needs to be made fully transparent with induction of private agencies including laboratories of Science and Engineering colleges. In this context, physical and chemical parameters needs to be supplemented by use of biodiversity indicators that are more easily discernible. Proper double-blind procedures need to be set up along the lines of testing for drugs amongst athletes to ensure complete reliability and public trust in the pollution monitoring process. We need to systematically create avenues for NGO involvement in the pollution monitoring process as members of committees, through public hearings and other mechanisms to ensure full access to pertinent information

5) Wildlife Protected areas such as wild life sanctuaries and national parks constitute the mainstay of biodiversity conservation efforts. While, in theory, these could include coastal and marine areas such as the Gulf of Manaar Biosphere Reserve in Tamilnadu, in practice they have tended to focus on humid forests and larger mammalian species. It is necessary to broaden the approach to conservation of biodiversity to aquatic as well as semi-arid ecosystems, and to lands and waters other than those under control of Forest Department. The concept of "heritage sites" of the Biological Diversity Act needs to be developed to help in this context, as well as those of Biosphere Reserves and Ecologically Sensitive Areas.

6) Current policies governing protected areas are inadequate and lack a focus on eco-development and participatory approach. It is imperative that the protected areas management too should be brought under a participatory regime. The present policy of protected area management does not address human-animal conflict satisfactorily. The existing provisions do not compensate the people adequately and promptly, hence mechanisms need to be developed to address the issue in a holistic manner. Undoubtedly, a most urgent need of the day is the creation of a policy and regulatory framework for joint management in biodiversity rich forest areas and in protected areas.

7) It is important to create a policy and regulatory framework for the protection of coastal and marine as also freshwater biodiversity. An act relating to fisheries has been under consideration of the Government of Karnataka for some years now, it needs to be revised in light of modern developments and brought into force. It should bring under control many destructive fishing methods such as use of dynamite, of nets of small mesh and ensure enforcement of closed seasons. The Central Government needs to step in to ensure coordinated action by all the coastal states and the involvement of Coast Guards. We need to elaborate new participatory institutions, such as Joint Fisheries Management Committees.

8) Karnataka's 40,000 odd tanks are a significant habitat for aquatic biodiversity, but have been viewed only as a source of irrigation and sites for culture of fish like carp. They need to be assessed as potential biodiversity conservation sites and some proportion, say 5% earmarked for biodiversity conservation purposes. Such conservation efforts should focus not only on the water-body, but on the catchment as well.

9) We should create new institutions and instruments to build on traditional practices such as conservation of sacred ponds and of sacred stream and river stretches, as well as sacred groves, trees such as peepal and animals such as monkeys. The devarakadus of Kodagu provide a great opportunity to initiate participatory approaches to biodiversity conservation and the Government of Karnataka should immediately implement the proposed Joint Forest Management (Devarakdu) programme.

10) We need a new policy, incentives and regulatory framework for the protection of biodiversity on private, community and other non-forest lands and waters. These should address the need to protect water bird breeding colonies, often on private land as at Kokre-Bellur, groves such as Gunduthopes, and sacred plants and animals. In this

context, we need to look at the rules for protection of archaeological sites as possible models for protection of such sites as sites of special scientific and cultural significance.

11) We need a new policy, incentives and regulatory framework for the protection of biodiversity on community managed sustainable use area such as village forests and grasslands like the Halkar village forest in Kumta taluk of Uttara Kannada district, and community and privately managed woodlands such as soppinabetta, kumki and hadi lands.

12) We need a new policy, incentives and regulatory framework for in-situ protection of agro-biodiversity, including diversity of land races of domesticated animals, in tandem with promotion of sustainable, largely organic agriculture, integrated nutrient management programme and integrated pest management practices.

13) Special Security Areas under control of armed forces provide excellent opportunities for biodiversity conservation that have been only occasionally exploited as in case of the National Defense Academy near Pune. Karnataka Government should work with armed forces to conserve areas like Anjadiv island under Sea-Bird Project of Indian Navy, prohibited zone around Kaiga Nuclear Plant and Defense Establishment areas in Bangalore city.

14) The new Biological Diversity Act provides excellent opportunities for a reform of the existing policy and legislative frameworks of civic bodies ranging from gram sabhas, gram panchayats, municipalities, and municipal corporations to zilla parishats from the perspective of conservation and sustainable use of biodiversity. It calls for the establishment of State – District – Municipality - Panchayat level Biodiversity Management Institutions. The Government of Karnataka should exploit its potential to nurture new broad based institutions with civil society participation to tackle the emerging challenges.

15) Environmental considerations, in general, and biodiversity issues, in particular, must be main-streamed into the working of various Governmental agencies, as well as private sector. This is conspicuously absent today. Thus the animal husbandry programmes focus on enhancing milk and meat production with no thought for the impact of cattle and goats on regeneration of natural vegetation. Minor irrigation focuses on desilting of tanks without any consideration of how the desilting operations may affect aquatic life. It is therefore important to create mechanisms for inter-sectoral co-ordination, e.g. with new bodies such as Karnataka Medicinal Plants Authority, to develop appropriate guidelines for consideration by the broad spectrum of Governmental line departments whose activities impinge on biodiversity resources, to focus on habitat integrity and connectivity, to implement recommendations accepted in the course of environmental impact assessments, as also to elaborate concepts like carrying capacity.

16). Given that our understanding of biodiversity is so inadequate, we need to operationalize the " Precautionary Principle". This principle suggests that while dealing with novel situations, such as the use of GMOs, we would not have available full evidence of their likely impacts. Under such circumstances, it is appropriate to err on the side of the caution. However, while doing so, we must also look at all the available evidence, including that from other parts of the world, and keep in mind the imperatives of enhancing productivity.

17). Today, we are in a situation in which those that have been traditional stewards of biodiversity, such as citizens of Kodagu who have maintained the devarakadus, or sacred groves bear the costs of conservation, while those responsible for environmental degradation bear little or no costs. In place of this, we must attempt to implement the " Polluter Pays Principle". Costs of biodiversity conservation should be charged to those responsible for its destruction through a variety of impacts such as pollution. New policies, legislation and institutions needed to do this need to be put in place.

18) Last, but not the least, we must work towards the development of a realistic system of economic instruments such as access fees, as positive incentives to encourage prudent and negative incentives or penalties to discourage non-sustainable utilization of biological resources and biodiversity. We must ensure that biodiversity conservation and sustainable use efforts help enhance the quality of life of women and the weaker segments of the population. We need to reform land tenurial arrangements to promote conservation and sustainable use of biodiversity resources. We should ensure that resources generated through ecotourism could support conservation efforts. To accomplish these objectives, we could motivate Panchayats with their Biodiversity Management Committees established under the new Biological Diversity Act, or Village Forest Committees or Joint Fisheries Management Committees by conferring on them authority to charge access/ collection fees, to levy fines on violators and be given special social recognition or financial awards for biodiversity conservation endeavours.

9. Action Plans

Listed below are a series of action plans for the Biodiversity sector, arrived at through an extensive process of consultations with the general public, NGOs and officials over the last three years. Annexure A further elaborates some of these action plans on the basis of inputs obtained during the consultation process for the Karnataka State of Environment Report and Action Plan preparation through district and state level consultations with officials, experts and NGOs.

SECTOR I. COASTAL AND MARINE ECOSYSTEMS

Establishment of seabird conservation sites

Islands like Netrani and Anjidiv, important habitats for seabirds, are reportedly being affected by naval exercises. The State Government along with the Defense authorities should protect the seabirds and other characteristic island ecosystems of Karnataka coast.

Establishment of protected areas for threatened estuarine fishes

To rehabilitate important threatened fishes such as Milkfish -*Chanos chanos* and Kanae meenu – *Silage sahama*, captive breeding may be carried out in the Kodi fish farm near Coondapur and the fingerlings produced may be released in the estuaries.

Promoting sustainable utilization of marine/estuarine fish

Strict implementation of uniform "closed season" for marine fishing for the entire west coast, from 10 June to 15 August is expected to protect the brood stock of fishes from exploitation by the mechanized sector.
Mesh regulations of nets necessary to exclude juveniles and non-target species.
Licenses for additions to the fleet of purse-seines and trawlers should be limited to sustainable limits
Soft loans for fisheries sector be limited to traditional fishing communities only so as to safeguard the fish stocks from over-exploitation by outside commercial sector.
No collaborative ventures for the bottom trawling, very destructive to marine ecosystems, be permitted in Indian territorial waters.

Use of large trawl nets to be regulated to minimize incidental catches and other damages to the sea bottom ecosystems.
Priority steps to be taken to identify fish breeding grounds and other sensitive areas and such areas be declared as "Marine Protected Areas". CRZ regulations do state fish breeding areas to be treated as CRZ I. In practice no such areas are identified.
Periodical ban on catch and sale of over-exploited fish species to be implemented

Safeguarding the livelihood security of artisanal fisherfolks

The near-shore waters, to a specified distance, to be reserved for fishing by artisan fishermen only who use traditional crafts and gear.
The coast guard may be deployed to safeguard the interests of the artisanal fishermen.
Promotion of self-help groups and co-operatives among fisher-women required

Pollution control in the prawn farms

The Supreme Court norms for shrimp farmers need to be adhered to strictly.
The stocking levels in the shrimp farms to be monitored and certified periodically.
The shrimps to be grown only by using biodegradable manures and disinfectants.

Aghanashini river estuary in Kumta taluk to be considered as Ecologically Sensitive Area without affecting river-based local livelihoods.

Aghanashini is by far the richest of the west coast rivers for biodiversity and productivity. It supports the livelihoods of thousands of people- fishermen, shell-fish and shell gatherers, salt makers, farmers, water transporters and so on. The collection and sale of shell-fish (bivalves), an affordable source of protein for the poor, provide livelihoods to hundreds of women. About 14 species of shell-fish exist in the estuary. An independent estimate says that the estuary produces about Rs.40 crore worth of fish and shell fish alone annually, apart from cultured prawns and rice.
An estimated 135 species of birds are associated with the river estuary.

Protection of ecology of sea shores

Many sea beaches of the coast are vulnerable to erosion during the rainy season; but building of protective stone walls along such beaches destroys beach ecology.
Priority to be given for protection of beaches by raising vegetation and sand dunes.
Raising economically important plants such as Honne (*Calophyllum inophyllum*), Honge (*Pongamia pinnata*), Ketike (*Pandanus*) and medicinal plants etc. can strengthen livelihoods of coastal poor.
The natural beauty of the sea beaches will be enhanced through raising vegetation, and such beaches can promote tourism.
Beach vegetation also enhances ecosystem value such as shelter for coastal birds, enrichment of inter-tidal fauna, and nutrient supply to the coastal waters, in addition to building up of sand dunes and promotion of ground water conservation
Turtle breeding areas along the Gangoli (Coondapur taluk) and Karwar taluk beaches need to be safeguarded from human disturbances
Seashores nearly in pristine conditions such as the beaches of Mundalli (Bhatkal taluk), Manuguni and Honnebail (Ankola taluk) and the rocky shore of Dhareswar (Kumta taluk) required to be protected from human disturbances through proper adherence to CRZ regulations. Night camping by tourists in such areas need to be prohibited. However ecological conservation works and nature club activities may be promoted.

Promotion of eco-tourism in beaches

The development of eco-tourism and protection of ecology have to go hand in hand. Ecotourism development should benefit local villagers and improve the ecology of beaches. Some of the beaches with tourism potential in Uttara Kannada are Shirali and Bailur (Bhatkal taluk), the beaches of Dhareshwar north, Kumta, Gudeangidi and Gangavali. (Kumta taluk). The activities necessary for promotion of ecotourism are:
Beautification of beaches by raising natural vegetation.
Promotion of sand dunes.
Cleaning of plastic trash.
Assistance to the local bodies for appointment of beach maintenance staff (from local villagers).
Tourism Department may provide assistance for eco-tourism.

Mangrove planting and protection

Mangrove swamps are high ranking productive ecosystems. Mangrove areas are rich in fisheries and act as nurseries for juveniles of fish, prawns, shellfish and crabs. The mangroves shelter coastal water birds and enrich the waters with nutrients. Mangroves can protect coastal river banks from erosion, rivers from flooding as well as compensate for the loss of nutrient input into the Western Ghat forests, due to the construction of dams. Yet they have suffered large-scale destruction due to human activities.

Coastal panchayats be allowed funds for mangrove planting
Incentives to be given to village Self-Help Groups and other village level organizations for raising and maintaining mangrove forests.
The expertise of traditional estuarine farmers such as the Patgars of Kumta taluk to be used for raising mangrove vegetation.
Traditional fishermen of backwater villages, whose livelihoods have been affected by commercial shrimp farming, may be also used for mangrove regeneration projects.
Forest Department to play important role in raising mangrove vegetation.

Abandoned prawn farms may be planted with mangroves so that their ecology is restored and they are made suitable for natural method of fish farming and raising of salt tolerant rice.
The 1800 acres of gajni lands in Kumta taluk, formerly allotted to the Ballarpur Industries at Binaga for salt production, and subsequently abandoned by the company, may be used for raising mangrove forests. This will have tremendously positive impact on the biodiversity and productivity of the Aghanashini river estuary.

SECTOR 2: FRESH WATER ECOSYTEMS

Conservation of sacred water bodies

Sacred stretches of rivers and streams and sacred ponds, where fish are protected from exploitation, are found in many parts of the State. Notable are at Shishila in Belthangadi taluk and in the Tunga river at Sringeri. More details are given in Annexure B. An inventory of all such places to be made and such community-centred protection measures to be encouraged.

River based conservation of biodiversity

A number of Western Ghat rivers including those flowing towards the east are associated with exceptionally rich biodiversity, such as of endemic fishes, water birds, and members of endemic plants such as members of Podostemaceae (see Annexure B). Stretches of rivers need to be conserved as refugia for endemic fishes.

Fish congregations are noticed in 12 areas in certain riverine stretches. Of these 3 are declared as 'Sanctuaries'. The others are also to be declared so. Local people need to be educated with the help of NGOs about the importance these 'in situ' conservation sites for fishes.

Establishment of lake/tank/reservoir centred biodiversity conservation

Threatened endemic fishes of the tanks of Karnataka, especially belonging to the genera such as *Labeo, Puntius, Gonoproktopterus, Mystus, Neotropius, Channa* etc. need to be multiplied in suitable fish farms such as at Narayanpur (Bijapur), Shantisagar (Davangere), Markonahalli (Tumkur) and Harangi (Coorg). The fish seed from these farms may be released in other areas.
Twenty tanks are proposed to be developed for in situ conservation of fishes.
Since the African catfish (*Clarias gariepinus*) being cultured in the lakes around the cities of Karnataka poses danger to the native fish species, the culturing of this species is to be strictly regulated.
Catchment areas of tanks need to be re-vegetated using NTFP species such as medicinal plants
The Inland Fisheries Act for the conservation of fisheries in the State is proposed to brought before the Legislature shall have proper power to regulate fisheries activities.

SECTOR 3: FORESTS AND WILDLIFE

Management of Protected Areas

Need to establish new protected areas including Conservation Reserves and Community Reserves.
Complete the legal procedures for Final Notification of existing and new protected areas.
Need to encourage voluntary re-location and re-habilitation of people living in the protected areas.
Payment of compensation for Wildlife Conservation as a conservation incentive can be given to the JFPM Committees, Forest Development Agencies and individuals who help in the preservation of wildlife and its Bio - diversity.
Effective methodology for crop compensation and loss of human life from wildlife needs to be worked out.
Protected area Management plans keeping the ecological concerns in view need to be prepared.
Capture and translocation of species, rewards to staff for successful conservation of species need to be worked out.

Degraded habitats out side protected areas must be developed as buffers to withstand the pressures of the peripheral habitations.
Poaching and illegal trade to be prevented by evolving strategies.
Creation of awareness and education about the protected areas by effective dissemination of wildlife biodiversity conservation needs to be formulated.
Limited tourism to promote a positive attitude towards wildlife bio-diversity needs to be done.
The wildlife laws and other environmental laws needs to be used in conjunction, so that the ecologically fragile habitats within and out side protected areas including inlands, coastal fish breeding areas, mangroves and corals to be protected.
Wildlife Bio-diversity Conservation needs to be dovetailed with other sectoral programmes of the government.

Measures for wildlife protection

Formation of ecoclubs/village wildlife protection committees in forest villages to monitor ecosystems and to create awareness.
Local Biodiversity Management Committees and Local Biodiversity Funds (under the the Biological diversity Act, 2002) to play a major role in wildlife conservation.
Fish farming may be promoted in de-silted forest ponds to supply more protein food to the people and to wean them from hunting.
Raising and protection of food plants for wildlife in forest blanks as well as in areas dominated by monocultures to be given due importance.
Creation of wildlife corridors and micro-corridors will facilitate unhindered animal movements and minimise human wildlife conflicts. Landless agricultural encroachers who happen to be along the wildlife corridors may be rehabilitated.
Upgrading Botanical Gardens, Zoos and Safari Parks.

Establishment of supplementary conservation sites in the drier tracts

The dry deciduous forests and scrub of Devarayana Durga in Tumkur district are rich in medicinal plants, birds and tree species.
Decentralised network of conservation sites for individual species as well as communities of plants and animals need to be identified in all the dry districts and granted the status of “Heritage Sites”.
Development of ‘Gunduthope’ tree genetic diversity conservation sites.

Formation of Sahyadri Ecologically Sensitive Area (SESA)

Anshi Ghat in Uttara Kannada is in the process of getting converted into a National Park. This could uproot hundreds of forest dwelling families. Instead it has been suggested that Anshi be part of the proposed SESA, which aims at protecting the Western Ghats area from Anshi to Radhanagari Wildlife Sanctuary in Kolhapur, including the protected areas of Goa. The services of the local people can be used for conservation and sustainable use programmes.

Establishment of conservation sites protecting special habitats

The **Myristica swamps** of southern Uttara Kannada are ancient and endangered habitats of high ecological value. Some of these swamps have hitherto unrecorded tree species *Semecarpus kattalekanensis.* Whereas the *Myristicas* once faced threat from plywood industry, the present threat is from forest encroachers who convert such swamps into arecanut gardens, with telling consequences on watershed and biodiversity. For safeguarding these special habitats the Forest Department, JFM committees and Self Help Groups should work together.

Relics of primary forests are still present along the Karnataka Western Ghats. Such places are of immense biodiversity and ecological value. These forests, despite their diminished extent, are still important sources of perennial watercourses. All these relics and their surrounding forests need to be identified on the ground, based on their species composition, mapped and conserved as “Heritage Sites”. The Karikallani Gudda-Katlekan-Malemane forests of Siddapur in Uttara Kannada, with the *Dipterocarpus, Semecarpus kattalekanensis, Myristica fatua* and the endangered Lion-tailed Macaque, is one such potential Heritage Site.

Bhimgad area in Belgaum district is well known for the bats. The endangered Wroughton's Free Tailed Bat that survives only in the Barapede Cave of Talewadi, amidst the dry deciduous forests. Krishnapur caves, also known for bats, need to be protected.
Establishment of heronaries conservation sites in suitable areas.
Some other Uttara Kannada sites for consideration are Karikanamman forest (Honavar taluk), a sacred forest with good growth of *Dipterocarpus indicus* and Yana forest (Kumta) for its watershed and cultural values as well as its importance as the refugia for the endemic palm *Corypha umbraculifera*.

More such places of biodiversity importance, all over the State, need to be considered for protection as Heritage Sites. Lists of already identified "Hotspots of Hope" and "Hotspots of Despair" are given in the annexures.
(The Biodiversity Act, 2002, empowers the State Government to notify areas of biodiversity importance as Heritage Sites, in consultation with the Central Government)

Riparian forests are extremely important in biodiversity, nutrient inputs into the river for riverine, estuarine and marine ecosystems, protection of rivers from siltation and for proper flow of streams into the river. The forests on the banks of all the rivers need to be protected from developmental pressures, expansion agriculture and from forest monocultures.

Adoption of watershed based approach in forest management

The Indian peninsula has been passing through one of the most critical periods, having to face the worst of the water crises, of recent history. Among the various reasons are forest fragmentation in the Western Ghats, diversion of streams to cater to the expansion of agriculture, forest monoculture and mining in the catchment areas of rivers.

In a watershed based approach, the forest patches may be graded on their watershed value, using remote sensing data, on the basis of their spectral characters. The multi-canopied natural evergreen forests have the highest water conservation values, and therefore should be accorded top priority for conservation.

Multi-strata evergreen forests need to be regenerated in all their potential areas, to ensure perenniality of rivers and to conserve endemic flora and fauna.

Sacred groves and sacred trees and other traditional conservation

Sacred groves and sacred trees of the Western Ghats and the west coast are are excellent instances of community based conservation. This ancient legacy is overall on the decline, more so in the plains of Karnataka. Steps need to be taken to support and strengthen the community efforts to safeguard and even restore the lost groves. Other traditional conservation practices to be documented and encouraged.
Implementation of the JFPM-Devarakadu project in Kodagu district necessary.

Nature of plants to be raised in forest nurseries

The species chosen for future forestry may specially include those aimed at (a) NTFP production (b) ecosystem services- water and soil conservation, carbon stocking, protection of local microclimate, rendering fire resistance; (c) food plants for wild life and (d) endemic species.

Biodiversity friendly management of privately controlled woodlands

Soppinbettas, Kumki and Hadi lands require suitable particiaptory management

Forests to support livelihoods

Forests have been conventionally seen as sources of timber and industrial materials or other commercial products. The potential of forests to sustain millions of livelihoods on a sustainable basis need to be explored more.
Degraded forests and catchment areas of tanks and poor grade plantations may be planted with medicinal plants and NTFP species.
Creation of a system of small scale nurseries to be run by marginal farmers and tribals will lead to greater employment opportunities.
Programmes for sustainable harvesting of medicinal plants from the wild may be implemented
Forests need to be enriched with NTFP plants for supporting rural livelihoods. Such a move, combined with formation of Self Help Groups and JFM Committees etc for sustainable use of NTFPs will replace the contract system, known to be detrimental to regenerative capacity of NTFP species. In fact the Biodiversity Act 1992, paves way for such a transition through the formation of local level biodiversity management committees
Importance given to NTFP and its harvest by local communities can go a long way in preventing the agricultural encroachment of forests
Training required for rural people, especially women, in preparing value added products from NTFP, including production of bases for plant based pharmaceutical products.
Some of the forest based employment opportunities for the local communities are : cane furniture and bamboo products, apiary, biopesticides, natural dyes, food products from the wild, production of gums, resins, spices etc.
Direct linkages should be developed between the NTFP collector and the end market so as to prevent the middleman siphoning of bulk of the profit.
Forest dwellers of tourism areas to be trained in handling eco-tourism
Local people may be employed in creation and maintenance of wildlife corridors

Conservation of the wild relatives of cultivated plants

Such plants are part of the 'gene bank' of crop plants. Forests of Karnataka are rich in the wild relatives of cultivated plants such as mango, jackfruit, *Garcinia*, gooseberry, nutmeg, ginger, pepper, cinnamon, pepper, turmeric, bitter gourd, snake gourd, pulses, brinjals, grapes, yams, aroids etc. Forests and other wilderness areas which harbour the genepool of such cultivated plants are to be identified and conserved.

Decentralised fire management strategy

Wildfires can be devastating on the forest ecosystems. To contain or control forest fires village or a landscape need to be chosen for operation of fire management strategy, in consultation with JFM, village panchayat etc.
Fire management has to be in mosaic of patches to prevent forests bursting into flames at one time.
Promotion of semi-evergreen ground vegetation, wherever possible, especially in weed infested forests can play a major role in preventing spread of forest fires.
Fireproof evergreen forests play major role in watershed conservation
Selective removal of dry biomass villagers to be permitted from locally designated areas where fire risk exists.

SECTOR 4 : DOMESTICATED BIODIVERSITY

Karnataka is very rich in domesticated biodiversity, both of crop plants and livestock. Yet there is no special strategy or action plan to protect the diversity of indigenous varieties. There needs to be primarily a policy and regulatory framework for in situ protection of domesticated biodiversity. The Biodiversity Bill, 2002 describes "in situ conservation" of cultivated species as conservation in the surroundings where they have developed their distinctive properties.

Conservation of traditional varieties of crop plants and animals

Make farmers, including marginal farmers, partners in conservation of traditional varieties in their natural surroundings.

The Biodiversity Bill 2002 says every local body shall constitute a 'Biodiversity Management Committee' for conservation, sustainable use and documentation of biological diversity including preservation of land races, folk varieites and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge related to biodiversity.
The Bill requires the State Government to constitute a Local Biodiversity Fund. "The fund shall be used for conservation and promotion of biodiversity in the areas falling within the jurisdiction of the concerned local body and for the benefit of the community."

Promotion of organic farming

The concept of organic farming need to be promoted among the farmers by the concerned Government departments as well as NGOs. Farmers need to be educated regarding the use of biopesticides, compost and vermiculture
Civic bodies to work in close coordination with agriculture department so that organic waste from market places are regularly composeted and made available to the farmers.
Pharmaceuticals to sponsor growing of medicinal plants by farmers using organic methods.
The creation of village fodder farms will promote stall feeding of cattle and make available more quantity of cattle manure.
Organic consumer movement to be promoted by NGOs so that the farmers get better returns for their farm produce

Conservation for household food security

Small scale conservation of indigenous crops, including tree crops such as mango, jackfruit, kokum, gooseberry, tamarind, drumstick etc. to be promoted for household food security.
Women to play greater role in promotion of home gardensusing indigenous biodiversity. Home gardens provide food security and provide an additional source of income for women. Even very poor could e part of this production system. Home gardens are important genetic resources of cultivated plants, and other folk knowledge related to the plants.

Conservation of domesticated animal biodiversity

Karnataka has a rich heritage of indigenous livestock, poultry and pet breeds. The State should make arrangements for documentation, monitoring and encouragement through incentives, if necessary, for the in situ conservation, breeding and distribution of this animal diversity.

Five important breeds of cattle are Amrithamahal, Hallikar, Khillar, Deoni and Malnadu Gidda.
Four livestock farms, under the Department of Animal Husbandry and Veterinary Services and one under University of Agricultural Science, Dharwad are already working for their conservation. Their ongoing activities need to be strenghtened
However, a farm needs to be identified for the conservation of Malnadu Gidda, the indigenous cattle of the Western Ghats
The Dharwad breed of buffalo, popular in northern Karnataka, also needs similar attention
Karnataka has four important breeds of sheep viz. Deccani (75% of total sheep population), Hassan, Bellary and Bandur varieties. Bandur is internationally known for quality meat. Its conservation work is already under the care of sheep breeding farm at Dhangur (Malavalli Tq., Mandya district), under the Karnataka Sheep and Sheep products Development Board, Bangalore. However, the Board needs to do more beyond the mere preservation of the breed. The ongoing cross breeding programmes also might lead towards eventual extinction of other three breeds of sheep, unless specific steps are taken to maintain them, both in situ and ex situ.
Karnataka has no claim to its own breed of goat. Nevertheless, the Composite Livestock Farm at Kurikuppe may be invested with the task of preserving the native breeds.
Steps need to be taken for preservation of the Aseel and other local varieties of poultry
An internationally recognized breed of dog viz. Mudhol has its origin in Bagalkote district. A detailed Rs.1.5 crore programme has been drawn up by Zilla Panchayat of Bagalkote.

SECTOR 5 : BIODIVERSITY INVENTORYING AND MONITORING

Bio-diversity of *regions* to be fully documented (as a few new species have been recently found in Nagarhole National Park).
Study of endangered species and the action plan for their survival needs to be worked out which should be site specific.
Captive breeding and re-introduction into the wild the endangered species, preventing of inbreeding and maintaining of genetic purity of the wildlife needs to be done.
Creation of a database on diversity of all the crop plants. District NRDMS centres to work in collaboration with departments of Agriculture, Horticulture and NGOs.
Inventorying and monitoring of genetically modified organisms essential.
Creation of community based inventories on conservation and management. Public domain knowledge on the uses of biodiversity to be documented.
Inventorying biodiversity indicators of pollution.
Establishment of herbaria, museum and electronic data bases.
Satellite imagery based mapping of forest and aquatic habitats essential.
Establishment of Geographical Information System for ecological habitats.
Studies to be made on implications of biodiversity loss on livelihoods and health.
Establishment of State and district level biodiversity information systems needed.
Enhancement of quality of Environmental Impact Assessment exercises, and making them more open and participatory.

SECTOR 6: CAPACITY BUILDING FOR BIODIVERSITY MANAGEMENT

Biodiversity management has tremendous potential to be a huge enterprise with millions of stakeholders, including villagers and forest dwellers. Capacity building for biodiversity management needs to be done at various levels:

- Decision makers at State, district municipalities and village panchayat levels
- School and college teachers and students
- Biodiversity conservation training for local stakeholders
- Coast Guards for marine biodiversity protection.
- Private sector

Role of NGOs in biodiversity management to be strengthened.

SECTOR 7: BIODIVERSITY POLICY

Policy to reward prudent use of biological resources and penalties for non-sustainable use.
Creation of a policy and regulatory framework for a. protection of fresh water as well as coastal and marine biodiversity.
Creation of a policy, incentives and regulatory framework for protection of biodiversity on private, community and other non-forest lands and waters.
Joint forest management system to be extended to richer forest areas in all suitable localities, including in protected areas.
Creation of a policy for in-situ conservation of agrobiodiversity.

Box 8: Elephant Action Plan

Arun Venkataraman, Asian Elephant Research and Conservation Centre, Bangalore

Status and Distribution

Karnataka is thought to hold the highest number of elephants in Asia today. Censuses carried out by the Karnataka Forest Department in 1993 and 1997 have indicated that the state has close to 6000 elephants (means= 6600, 1993; 5838, 2002). On considering the standard errors associated with these means the numbers seem to be stable within the state.

Elephant habitats largely fall within a complex of forests covering the Eastern and Western Ghats and the Nilgiri foothills. These forests comprise an aggregation of protected (wildlife divisions) and non-protected (territorial) divisions and comprise Elephant Range 7 of Project Elephant, Ministry of Environment and Forests, Government of India (Map 1). This area has around 6000 km ^{2} of elephant habitat (AERCC 1998). There are a few scattered small populations north of this Elephant Range in the Chickamagalur, Belgaum and Uttar Kannada Districts. These populations have around 150 elephants (Forest Department Census, 2002). The Bhadra and Dandeli Wildlife Sanctuary have a large proportion of these elephants.

Threats

1. Poaching for ivory

Some areas within Elephant Range 7 have witnessed fairly intense poaching of adult males for ivory. This has resulted in female biased ratios deviating significantly from natural sex ratios, which are thought to be around 1:3. The Bilgirirangawamy Temple Sanctuary and Cauvery Wildlife Sanctuary have adult sex ratios of 1:7.6 and 1:9 respectively reflecting fairly serious poaching pressure. Skewed sex ratios are thought to have deleterious demographic consequences. In Nagarahole National park, which still maintains sex ratios of 1:3, a spate of recent poaching has been of major concern. From the years 1986-1997, 96 cases of poaching of elephants were recorded in Karnataka that largely comprised males (Menon *et al* 1997)

2. Crop raiding

Crop raiding and manslaughter by elephants is a problem that appears to be escalating through the years. The reasons are multifarious and region specific. Elephant-human conflict has caused antagonism within communities on the peripheries of elephant habitats. As a result retaliation by killing elephants through shooting and electrocution is frequent today. In addition there has been a drastic increase in the skepticism for wildlife conservation strategies across antagonized communities.

3. Habitat Fragmentation

Attrition of habitat on the peripheries of protected areas and fragmentation caused by transformation of elephant habitat through the spreading of cash crop plantations e.g. coffee are serious problems in certain areas. These factors disrupt normal habitat utilization, increase the interface between settlements and elephant habitat and generally cause an increase in conflict levels. Examples of areas affected by fragmentation include the Bannerghata National Park and the Kodagu District.

Conservation strategies

1. Curbing poaching

In some protected areas, such as the Bandipur National Park, an extensive network of fairly well equipped anti-poaching camps has been set up. Through formal tri-partite agreements with the neighbouring states of Kerala and Tamil Nadu a highly effective mechanism for the sharing of intelligence on poaching has been instituted.

2. Mitigating elephant-human conflict

Most protected areas within Elephant Range 7 are demarcated with solar powered electric fences and elephant proof trenches to curb excursion of elephants into adjoining human settlements. The success of this strategy has been highly variable. Recently the Forest Department has been experimenting with providing subsidies for the erection of electric fences. Capture of habitual crop raiders and their ultimate domestication has been frequent in Kodagu District.

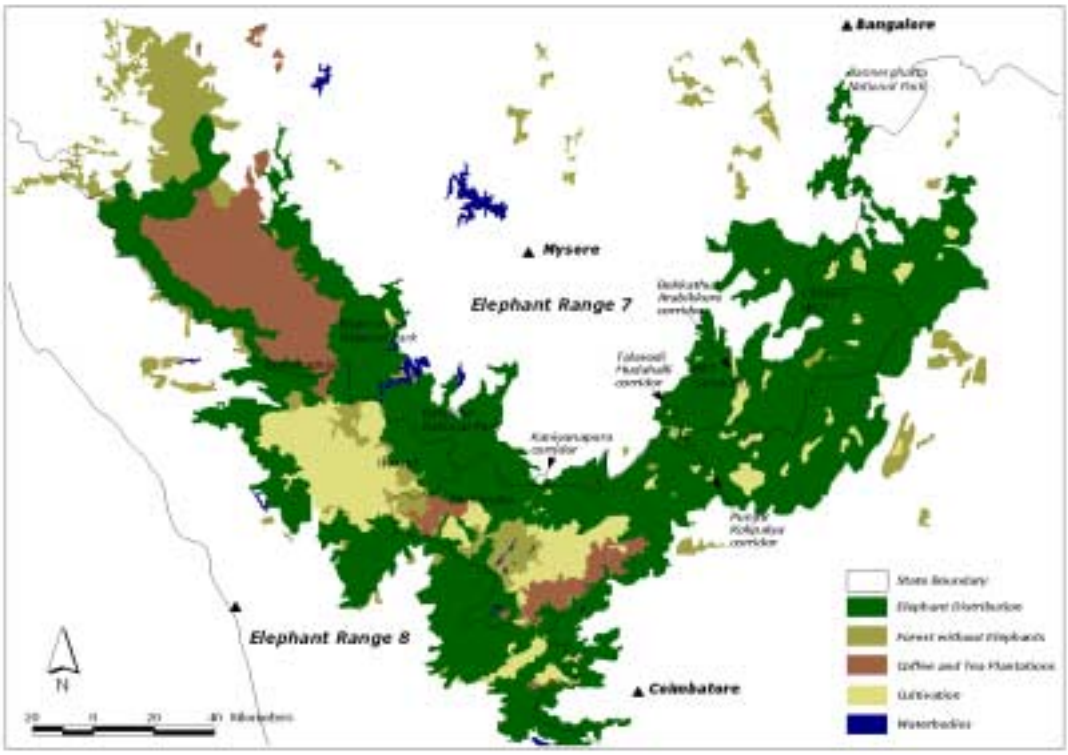
3. Habitat Fragmentation

In an attempt to reverse habitat fragmentation the Forest Department is actively involved with the augmentation and restoration of elephant corridors. This has been carried out in collaboration with national conservation NGOs. Four priority corridors have been identified for action and are shown in Map 1. With assistance from Project Elephant, specific action has occurred in the Kaniyanpura corridor in the Bandipur National Park. The corridor has been widened by 400 m by the acquisition of revenue land (Map 2).

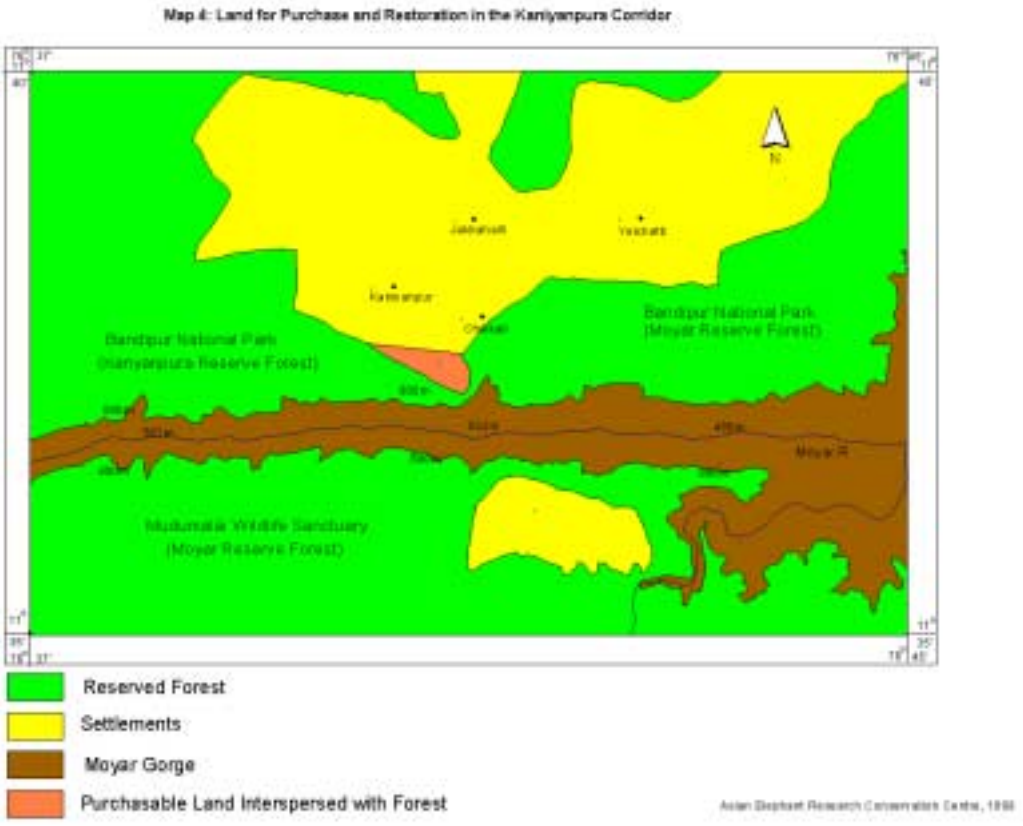
References

1, Asian Elephant Research and Conservation Centre (1998). The Asian elephant in southern India: A GIS database for conservation of Project Elephant reserves. Technical Report 6, AERCC, Bangalore

Map 1: Elephant distribution in Elephant Range 7 and priority elephant corridors in Karnataka



Map 2: Strategy successfully employed for augmenting the Kaniyanpura Corridor



Box 9: Lake Restoration

Karnataka enjoys a rich heritage of freshwater biodiversity that provides nutritive food in rural areas and employment to thousands of fisherfolk. It yields varieties of bye-products such as fish meal, fish oil, gelatin, insulin, etc. This heritage needs to be nurtured in coming years in conjunction with programmes such as those of lake restoration. For this purpose we should evolve programmes of culture of indigenous fish and mollusks and their release in restored tanks. Some of the freshwater indigenous fish species, such as Labeo fimbriatus, L. calbasu, catfishes and air-breathing fishes can complement carp culture programmes. The air-breathing fishes and catfishes are most nutritive and have little of bones. Puntius pulchellus , an indigenous herbivorous carp may be utilized for the control of aquatic weeds in canals, irrigation tanks, etc. Salmostoma spp. are of great nutritive value as the soup prepared of these species is specially fed to expectant- and lactating mothers.

The following indigenous fish and molluscan species may be cultured and specially introduced in lakes being restored:

Sl.No.	Scientific Names	English	Kannada
	Minor Carps and weed fishes		
1	*Puntius dorsalis*	Long-snout Barb	Sanna Gende
2	*Puntius sarana sarana*	Olive Barb	Gende
3	*Puntius sophore*	Spot-fin swampy Barb	Gud-pakke
4	*Puntius ticto*	Ticto Barb	Bud-pakke
5	*Puntius puckelli*	Puckelli Barb	Mooru Pakke
6	*Puntius vittatus*	Kooli Barb	Karse

7	*Rasbora daniconius*	Black-line Rasbora	Saslu
8	*Amblypharyngodon mola*	Mola carplet	Enapu Pakke
9	*Salmostoma acinaces*	Silver-razor belly minnow	Sampaj
10	*Salmostoma clupeoides*	Black-razor belly minnow	Orali
11	*Chela cachius*	Silver Hatchet Chela	Borle Meenu
12	*Danio aequipinnatus*	Giant Danio	Arshina Patte
	Spiny Eels		
1	*Mastacembelus armatus*	Spiny Eel	Havu Meenu
	Murrels		
1	*Channa striatus*	Stripped Snake-head	Kuchhu
2	*Channa orientalis*	Asiatic Snake-head	Hole-Korava
3	*Channa punctatus*	Spotted Snake-head	Bud-pakke
	Minor Catfish		
1	*Mystus vittatus*	Striped dwarf catfish	Girlu
	Molluscs		
1	*Bellamya bengalensis*		
2	*Lymnaea luteola*		
3	*Lymnaea acuminata*		
4	*Thiara (Thiara) tuberculata*		
5	*Thiara (Melanoides) scabra*		
6	*Gabbia stenothyroides*		
7	*Gyraulus convexiusculus*		
8	*Lamellidens marginalis*		
9	*Lamellidens corianus*		
10	*Corbicula striatella*		

Annexure A: Details of Action Plans

We annex below the details of specific action plans received during consultations for the Karnataka State of Environment Report and Action Plan preparation through district and state level consultations with officials, experts and NGOs. The numbers refer to the Action Plans in Section 9 above.

*The Defence Authorities, Government of India have taken over prime fishing area for the construction of Naval Base - "SEA BIRD" near Karwar and also they are conducting Naval exercises at Netrani Island near Karwar. In the interest of protection of marine aquatic life, it is necessary to take precautionary measures. Therefore the Defence Authorities should be suitably addressed to take measures to protect coastal marine biodiversity.
Action: Government of Karnataka / Central Government.
*To rehabilitate threatened estuarine fish species like Milkfish - Chanos chanos and Kanae meenu - Sillage sihama, it is proposed to raise them in captivity and breed them. The seed produced may be ranched in protected areas of estuaries. The Kodi fish farm near Coondapar, Udupi district may be utilised for this purpose after attending to repairs and expansion.
Period of study: 4-5 years, Budget Rs. 10.00 lakhs
*Some fish species which are endemic to Karnataka are listed under "threatened category" such as Labeo fimbriatus, *L.* calbasu, L.bata, L.porcellus_Puntius pulchellus, P.carnaticus, P.dorsalis. P. narayani., P.puckelli, Gonoproktopterus curmuca, G.dubius, G.kolus, G.micropogon micropogon, G. thomassi, Mystus krishnensis, Neotropius khavalchor Channa marulius,C.striatus etc. It is proposed to collect these from the wild stocks, raise them in captivity and to breed them. For this purpose, it is proposed to identify some fish farms under the control of State's Department of Fisheries. Ponds in these farms require certain repairs to enable them to hold water. The farm staff are required to be trained in the technique of breeding. The farms tentatively identified are (a) Narayanpur (Bijapur) (b) Shantisagar (Davangere), (c) Markonahalli (Tumkur) and (d) Harangi (Coorg). The seed produced of these fish species may be stocked in protected areas for their establishment and perpetuation.
Period of Study : 4 - 5 years, Budget: Rs.40.00 lakhs.
*It is proposed to develop one reservoir in each valley by stocking endemic fish species to the stretch of the river against which the dam is erected. The reservoir fishery shall be protected by following conservation practices like "close season", mesh regulations etc., So it is proposed to develop 4 reservoirs in each of the drainage system - 1. Cauvery 2. Krishna 3. Godavari and 4. Wets flowing rivers under this programme
Period of Study : 3 years, Budget: Rs. 15 lakh;
*The perennial tanks in each valley shall be identified for conservation of Tank fisheries by stocking the indigenous fauna and protect the fisheries following conservation practices. 20 tanks are proposed to be developed. They will act as insitu conservation of stocks.
Period of Study : 3 years Budget: Rs. 60.00 lakhs.
*The Department of Fisheries in collaboration with the National Beareau of Fish Genetic Resources to establish a "gene bank" in Karnataka to preserve the endangered fish species.
Period of study : 2 years, Budget: Rs.5.00 lakhs
*Proposed action: Uniform Marine fishing Regulation Act is proposed to be implemented in the entire coast in order to declare "Close - season" from 10 June - 15 August to protect brood stock of fishes to facilitate breeding and recruitment of their stock.
Responsibility : Department of Fisheries, State / Central Governments.
*Proposed action: The Department of Fisheries, Government of Karnataka is contemplating to impose mesh regulations for the fishing gears in operation in Karnataka coast to prevent catching of young and juvenile fishes.
Action : Department of Fisheries.
*Permission for addition of fishing crafts like purse - seines and trawlers shall be restricted to control units engaged in the exploitation of coastal fisheries.
Action : Department of Fisheries.
*Action plan : Regulation of marine fishing to sustainable limits
The domination of fishing sector by outside commercial sectors to be brought under check.
Finances for fishing related enterprises to be given to traditional fishing communities only.
Mesh regulations for all kinds of fishing nets to be strictly enforced.
The imposition of closed fishing period during the monsoon, when most of the fish, breed, to be uniformly followed by all the coastal states. This needs a Central Government agency to monitor. It has been suggested that a Central Ministry on Marine and Coastal Resources is desirable.
No collaborative ventures for bottom trawling in Indian territorial waters to be allowed on the grounds that such trawling is very destructive of the marine ecosystems.
The use of any kind of large-scale trawl nets needs to be re-examined to minimise the incidental catches and other damages to the ecosystems.

Licensing of more number of trawlers, and purse-seines and other mechanized boats to be stopped in the entire coastal Karnataka, for the next 10 years, until the fish stocks recover.
Action plan: Identify breeding grounds and other sensitive localities of fish and other marine species, and declare such areas as protected from exploitation.

- CRZ regulations state areas of fish breeding and mangroves are to be treated as CRZ I. However no such areas are so far identified.

*Action plan : Safeguarding the livelihood security of the artisan fisheries
The near-shore waters, to a specified distance, to be reserved for fishing by artisan fishermen only, who use Rampani nets, caste nets, hooks, canoes and other non- mechanized crafts.
The artisan fishermen may be exempted from the fishing ban imposed during the monsoon seaspn.
The Coast Guard may be deployed to carry out such regulations.
Promotion of fisher-women's co-operatives is very essential
Panchayat-wise yards for preparing dry fish
*Action plan : Restrictions on prawn catching during breeding period
Paeneus indicus —white shrimp- breeds during December to May, *P. monodon* —tiger prawn- breeds during May to October, in bar mouths, estuaries and backwaters. A ban on catching of the above species during the breeding periods has been recommended.
*Action plan : Pollution control in the prawn farms
The Supreme Court norms for shrimp farmers are to be strictly implemented. The stocking levels in the shrimp farms are to be monitored and certified periodically. The shrimps are to be grown only by using biodegradable feeds, manure and disinfectants.
*Action plan : Aghanashini river estuary to be considered as Ecologically Sensitive Area
Today, despite rising human disturbances in its estuaries, Aghanshini is by far the richest of the west coast rivers in terms of its biodiversity and productivity.
The river supports livelihoods of thousands of families of fishermen, shell-fish and shell gatherers, salt makers, farmers, water transporters, and so on.
The river is very rich in shell-fish the collection and sale of which employs thousands of women.
Primary productivity in the river is stated to be high
An estimated 135 species of birds are associated with the river estuary.
An independent estimate says it produces annually about Rs.40 crores worth of fish and shell fish alone (in addition to income from agriculture it supports, salt making. Aqaufarms etc.).
It is to be ensured, however, that the declaration of the river/estuary as HSA does not affect the traditional livelihood activities of the coastal farmers and fishing communities.
*There are 12 areas in certain riverine stretches of the State where fish congregations were noticed. Of these, only 3 such congregation spots are declared as 'Sanctuaries'. The other places are required to be declared as 'Sanctuaries'. It is contemplated to survey all these fish congregating centers or sanctuaries and also to take action to rejuvenate them by educating people for the protection of valuable fish stocks. Organis NGOs to take care of these areas by providing financial assistance and also to rehabilitate the native fish species of the concerned rivers. Thus organise 'in situ' conservation of the riverine fishes.
Period of study : 2 years, Budget- Rs.25.00 lakhs
*Creation of fish-ladders for the breeding of fishes and conservation of aquatic organisms
*The culture of African catfish Clarias gariepinus around cities in Karnataka is proposed to be discouraged and the people engaged shall be educated on the adverse effects of its culture. Culturing the African catfish shall be controlled.
Action : Department of Fisheries.
*To prevent dynamiting and poisoning to catch fish, people in the vicinity of rivers, reservoirs are proposed to be educated by mass meeting, distributing literature etc., on the effect of using this destructive methods.
Period of Study : 2 years Budget of Study : Rs. 8.00 lakhs,
*Action plan: Anshi to be part of the proposed Sahyadri Ecologically Sensitive Area (SESA)
Anshi Ghat is in the process of getting converted into a National Park. This could uproot hundreds of forest dwelling families, who have been living there through generations. Instead it has been suggested that the Anshi be part of the proposed Sahyadri Ecologically Sensitive Area (SESA). The services of the people can be enlisted in conservation and sustainable use programmes.

Agro-biodiversity
*The Sahyadri Ecologically Sensitive Area (SESA) aims at protecting preserving and promoting the western ghats area between Anshi National Park in Uttara Kannada, all along the Sahyadri's to the North to Radhanagari Wildlife Sanctuary in Kolhapur, including the protected areas of Goa.
*There are reports that Maravanthe beach and beach near Bhatkal (Heble) are the areas where turtles make their ways to lay eggs to raise their young ones. In order to protect the eggs and the young ones, it is contemplated to conduct a detailed

study to cover period of migration of turtles to the beaches, areas of laying eggs and young ones moving to sea etc., and also suggest ways and means to protect their eggs and young ones from destruction.
Period of Study 2 years, Budget required Rs.5.00 lakhs.
*Educate fishermen on the pollution likely to be caused on account of throwing away of unwanted fishes both in deep sea and coastal waters and also about oil spills and the need to prevent such actions, fishermen are required to be educated suitably in their regard.

Action : Ecology and Environment Department, Department of Fisheries, Government of Karnataka and Central Government.
*Action plan: Protection of ecology of sea beaches
- Construction of seawalls to protect sea erosion should be done with the permission of CRZ authority, and only after Environmental Impact Assessment.
- Sea beaches to be re-vegetated on a war footing:

To protect them from erosion

To enhance ecosystem value- shelter for coastal birds, enrichment of inter-tidal fauna, nutrient supply to the coastal waters.

*Preservation of the naturalness of pristine beaches
Coastal Uttara Kannada, despite developmental pressures, and rising human population has some of the pristine beaches of the west-coast. The pristineness of such beaches need to be safeguarded. The notable beaches are Mundalli (2 km south of Bhatkal), rocky beach of south Dhareshwar (Kumta taluk) and Managuni and Honebail (Ankola taluk).
The following measures are suggested for their conservation:
CRZ regulations to be followed strictly
No tourism project to come up in the vicinity of these beaches
Vegetation need to be preserved without disturbance
Night camping by tourists not to be permitted.
Nature clubs may be promoted in the respective beaches for vigilance
Activities such as educational tourism and trekking may be promoted
*Action plan: Mangrove planting and protection
Mangrove forests ('Kandla-vana') of the backwaters arc considered high ranking productive ecosystem of the world. Yet most mangroves have been destroyed. Mangrove marshes are rich in fisheries, and act as nurseries for the juveniles of fish, prawns, shellfish and crabs. The mangroves shelter coastal water birds and enrich the waters with nutrients. Widespread planting of mangroves can protect the river banks from erosion, the rivers from flooding as well as compensate for the loss of nutrient input into the estuaries from the Western Ghat forests due to construction of dams.
Coastal panchayats to be allowed funds for mangrove planting. Incentives to be given to panchayats and other local bodies, village self-help groups and cooperatives of estuarine farmers for raising and maintaining mangrove forests.
The services of estuarine farmers like the Patgars to be taken for raising mangroves in the backwaters.
Involve traditional fishermen of backwater villages, whose livelihoods have been affected by commercial shrimp farming, in mangrove regeneration and protection.
Top priority to be given for raising mangroves by the Forest Department
Scheme to be prepared for rehabilitation of abandoned prawn farms with mangroves so that their ecology is restored and they are made suitable for natural method of fish farming and raising of Kagga rice.
The gajni areas used by the Ballarpur Industries, Binaga for salt production, and abandoned subsequently, may be reconverted into mangroves. This will enrich the coastal ecosystems substantially.
The owners of fallow estuarine lands to be extended assistance for mangrove planting. Scheme to be evolved for planting potential mangrove areas and degraded mangrove areas within CRZ to be planted with mangroves. The scheme to cover both private and state owned lands.
*Project: Conservation of the swamp forests and their surroundings.
A recent study of the Myristica swamps of Uttara Kannada reveals that these swamps are highly threatened. These swamps have rare and even hitherto unrecorded species- the endangered tree *Semecarpus kattalekanensis* for instance. The main problem for conservation of these rare forest stands are 1. Ignorance of the biological and ecological value of such forests; 2. The understaffed nature of the Forest Department. As many of the swamps and rare forest stands are in remote areas they are easily encroached upon by the people for conversion into arecanut gardens. These encroachments are detected only after the damages are already done. Local forest committees of villagers have to be formed for protection of such swamps. Local youth may be appointed as watchmen. Rights for harvesting of NTFP from the surrounding forests may be given to the local villagers as an incentive for protecting such rare ecosystems.
The most important swamp forests to be protected along with their surrounding forests are
Forests of Malemane village (Siddapur Range)

Myristica swamps of Hemgar, Kudgund and Hukli villages (Siddapur and Kyadigi ranges)
Myristica swamp of Halsolli hamlet in Mahime village (Gersoppa range)
Myristica swamps of Harigar and Unchalli villages of Amenalli range.
Responsibility: Forest Department in collaboration with JFM committees, Self Help Groups, or by appointing local youth for monitoring and safe-guarding these swamp forests and other rare forest stands rich in endemics.

*Action plan 2: Protection of relics of primary forests
Relics of primary forests are still present in Uttara Kannada, especially towards its south. These can be recognized by the presence of high levels of endemism among the flora and fauna. These forests give rise to more perennial streams than the secondary forests. Examples of such forests are Karikallani Gudda (Siddapur range),
Relics of primary forests and forests in advanced stages of succession to be identified at the ground level and by using satellite imageries.
Steps to be taken for maintaining proper connectivity between such forests
Greater attention to be paid for their protection and prevention from any kind of fragmentation.

*Action plan: Protection of riparian forests
These forests are extremely important in biodiversity, nutrient supply to the river, protection of rivers from siltalion and proper flow of streams into the river. The forests on the banks of all the rivers to be protected from any further development pressures.
*Action plan: Conservation of wild relatives of cultivated plants
Such plants are part of the 'gene bank' of crop plants. Uttara Kannada forests are rich in the wild relatives several cultivated plants such as mango, jackfruit, Garcinia, Nellikai (goose-berry), nutmeg, pulses, ginger, cinnamon, turmeric, pepper, bitter-gourd (hagalakai), snake-gourd (patalekai), brinjals, grapes etc. Forests having good population of such wild relatives to be given special place in conservation.

*Turtle breeding along the Gangolli beaches need to be protected

*To prevent sea erosion during monsoon season, construction of sea-wall along the coast using boulders and granite blocks has lead to environmental degradation. Construction of sea wall affects breeding of fishes. Formation of natural sandy coast (French Technology) could be though of for the protection. This would also provide breeding ground for coastal fishes.

*Bhimgad area has unique sites with bat habitations, like the Talewadi caves, Krishnapur caves and the Bhimgad caves. These need to be given the status of a sanctuary for conservation of the bats (Wroughton's Free Tailed Bat(*Otomops wroughtoni*)) and their habitat.
*Action plan: Strategy for fire management in forests
Effective fire management cannot take place without people's co-operation. Forests in dry belt cannot be protected from fires for years together, as the fire clanger increases from accumulation of dry biomass. The fire itself has a place in forest management. Therefore the fire management strategy may be flexible

*Action plan: Adoption of watershed based approach in forest management
The Indian peninsula is passing through one of the most critical periods as far as water availability is concerned. Forest fragmentation, diversion of the streams, creation of more monoculture plantations, instead of species rich forests, mining etc. have resulted in decline of the water-holding capacity of the forests.
In a watershed based approach, every forest patch may be graded based on its spectral characters in the satellite imageries. The multi-canopied natural evergreen forests have highest water conservation value. Such forests may be earmarked for future protection. All the swamp forests of the Western Ghats have highest water-conservation values and therefore should be accorded top priority. Such swamps like the Myristica swamps of Uttara Kannada may be protected with the help of the local village communities.
Multi-strata evergreen forests have to be restored in all potential areas if we desire that the streams and rivers should flow perennially. Also such forests are rich in species, especially endemic species of the Western Ghats.
*Action plan 4: Dispensing with the contract system for NTFP collection
This would involve formation of local level biodiversity management committees as enunciated in the Biodiversity Bill. If JFM committees are already functioning well in such villages, the NTFP gathering may be entrusted to these.
Project: Training of rural people, especially women in value addition to NTFP or utilisation of NTFP for producing goods through cottage/small-scale industries.
Responsibility: Department of Small-Scale Industries, Forest Department.
Training rural women in scientific extraction, processing/manufacturing and marketing of forest-based goods can considerable employment
Production of cane furniture, bamboo articles

Honey preservation, bottling and marketing
Primary processing of medicinal plants, extraction of crude drugs, preparation of finished drugs if simple procedures are involved.
Production of biopesticides
Production of natural dyes from plants, which have ever-expanding global market.
Production of pickles, juices, jams and preserves from the fruits of wild plants
Extraction, cleaning, packing and marketing of gums, resins, spices etc from the wild
These activities will generate more employment in the rural areas.
*Project: Development of direct linkages of NTFP collector with the end-market
The middlemen siphons off bulk of the profits by monopolising the marketing links for NTFP thereby depriving the forest dwellers of fare share, which, otherwise would have been theirs' if direct linkages are developed between the collectors or heir co-operatives and the market.
*Action plan: Enrichment of forests in biodiversity to support more number of livelihoods and not through expansion of agriculture.
This will involve:
Planting up poor grade forest plantations with NTFP species. Such plants while improving the quality of forests will also generate employment through forest based handicrafts, cottage industries etc.
Creation of a system of small scale nurseries to be run by marginal farmers and tribals
Plants to be raised in such nurseries should be for (a) NTFP, (b) ecosystem services (water and soil conservation, carbon stocking, protection of local microclimate, rendering fire resistance); (c) food plants for wildlife and (d) endemic species of Western Ghats
The creation and maintenance of wild-life corridors (migratory paths of wild animals)
Local people to benefit from religious, cultural, academic and adventure tourism

Fire management strategy to be implemented village-wise only in consultation with the JFM, village panchayat etc.
Fire management has to be in mosaic of patches so as to avoid the risk of forests bursting into flames at one time.
Semi-evergreen ground vegetation to be promoted wherever possible
Greater watershed protection in fire prone forests
Selective removal of dry biomass by villagers to be permitted from locally designated areas where fire risk exists.
*Action plan: Promotion of eco-tourism in beaches
The development of cco-tourism and protection of ecology have to go hand in hand. Ecotourism development to benefit local villagers and to improve the ecology of beaches. The beaches having the potential for eco-tourism development are: Shirali and Bailur (Bhatkal taluk), the beaches of Dhareshwar north, Kumta, Gudeangidi and Gangavali (Kumta taluk).
The activities necessary for promotion of ecotourism are:
Beautification of beaches by raising natural vegetation of native trees, bushes, creepers and herbs.
Promotion of sand-dune formation
Periodic cleaning up of plastic and trash
Providing water and toilet facilities in the houses of poorer people
Assistance to the local bodies for appointment of beach maintenance staff (to be chosen from among the local villagers).
Tourism Department may provide assistance for eco-tourism development which should avoid any construction activities on beaches.
*Project: Creation of butterfly parks within every vegetational zone
This could be an important activity to be sponsored within every vegetational zone of the district. Such activity will be of high educative value, will enhance tourism potential, will generate knowledge on kind of plants to be grown for promoting various kinds of butterflies. The butterfly parks to generate adequate revenue for their maintenance as well as generate rural employment.
*Action plan: Protection of forests from increased tourism
The increased tourism within forest areas have adverse effect on fragile ecosystems, eg Yana and Uluvi forests.
Carrying plastic bags, littering forests with plastics, paper or other refuse to be banned. Successful protection of mountain ecosystems from trash, found in Eravikulum National Park to be emulated.
Forest trails to be periodically cleaned off trash by volunteers. Such a policy has been developed in Matheran (Maharashtra) by the Municipal Corporation
Nature clubs to be formed in tourism villages
Tourist education bureaus to be set up in tourist areas.

*Action plan: Welfare measures for fishing community women
Farming of ornamental fishes and aquarium making and servicing.
Promotion of cottage industries using sea-weeds (in production of agar, algin, pickles, jellies, base for medicines etc)

*Action plan 3: Forestry to be more people and biodiversity centred, than timber-centred.
Species rich forests of the Western Ghats have great potential to support livelihoods of lakhs of people. Day by day newer materials from forests are finding demand, especially in this age of great advances in medicine and biotechnology. Plants are becoming popular as sources of more and more medicines, natural dyes, biopesticides, cosmetic products, essential oils, biochemicals etc. These are in addition to conventional NTFP such as fruits and seeds, shikekai, dalchini, canes, uppage, honey etc. Biodiversity conservation cannot succeed by alienating thousands of humans who live dispersed throughout the forest belt of Uttara Kannada. Uttara Kannada forests being rich in diversity, these can be developed into great sources of NTFP.
There is general discontent among the rural people and forest dwellers about the contract system for gathering NTFP. The contractors have no permanent interest in the forest and their method of extraction is destructive. Therefore NTFP management has to be passed into the hands of c6mmittees of villagers, where JFM is not existing. Forest Department and NGOs should be entrusted with the formation of such committees or Sclf-Help groups.
The Revised Forest Strategy of the World Bank Group, while highlighting the importance of forests in protecting vital local and global environmental services and values provided by forests, emphasizes harnessing the potential of forests to reduce poverty; and integrating forests in sustainable development.
Forest policies need to be reoriented towards creation and strengthening of rural livelihoods, through NTFP enrichment.
NTFP management committees to be formed at village/hamlet levels where JFM is not existing.
Contract system for NTFP gathering is more destructive than earning revenue to the State.
Forest Range-wise planning to be made and reviewed towards achieving the objectives of NTFP enrichment, enhancement of watershed value and safeguarding the ecology.
Villagers to be trained in NTFP management and value addition
Developing direct linkages of the NTFP collector at the grassroots with the end- market necessary so that the profits are not siphoned off by the middlemen.
As honey from wild plants is in good demand as a nourishing food, and for preparation of medicines, the degraded forests should be planted with nectar producing plants.
The forest plantations to be critically re-evaluated from their productivity point and ecological values. All poor-grade plantations to be planted up with NTFP plant species of the Western Ghats.
People's Biodiversity Registers to record the local people's knowledge about forest biodiversity and traditional uses of forests

The Government to create trade centres for marketing of local arts and crafts, ethnic foods, forest based herbal medicines etc.
Local youth to be trained as certified guides and resource persons for eco/ academic and cultural tourism
Manpower need to be created for waste management in tourist areas within forests
Creation of specially maintained "honey forests" in the vicinity of every village, where plant species known to promote honey production to be raised.
Bamboo craftsmen of Uttara Kannada to be encouraged and be provided with bamboo at nominal rates.
Movement of bamboo out of the district may be restricted but all kinds of bamboo items produced by cottage industries may allowed to be transported to markets outside
Creation of taluk-wise butterfly parks will promote both biodiversity and education

*Project: Promotion of local medicinal plants in home gardens
Women may be trained in raising local medicinal plants in small scale in their home gardens. They may also be trained in storage methods for such medicinal plants/their products, and in marketing. These gardens could also strengthen traditional health care systems.
Responsibility: NGOs, Departments of Agriculture/Horticulture/Small Scale Industries.
Project: Documenting, conservation, and sustainable use of semi-wild plants of rural landscapes
The village communities have great dependence on local biodiversity of semi-wild and wild plants for food, medicines, dyes, cosmetics and various other needs. Such plants often are under threat due to increasing human impacts. The PBR should account for such' utility plants of the village landscapes and plan for their conservation through habitat protection and cultivation as well as record their uses by local people.
*Action plan: Make farmers, including marginal farmers partners in conservation of traditional varieties in their natural areas *(in situ* conservation)
("In *situ* conservation" of cultivated species means conservation in the surroundings where they have developed their distinctive properties- Ref: Biodiversity Bill, 2002).
The Government of India, as well as the State agricultural universities are spending huge amounts on conservation of genetic diversity of crop plants, fruit trees etc, at enormous cost to the public finances, in central places, away from natural areas of these crops *(ex situ* conservation). At the same time the farmers who have evolved scores of traditional varieties through ages of efforts are not made partners in conservation.

The services of farmers, including marginal farmers are to be used with proper recognition/ incentives to them as an encouragement for continued conservation of rare or threatened local varieties of all domesticated crops. Such a plan of conservation, under proper monitoring, will greatly ensure the continuity of all rare and threatened varieties while recording, acknowledging and providing incentives for the role of the farmers.
For example "Kagga" rice which has salt tolerance, and grown in the coastal gajni lands is endangered due to conversion of rice fields into prawn culturing areas. The scented "Sannakki" of Medine village is grown in very small area by Karivokkaliga farmers, without encouragement from source whatsoever.
Note: The Biodiversity Bill 2002 says every local body shall constitute a "Biodiversity Management Committee" for conservation, sustainable use and documentation of
biological diversity including preservation of land races, folk varieties and cultivars,
domesticated stocks and breeds of animals and microorganisms and chronicling of
knowledge relating to biodiversity."
*
("Cultivar": A variety of plant that has originated and persisted under cultivation or was specifically bred for the purpose of cultivation.
"Folk variety" means a cultivated variety of plant that was developed, grown and exchanged informally among farmers.
"Landrace" means primitive cultivar that was grown by ancient farmers and their successors).
The Biodiversity Bill requires that while taking any decision relating to the use of local biological resources and the knowledge relating to them the respective Biodiversity Management Committees (BMC) are to be consulted. The BMC may even charge for any agency for using biological resources within its jurisdiction.
The State Government is required to constitute a Local Biodiversity Fund. "The fund shall be used for conservation and promotion of biodiversity in the areas falling within the jurisdiction of the concerned local body and for the benefit of the community..."
*Project: Restoration of Kagga rice cultivation in gajni fields: Government to assist the farmers whose gajni rice fields in the backwater areas have been severely damaged because of conversion into shrimp ponds.
*Action Plan: Promotion of organic farming:
The Uttara Kannada farmers have a great heritage of organic farming, perhaps more than any other district in Karnataka State. Because of hilly landscape and heavy seasonal rains organic matter is highly essential for protection of agricultural soils. Most arecanut gardeners have been granted bettalands for extraction of leaf manure. These bettalands are forests in support of agriculture. The other farmers usually resort to "Minor Forests" or even Reserve Forests for their leaf manure needs.
Most Minor Forests have been in poor condition. This has prompted the Forest Department to plant fast growing tree species such as *Acacia* in such degraded forests. The actions required to promote organic farming are:
Promotion of tree growth in bettalands, most of which are in poor condition. The Forest Department to evolve joint schemes with farmers to make the bettalands more tree-covered.
Enrichment of Minor Forests with more local species for promotion of organic agriculture.
Promotion of bio-pesticide plants and use of bio-pesticides. Education of farmers regarding use of biopesticides.
Agriculture and Horticulture departments to promote only organic farming.
Promotion of vermiculture
Civic bodies such as municipalities and panchayats to work in close coordination with agriculture departments so that organic waste available in market places are regularly composted and made available to farmers as manure.
Pharmaceuticals to sponsor growing of medicinal plants by farmers by using organic methods.
The creation of village fodder farms will promote stall feeding of cattle and make available more quantity of cattle manure.
Organic consumer movement to be promoted by NGOs so that the farmers get better returns for their farm produce.
*Action Plan: greater facilitation of women in conservation of traditional crop biodiversity
Small scale conservation of indigenous crops, including tree crops such as mango, jackfruit, kokum, gooseberry, drumstick etc. to be promoted for household food security.
Even non-agricultural families to be involved in such efforts. Women to play greater role in promotion of home gardens. Prizes to be instituted at village and taluk levels for promotion of home gardens.
*Project: Promotion of efforts like "Malcnadu Home Garden and Seed Exchange Network" of Uttara Kannada Women (based at Sirsi), for conservation of traditional crop biodiversity.
Begun in 2001, this is a modest effort at documenting and increasing the diversity of home gardens in Uttara Kannada. The home garden could be a tiny patch of land outside one's house, or a small field or a mixed garden. Home gardens provide food security, nutrition and provide an additional source of income, especially for women. Even the very poor are part of this production system. Home gardens are important genetic resources of cultivated plants, and other folk knowledge related to the plants.
Growing of vegetables, flowers and even trees are part of these home gardens. Currently, about 100 women from 5 villages of Yellapur are part of this network. They meet regularly to discuss about the gardens, exchange seeds. The crops grown are non-hybrids and only by organic methods.

The home garden network is part of a project of Kalpavriksh, Pune. A network of seed banks to be run by women to be encouraged/sponsored.
Such projects need sponsorship from institutes such as NBPGR, which anyway spend huge amounts of money for *"ex situ"* conservation of seeds/genetic resources.

*Fodder; -
No Animal Husbandry activity can be successful and complete without simultaneous development of fodder resources. Fodder can be developed in the farms, community lands, community property resources (CPR), in Water Sheds and Forest lands etc.,. Fodder varieties of different kinds need to be grown as a matter of Bio-Diversity. More emphasis for permanent fodder development measures to be given in Water- Shed approach.
For the conservation and preservation of Bio-Diversity in Animal Husbandry sector, as noted above, an amount of Rs. 25 Crores may kindly be earmarked for taking up the above-mentioned activities in a successful manner.Project II.B.10 Breeding of indigenous livestock, poultry and pet breeds to maintain the animal genetic resources and to make them available to people

*Implementation of the JFPM-Devarakadu in Kodagu district

*Animal Husbandry sector
Karnataka state has diverse breeds of Livestock and poultry, which need to be conserved and preserved as an element of Bio-Diversity.
Cattle: -
In respect of cattle, there are four important breeds, which are Amrithmahal, Hallikar, Khillar and Deoni. These breeds are not only hardy but are also very popular amongst the farmer community as well.
Four livestock farms, three under department of Animal Husbandry and Veterinary Services and one under University of Agriculture Science, Dharwad have been identified and functional for preservation and conservation of these breeds. All that is presently required to be done is to strengthen the on going activities. It may be pertinent to add that the conservation and preservation of these breeds has been taken up under Cattle and Buffaloe breeding project under financial assistance from Govt. of India, and will be implemented from the year 2003-04.onwards.
Another breed of importance in Karnataka is the so-called " Malnad Gidda" which is known for its compactness and utility in the hilly terrain, particularly in the coastal belt and malnad regions of Karnataka. It may also be pertinent to add that, this breed needs very little inputs for maintenance, besides being highly resistant to many diseases. Unfortunately, there is no farm or sector earmarked for preservation and conservation. Therefore, a farm needs to be identified for the conservation and preservation of Malnad Giddas and all the expenditure may be met out of National Project on Cattle and Buffaloe development [Rs.90 crore project].

*Buffaloes: -
A, local breed of buffaloe viz. Dharwad breed is quite popular in northern Karnataka, which also needs to be similarly treated as above.This aspect is also covered under the Cattle and Buffaloe breeding project mentioned above.

*Sheep: -
There are four distinct breeds of sheep viz. Deccani [which constitutes 75% of total sheep population], Hassan, Bellary and Bandur variety [constitute the balance 25%], the last named viz. Bandur is an internationally known breed for quality and tasty mutton. Presently, it is being conserved and preserved at sheep breeding farm, Dhangur [Malavalli Tq. Mandya Dist], under the control of the Karnataka Sheep and Sheep Products Development Board, Bangalore. As enough funds are not made available in the Sheep Board, no other activity other than routine maintenance of these animals has been possible. Therefore, it is suggested that the Board may draw out a programme for preservation and conservation of this breed with specific financial outlay as a medium and long-term process.
The other three breeds viz. Deccani, Hassan and Bellary breeds need also to be conserved similarly without allowing them to be extinct in the process of cross breeding which is presently gaining importance. Therefore, some sheep farms in the state should be identified for this purpose. Again, the Karnataka Sheep and Sheep Products Development Board may be advised to draw out a detailed project with financial implications for consideration by the Govt.

*Unfortunately, there is no breed of goat that can be identified with Karaataka. However, the breed[s] of goats available in the State are disease resistant and moderate producers of meat. In fact, in cities, mutton from goats is preferred to mutton from sheep for its low fat content. Although there is no farm to develop goats, the present Composite Livestock Farm at Kurikuppe may be identified to develop and preserve the native breeds under the direct supervision of Dept. of AH&VS. The details of project cost etc; can be worked out when called upon to do so.
*Piggery: -
As in the case of goats, there is no recognized breed[s] of pigs in Karnataka. However, the local breeds of pigs, which are being slowly reduced through, cross breeding also need to be conserved as a measure of Bio-Diversity. Therefore, the

Dept. of AH&VS through its three Piggery development farms located at Hessarghatta, Koila and Kudige shall aim at preserving these local breeds as a measure of Bio-Diversity.
*Poultry: -
The Aseel breed and the local variety are mainly concentrated in the villages of Karnataka and are a source of meat and few eggs and are resistant to many diseases and have fighting quality besides being more popular at the cuisine. Although they are not high yielders, they are maintained on zero input as Scavengers.On the other hand, the improved varieties need to be housed and fed. Therefore, above birds need to be conserved and preserved. Poultry farms in the department, shall also aim at preserving these local varieties.
*An Internationally recognized breed of dog viz. Mudhol has its origin in Bagalkote dist, and this breed is a hound meant for hunting and watch & ward purposes. A detailed programme has been drawn up by Zilla Punchayat Bagalkote Dist at a cost of Rs. 1.15 crores, which if sanctioned, by the State Govt. will go a long way in conservation and development of this breed, in addition to catering to the needs of export.

*The factories effluents and the untreated domestic sewage (specially organic waste) are discharged into the estuaries and coastal waters. This is causing deleterious effect on the biota and other aquatic life. Therefore the concerned Water Supply and Sewage Board and Pollution Control Board, Government of Karnataka may take appropriate measures to prevent pollution in estuarine and coastal areas.
Action: State Rural water Supply and Sewage Board and Pollution Control Board.
*Action plan 15: Regular monitoring, reporting and controlling of pollution levels
Dumping of city wastes in the coastal estuaries are great threats to their ecology and human health
Pollution from various chemicals, oil spills, heavy metals, radio-active materials, domestic and municipal waste, bacterial contamination etc. to be routinely monitored and the results to be brought out for public benefit in monthly bulletins.
The local bodies to strictly enforce pollution control measures for the sea and coastal waters. They should have stream-lined waste disposal measures.

*The discharge of factory effluents, domestic untreated sewage into rivers, reservoirs and tanks should be strictly controlled to protect the aquatic fauna.
Action : Pollution Control Board and Rural Water Supply and Sewage Board.

*Coffee planters discharging the pollutants into the stream. The action must be taken against polluters
*The status of freshwater fish fauna was assessed during 1963 - 65. There have been various factors which have affected the fauna. Therefore to ascertain the present status of freshwater fish fauna, there is urgent need to undertake a detailed survey. While undertaking the survey,
Threatened fish species may be identified.
Fish congregation areas should be demarkated.
Natural breeding grounds in river stretches have to be identified.
Distribution of ornamental fishes in rivers and areas of their abundance should
be demarkated.
*Action plan: Creation of a database on diversity of all the crop plants.
Responsibility: Departments of Agriculture and Horticulture, to work in coordination with NGOs and academic institutions, and knowledgeable individuals from villages.
iMethodology: The departments should maintain, as a matter of routine, village-wise database on cultivated biodiversity. The database has to be periodically updated. Geographic Information System (GIS) to be used for the database with the assistance of the District NRDMS Centre, if required. It is very important to prepare Panchayat-wise "People's Biodiversity Registers" (PBR), in which all such information has to be recorded.
*Project: Evaluating watershed value of forests using satellite imageries to be supported by ground surveys.
Responsibility: Forest Department in collaboration with scientists/local academic institutions/Centre for Ecological Studies, IISc.
*Project: Fanner's Newsletter on traditional agriculture
Farmer's Newsletter to cover various traditional crop varieties, including tree crops and wild relatives of cultivated plants
Write up on rare local varieties and the farmers/individuals who safeguard them to be given prominence
*Action plan: Measures for wildlife protection
Habitat and microhabitat types of all forms of wildlife to be identified and protected.
Eco-clubs/village wildlife protection committees to be formed in forest villages to monitor ecosystems, to create awareness
Local Biodiversity Management Committees and Local Biodiversity Funds (under the provisions of the Biological Diversity Act, 2002, to promote eco-clubs, wildlife protection committees

Ponds in forest areas to be de-silted and fish farming promoted under the various schemes so that more protein food is available to the people
Markets for sea-fish selling suggested as an ameliorative measure
Raising and protection of food plants for wildlife in forest blanks as well as in areas dominated by monocultures to be given due importance.
Maintenance and creation of wildlife corridors, including micro-corridors to be considered.
Encroachers who belong to otherwise landless categories and who have blocked important wildlife corridors may be rehabilitated elsewhere.
*Action plan : Involvement of Indian Navy and Coast Guard in environmental protection
The Navy to raise natural vegetation in the Project Seabird area and in the islands such as Anjidiv.
Caution to be exercised to protect sensitive island ecosystems such as at Netrani island in Bhatkal reported to be affected by naval exercises, firing etc.
*Action plan: The question of shell mining and sand mining in the coastal rivers and estuaries to be re-examined and subjected to fresh EIA studies.
Both the activities are presently not covered by CRZ regulations

*Belgaum District: Mining lease renewal in Talewadi, Jamgaon, Degaon, Krishnapur.
Mahadai Power Project, Mahadai/Bhandura/Kalsa river diversion projects
Siltation of dams as at Kolachi Weir below Ramdurg on the Malaprab

UDUPI DISTRICT

DEPARTMENT OF PORT AND FISHERIES, UDUPI

Rs. 450 lakhs are required for the Conservation of sea coast using modern technology

KUNDAPUR FOREST DIVISION, KUDDAPUR, UDUPI

Conservation of ficus tree resources through avenue plantation Amount Rs. 10 Lakhs
Creation of satellite imagery data lease on boundaries of protected areas Amount Rs. 20 lakhs
Creation of policy and regulatory framework for the protection of fresh water biodiversity Rs. 12 lakhs.
Promotion of sustainable utilization of timber resources Amount Rs. 5 lakhs.
Establishment of District and Panchayat level Biodiversity Management Institution Amount Rs. 5 lakhs.
Promoting sustainable utilization of natural population of medicinal plants Amount Rs. 10 lakhs.
Creation of a policy and regulatory framework for the protection of biodiversity on private, community and other non forest lands and water Amount Rs. 3 lakhs.
Creation of a policy and regulatory frame work for joint management in biodiversity rich forest areas and protected areas Amount Rs. 5 lakhs.
Creation of a policy and regulatory framework for management in biodiveristy rich forest areas Rs 10 lakhs.
Creation of Geographic information system database on boundaries of forest and revenue land holdings Amount 15 lakhs.
Development of capacity building on biodiversity planning: II Government decision maker at district and village Panchayat level Amount 5 lakhs.
Development of capacity building on biodiversity Inventorying and Monitoring III. Folk Ecologist Amount 5 lakhs.
Establishment of Honge (Pongamia Pinnata and Neem (Azadiracta india) Genetic Resource centre Amount Rs. 10 lakhs.
Conservation of Sahyadri Ecological Sensitive Area Amount Rs. 10 lakhs.
Establishment of Heronaries Conservation sites Amount Rs. 5 lakhs.
Compilation of Seientific inventory Amount Rs. 5 lakhs.
Compilation of community based inventory Amount Rs. 5 lakhs.
Identification, Inventorying, and Monitoring of Exotic Invasive Species Amount Rs. 5 lakhs.
Establishment of Herbaria, Museum and Electronic Database Amount Rs. 15 lakhs.
Documentation of traditional method of Conservation- sustainable use practice Amount Rs. 5 lakhs.
Studies on livelihood implication of biodiversity loss Amount Rs 3 lakhs
Local capacity for development and management of Biodiversity based enterprises such as Ecotourism Amount Rs. 3 lakhs.
Establishment of Conservation sites protecting special habitates Amount Rs. 8 lakhs
Establishment of Gunduthopu tree genetic diversity Conservation sites Amount Rs. 1 lakhs.
Development of medicinal plants conservation areas Amount Rs. 2 lakhs.

Development of medicinal plants genetic resources development centre Amount Rs. 10 lakhs.
Conservation of Sacred Ponds, groves, trees, streams and rivers Amount Rs. 3 lakhs.
Biodiversity friendly management of Community controlled sustainable use areas such as village forest and grassland Amount Rs. 12 lakhs.
Control of exotic invasive species Amount Rs. 1.00 lakhs.
Biodiversity friendly management of private controlled woodlands such as Soppinabetta, Kumki and hadi lands Amount Rs. 12.00 lakhs.
Establishment of medicinal plants genetic resource centres in degraded forest areas and avenue plantations Amount Rs. 20.00 lakhs.
Local capability building for development and Management of Biodiversity leased enterprises such as collection, cultivation and value addition to medicinal plants. Amount Rs. 5 lakhs
Development of capacity on biodiversity Inventorying and Monitoring in Government agency Personnel Amount Rs. 8 lakhs.

TOTAL AMOUNT REQUIRED RS. 333 Lakhs.

3. COASTAL REGULATORY ZONE (CRZ)

Creation of satellite imagery data lease on coastal zone and documentation of HTL, LTL and NDZ areas in village maps etc. Amount Rs. 10 lakhs.
Raising and maintaining of Mangrove forests coming in CRZ areas on river belts over 100 ha @ Rs. 10,000/- per ha. Amount Rs 10 lakhs.
Raising Casuarina plantation in CRZ areas all along the coast in the district over 100 ha @ Rs. 10,000/- per ha Amount Rs. 10 lakhs
Creation of Geographic Information system database for effective identification and marking of Geostationery Positions in maps and fields accurately Amount Rs. 20 lakhs
Maintenance of details regarding salinity in river upstreams for CRZ identifications Rs. 4 lakhs.
Promotion of public Awareness Programme through notices, booklets, workshops, meetings and electronic media etc. Amount Rs. 2 lakhs.
Compilation of scientific inventory Amount Rs. 2 lakhs
Establishment of Turtle breeding beaches conservation sites Amount Rs 2 lakhs.

TOTAL AMOUNT REQUIRED: RS 60 Lakhas

MINOR IRRIGATION DEPARTMENT
Sea Erosion Regulation Sub-Division, Udupi
The department is managing 14 salt-water Preventing dams, 29 vented dams and 4 tanks in udupi, Kundapur and Karkala taluks.
Creation of fish- ladders for the breeding of fishes and conservation of aquatic organism in downstream of vented dams and tanks are very essential Rs 50,000/- is required for the construction of conerete fish-ladders per vented dams/ tank.

5. INFORMATION DEPARTMENT
Creation of publicity Assistant Post Amount required Rs. 87,000/- per year
Creation of a post of Assostant Director at the scale of Rs 5575- 10,620.
Creation of a post of Information Assistant at the scale of Rs 4575- 8400
Creation of Information Assistant for each taluk Panchayat at the scale of
Rs. 4575- 8400.

6. WOMEN AND CHILDREN WELFARE DEPARTMENT.

Amount required for Training Programme in Udupi District.

1. Environment Conservation and Biodiversity Coservation Rs. 2,64,000

DEPARTMENT OF TOURISM
1. There is a need for the creation of a post of the Deputy Director @ scale of Rs. 6000-11,200

Tourist officer @ scale of Rs. 4575-8400

Tourism Promotor @ scale of Rs. 3000-5450
'D' Category Post @ scale of Rs. 2500-3850
TOTAL Expenditure/ Year Rs. 3,08,905- 00

Opening an Information Centre at Udupi Railway Station
Tourist Promotor @ scale of Rs. 3000-5450
'D' Category Post @ scale of Rs 2500- 3850
TOTAL Expenditure/ Year Rs. 1,05,966-00

Posts for the office of the Deputy Director 2 Clerk-cum- Typist Posts
TOTAL Expenditure/ Year Rs. 1,15, 140-00

For Conducting Workshop @ one workshop/ Month.
TOTAL Expenditure Rs. 1,20,000/-

8. DEPARTMENT OF PUBLIC EDUCATION
Training Programme for Teachers
Organizing Programmes for the N.S.S, Sout-Guides, N.C.C. and for Resource Persons and Social Workers Rs. 2,00,000-00.
School towards Community and Return to School Programme:
Organizing training Programme for 1000 teachers of 142 Grama Panchayats Rs. 5,00,000-00

Organizing Awareness Progamme and Information Dissemination Programme on Health and Cleanliness, Air and Water Pollution, Horticulture, Environment friendly livelihood, Energy, Rain water Harvesting, Use and Management of plastic, priological Agriculture etc Rs. 12,00,000-00

9. DEPARTMENT OF HEALTH AND FAMILY WELFARE
Effect on Health due to loss of Biodiversity: Training the officers and staff of Health Department on the effect of Health due to loss of Biodiversity.
The cost of the educational materials for the training Programme.
Approximate Expenditure Rs. 5,00,000-00

Cleaning the environment of Health Organization: Deweeding the environment of Health organization and cultivating the Medicinal Plants and conserving them.
Approximate Expenditure Rs. 3,00,000-00

Management of Biomedical wastes: Training the officers and staff for proper disposal of Biomedical waste Rs. 3,00,000-00

Approximate cost of the material required for the disposal of biomedical waste Rs. 3,00,000-00

Regulation of Harful organisms on Health: For undertaking biological control of vectors such as mosquitoes, Houseflies, Leeches etc and training the staff on such programme.
Approximate Expenditue Rs.10,00,000-00

Analysis of Purity of Drinking water and regulation of diseases:
Organizing Programmes at the rural areas and at the district level for analyzing the quality of water Rs. 4,00,000-00

10. UDUPI CITY MUNICIPALITY

Mannapalla of Manipal. As a part of the development of Urban forestry, development of forest plantation and growing useful trees:
Amount required---------- Rs. 2 lakhs

Development of Garden in 1 acre 7 cents land donated by the Sode Vadiraja Mata to the Municipality at subramanya Nagara.
Amount Required: Rs. 2 lakhs

Development of Arboratum in Doddana Gudde Privately owned land, now improved by the Housing Board
Amount Required: Rs. 50,000-00

Development of Arboratum in Ajjarakadu and Priofriendly electrification
Amount Required: Rs. 10,000,00-00

Development of a Garden in 35 cents land in Padmanabhanagara in 76 Badagubettu village
Amount Required: Rs. 50,000-00

Chikamagalur District:

1. Upgrading Botanic Gardens, Zoos & Safari Parks

No zoos and safari parks in Chikmagalur district
A Medicianl plant garden comprising 50 Charaka Ganas is present at Kelgur
Mattavara Information Centre serves to disseminate knowledge about forests to school children and public.
Mattavara was a degraded forest about 10 year's back. With the protection provided, the area is returning to normal with the return of animals and birds.

2. Conservation *of Ficus* tree resources through avenue plantations

- *Ficus* trees are keystone species providing food for many birds, Insects etc. Examples are Atti, Goli, Basari, Arali, Kari Basari etc.

3. Creation of a Policy and regulatory Framework for the protecton of freshwater biodiversity

Coffee planters after pulping are discharging the pollutants into the streams To prevent this law in force should be strictly enforced.
Siltation of streams and rivers has resulted in the disappearance of deep pools meant for spawning of Mahsheer fish. It should be addressed on priority.
Sacred ponds for breeding Mahsheer fish at Sringeri should be preserved and protected.

4. Promoting sustainable utilization of Timber resources

There is a tendency among the coffee planters to go for planting species like Silver Oak, Balanji and Halavana etc., at the cost of the native species resulting in monoculture.
Modest felling of dead trees creates canopy opening resulting in fast regeneration of young trees.

5. Promoting sustainable utilization of NTFPs

The private stakeholders such as Pharmaceutical companies etc. should be asked to grow raw-materials required for their own use, instead of depending on forest areas for the same.
NTFP collectors sometimes set forest fire resulting in the loss of valuable fauna and flora.
Sustainable harvesting practices to be practiced and monitored

6. Establishment of State, District, Panchayat level Biodiversity Management committees

- It is better to strengthen the existing institutions like VCFs rather than creating new bodies.

7. Promoting sustainable utilization of natural population of medicinal plants

Medicinal plant conservation areas have been established by KFD at 13 RFs in collaboration with FRLHT. These MPCAs have attached nurseries where thousands of saplings of over hundred medicinal plants including 30 Red listed species are raised.
It is very difficult to promote sustainable utilization of natural population of medicinal plants due to overriding commercial concerns of agencies involved. These agencies should be asked to grow their own raw materials rather than harvesting the existing natural crops. Sustainable use is not possible when commercial considerations take over.

8. Formulation of Guidelines on compensatory activities to offset biodiversity loss.

• Biodiversity has eroded because of excessive harvesting of various species. If foolproof protection is given, the biodiversity is restored as has happened in Mattavara, Brahmasandra and Bukkasandra etc.

9. Development of Capacity on Biodiversity Planning. I:Private stakeholders

• There is a need to involve private sector stakeholders such as Pharmaceuticals, bioinformatics, biocosmetics, seed or ecotourism companies. KFD may assist these private stakeholders.

10. Compilation of a scientific inventroy

• It would be better to involve the departments like forest, fisheries, agriculture, Botanical and Zoological Surveys, Agricultural universities and Research Wings.

11. Studies on livelihood implications of Biodiversity loss

• Folk healers (Naati vaidya) using medicinal plants from forests, traditional fishermen and marginal farmers growing agrobiodiversity, bamboo artisans, bobbin wood makers etc. are the worst affected community by the loss of biodiversity.

12. Local capacity building for development and Management of Biodiversity based enterprises such as Ecotourism

• Mullayyanagiri, Kallathigiri, Charmadi Ghats, Hebbe falls, various Sholas, Kudremkh National Park, Bhadra Wildlife Sanctuary etc. have great potential for ecotourism.

13. Development of Medicinal Plant Conservation Areas

Kelgur medicinal plantation is to be developed into MPCAs.
Balur Social forestry block as a whole can be developed as Medicinal Plant conservation Area.
Naati vaidyas need to be recognized and encouraged locally.

14. Establishment of bat colonies conservation sites

Bat colonies found on the trees in Municipality office, DC's residence. DCFs office premises need to be maintained and protected.
Bat colonies are also found in townships including Kadur, Sakrepatna and Tarikere.

15. Conservation of sacred trees

• The Forest Department and the Joint Forest Management Committees (JFMCs) must take strict action for conserving sacred trees. All kinds of hunting and felling of trees must be regulated.

2. DISTRICT HEALTH AND FAMILY WELFARE DEPARTMENT

1. Studies on health implications of biodiversity loss

The implications of biodiversity loss on human health are well known and to improve the health conserving the biodiversity of the locality is quite essential. Plants providing food, timber, medicine, shade and other ornamental plants must be grown and conserved wherever possible.

The District Government Hospital, Taluk Government Hospital and Primary Health Centres have proposed an action plan for planting vegetation yielding flowers, fruits, medicine, timber, vegetables etc. in their respective compounds and the same is forwarded to the authorities for necessary funding and actions. The loss of fishes in the water bodies has resulted in the increased incidence of epidemic diseases including Malaria and Filaria. The introduction of larvivorous fishes such as Guppies, Gambusia etc. would certainly help in the biological control of insect larvae, particularly of mosquitoes.
Chikmagalur District has 48 Primary Health Centres. A detailed action plan is provided to improve the biodiversity of respective localities by planting flower, fruit, timber, food, medicine, and vegetable yielding plants for improving the biodiversity.
The budgetary provision needed for the implementation of the proposed action plan: Rs.20,848,55-00.

3. WOMEN AND CHILDREN WELFARE DEPARTMENT

1170 'Anganavadi' Centres and 1320 'Stree Shakti' self-help groups are functioning in the district. Through these organizations, biodiversity conservation programmes may be undertaken.
With the help of horticulture and forest departments fodder and fuelwood yielding plants may be cultivated and this will reduce the pressure on the natural vegetation and thus indirectly help in the conservation of biodiversity.

4. SCHEDULED TRIBES WELFARE PROGRAMME

12 Residential Schools. 6 Hostels, 1 Morarjee Desai Model Residential School are functioning in the district. 2 LAMPS Societies are also functioning. Through these biodiversity conservation prgogrammes can be undertaken. With the help of Horticulture and Forest Departments fodder and fuelwood yielding plants may be cultivated and this in turn will reduce the pressure on the natural vegetation and thus indirectly help in the conservation of biodiversity The biodiversity conservation programmes may be undertaken in localities where empty land is available, with the help of Horticulture and Agriculture Departments.

5 KANNADA AND CULTURE DEPARTMENT

Programmes such as doll show, folk song. Haikathe, street drama may be organized to create awareness for biodiversity conservation.

To undertake environmental/ecosystem/biodiversity awareness programmes in 7 taluks of the district a sum of Rs.12 lakhs is requied.

6. PREUNIVERSITY AND PUBLIC EDUCATION DEPARTMENT

Organizing biodiversity related programmes through Eco-clubs and science associations.

Motivating Guides and Scouts for planting various species in the school garden

Documentation of biodiversity elements through students under the guidance of teachers

Organizing tours to wildlife Sanctuaries, Botanical Gadens and Zoological Parks for listing the plants and animals and their important characteristics.

Providing fencing and water facilities to school gardens for conservation of species.

Each School may be provided a sum of Rs.1000/- to undertake the ecodevelopment programme.

7. SOCIAL WELFARE DEPARTMENT

• The department is running 127 educational institutions. About 80 percent of these institutions have their own buildings and sufficient space is

available in most of the institutions, particularly in hostels, where plant growing programmes can be undertaken.

• In about 80 hostel premises, a minimum of 3200 plants can be grown, @ 40 plants per hostel. In addition, each of the Morarjee Desai Model Residntial Schools own about 20-25 acres of land and altogether there are four such schools in the district. The indigenous plants such as mango, neem, jackfruit, tamarind etc. can be grown in all vacant areas of these schools with the help of Forest Department. The responsibility of maintenance may be given to the students, the staff members and the officials of the Taluk level Social Welfare Officers. Since such a project has not been envisaged in other districts in the state, the Chikmagalur District can take up the project.

8. DISTRICT INDUSTRIAL CENTRE

Bee-keeping

Honey bees besides yielding honey, play an important role in pollination, especially of horticultural crops. In recent years, due to the extensive use of pesticides and also due to mite infections, the bee keeping has been greatly affected. Therefore, a research project may be undertaken to combat the diseases inflicting the honeybees, under the proposed action plan.

9. DEPARTMENT OF FACTORIES AND BIOLERS

In Chikmagalur District, out of 52 registered factories, only 5 factories have been identified as hazardous factories as per the provisions of sections 2(cb) of the Factories Act.

'The Environmental Protection Act, 1986' passed by the Government of India, has been in forefront, insisting on various protective measures to be taken by the industrial establishments in the formation of a series of related rules.

The on site Emergency Management Plan (BMP) include mock rehearsals once in 6 months, regular safety training classes to impart awareness with regards to the safety, health and environment by the accidents.

10. MANGALORE ELECTRICITY SUPPLY COMPANY LTD. (MESCOM)

The item No. 15 (Conservation of Special Security Areas) does not come under MESCOM. It comes under the perview of the Karnataka Power Corporation (KPC). While drawing the electric lines, only branches of the trees along the line are cut, but not the trees. The department is doing its best for the conservation of the environment.

11. FISHERIES DEPARTMENT

• Promoting sustainable utilization of freshwater fish and shellfish populations.

This includes banning fishing in ponds and reservoirs during the breeding season and also regulating the size of the eye of the fishing net. Besides, involving fisherman as stakeholders and imparting awareness programmes of sustainable utilization offishery resources would be considered under the action plan.

Grant required for the programme: **Rs.50,000-00**

- **Institutional Capacity developpment for civic bodies**

Giving the management of freshwater bioresources to the local institutions and organizations such a JFMs, Joint Fishery Management Committees etc. on contract basis. This will help to conserve the Freshwater bioresources.

- **Creation of policy and regulatory framework for the protection of freshwater biodiversity.**

The local organizations, Research Centres and Fisheries Department should jointly work for the conservation of freshwater biodiversity, which would include: (i) fishing period (ii) fishing method (iii) proper utilization of water. The joint management committees may be accorded social recognition by awarding special prizes for their sincere efforts for conservation of bioresources. Grant required for the programme: **Rs.50,000-00**

- **Development of a Realistic System of Economic Instruments** such as access fees, incentives to encourage prudent and penulties to discourage non-sustainable utilization of Biological Resources and Biodiversity.

Grant required for the Programme: **Rs.50,000-00**

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12. AGRICULTURE REGULATED MARKETS

Six Agricultureal Produce Marketing Committes are functioning in the district. Excepting Koppa and Sringeri, the remaining four marketing societies have a minimum of 4 acres and a maximum of 24 acres of land. By planting fruit yielding and shade giving trees in the vacant land and also on either side of the roads, the biodiversity of the area could be improved. By providing adequate drainage in the market yards, the pollution can be regulated

13. INFORMATION DEPARTMENT

- **Formation of a committee to develop curricula and educational material**

Information Department is playing a key role in dissemination of information pertaining to the developmental projects of the government to the rural masses. In addition, the department is organizing video shows, discussion meetings in educational institutions pertaining to developmental projects of the Government, health, education, culture etc.

If the department has necessary funds for developing various information materials including video- cassettes, booklets, pamphlets etc., awareness programmes can be effectively implemented.

POLLUTION CONTROL BOARD

- **Identification and inventorying of biodiversity indicators of Pollution**

It is essential to identify and inventory the sensitive species of Flora and Fauna in ific locality

Promotion of NGOs, role in enhancing the quality of monitoring of pollution impacts on biodiversity

One or two NGOs, which have sincerity in purpose, will have to be identified and registered with the pollution Control Board. The registered NGOs representatives can do the data collection.

- **Enhancing the Quality of Environment Impact Assessment**

Many institutions and private persons are currently doing environmental impact Assessment. The competence of the institutions and the people are questionable. Hence, agencies with capabilities and the people who are qualified to do the impact assessment must be identified. These agencies or the persons must be registered with the government and their services must be availed when necessary.

- **Promomtion of NGOs role in enhancing the quality of Environmental Impact assessment Exercises**

Most of the NGOs are activists, but do not have the scientific or academic capability to conduct an effective EIA. Hence, it is essential for the Government to identify NGOs of this standard like BNHS, University of Mysore, Indian Institute of Science etc.**15. URBAN DEVELOPMENT DEPARTMENT**

The urban development is not undertaking any one of the items listed in the brochure provided. However, the department will take necessary steps to conserve and develop Roadside Avenue trees and reserve place for the development of gardens in suitable locations.

16. LABOUR DEPARTMENT

Eventhough the labour Department is not included in the Biodiversity Action Plan, the department is duty bound to provide information to the labourers to maintain clean environment.

17. MINOR IRRIGATION DEPARTMENT

There are 122 large ponds and 70 pickup tanks providing irrigation water for 26,000 hectares. Malnad area of the watershed harbour rich biodiversity including medicinal plants, fresh water fishes, crabs, frogs, insects and rich vegetation. On priority basis, the irrigation department can take up the following action plans:
Providing water for medicinal plants genetic resources in irrigation tank catchment areas.
Maintaining water level beneath the outlet of ponds for the survival of the aquatic organisms.
The district has sacred rivers like Tunga, Bhadra, Hemavathi and in addition there are a number of tanks and ponds in the course of these rivers. To prevent siltation o rivers and ponds planting trees on the blanks and and bunds will be taken up.
The district has several ancient ponds located in the premises of old temples and some in the centre of the villages. These provide water for the people and the cattle. It is necessary to undertake desilting to increase the ground water level.
Establishment of 'Gunduthopu' tree genetic diversity conservation sites in the vacant areas surrounding the ponds and tanks would reduce pollution and also add aesthetic value to the regions.
Establishment of irrigation tanks biodiversity conservation sites wherever possible.
Creation of satellite imagery based database on boundaries of wetlands would help to take up precautionary measures.

Grants needed for the above action plans: Rs. 90 lakhs.

18. BACKWARD CLASSES AND MINORITIES DEPARTMENT

The department is running 50 pre-metric hostels, 10 post-metric hostels, 1 Morarjee Desai Model Residential School and 3 *Ashrama* schools. Of the above mentioned 64 educational institutions, 33 institutions were built on own land. Since sufficient vacant land is available around the educational buildings, an action plan can be drawn for the cultivation plants, especially the herbal gardens with the support of forest department.
The Morarjee Desai Model Residential School owns 13 acres of land. In the vacant land surrounding the building plants such as the mango, neem, jackfruit, tamarind and coconut may be grown.
The responsibility of raising herbal gardens, plantations etc. can be given to the students of the hostels, staff and the supervisors.

19. ANIMAL HUSBANDRY DEPARTMENT

This department is husbanding domesticated animals such as cow, buffalo, sheep, goat, pig, rabbit, horse, ass, dog, domestic fowl etc.
There are two traditional varieties of cows, namely, ***'Amrith Mahal'*** and ***'Malnad Gidda'.*** The characteristic features of Amrithmahal has been scientifically studied and documented. There is need to study the characteristic features of Malnad Gidda.
The Government Karnataka has established a Centre for the development of Amrith Mahal breed in Ajjampura in Chikmagalur district. 2585-hectare area has been reserved for the development of Amrith Mahal breed.
A semen collection centre has been established at Birur for the development of Amrith Mahal breed through artificial insemination.
There is a need for the conservation of Amrith Mahal breed through *'watchers'* by creating trenches for preventing the access to other breeds of cattle. Ajjampura watch centre has been completed and there is a need for making watch centres at Lingadahalli, Basur and Birur.
Grants required for the establishment of watch centres at Lingadahalli, Baasur and Birur: **Rs. 28 1akhs.**
Grants required for strengthening Semen collection centre at Birur: **Rs. 45 lakhs.**

Development of Malnad Gidda Breed

Malnad Gidda breed occurs in manad Taluks, including sringeri, N. R. Pura, Koppa, Moodigere and Chikmagalur.
Grants needed for the development of Malnad Gidda Breed: **Rs.** 2 **lakh.Kodagu District:1.Proposals submitted by Development departments.1.Forest Department.**

A. Social Forest Division:

Notionai Budget (Lakhs) Conservation of Ficus tree resources through avenue plantations.	1.50
Promoting sustainable utilization of timber resources.	37.50
Promoting sustainable utilization of non-timber forest products.	3.45
Promoting sustainable utilization of natural population of Medicinal plants	3.75
Conservation of Sacred groves.	25.00
Soil and water Conservation works.	3.00
Fire protection measures.	6.00
	80.20

***PIan out lay for 5 year period 401 lakhs.**

B.Wild life Division:

1.Conservation of Ficus tree resources	3.00
2.Creation of a GIS database on boundaries of forest and revenue land holdings.	6.00

3.Creation of policy and regulatory framework
for management of biodiversity in forest area. 10.00
4.Local capacity building for development and management of biodiversity
based enterprises such as ecotourism. 2.00
***Plan outlay— 21 lakhs. 21 00**

C.Silviculture Division:
1 .Establishment of Honge genetic center 2.00
2.Establishment of Bevu genetic resource unit 2.00
3.Promoting sustainable utilization of natural population of medicinal plants. 2.00
4.Promoting sustainable utilization of non-timber forest products. 10.00
16.00
Plan outlay for 5 years—16 lakhs.

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RAIN WATER HARVESTING

Nirmala Kodagu, an NGO, working to improve the environment of Kodagu District, has submitted the Rainwater Harvesting Project proposal to the Deputy commissioner of Kodagu District on 9 April 2002.

Kodagu being the catchment area of river Cauvery, it requires rainwater-harvesting system. Artificial ground water recharge systems with rapid percolation pits to recharge the perennial water sources need to be commissioned. PWD and Zilla Panchayat could implement this during their road construction and other developmental work. This would not only help to maintain satisfactory ground water level, but also would prevent occurrence of flood and drought. This would also overcome the drinking water problem in the district.

Nirmala Kodagu working in the field of environment in the district is willing to join the district administration in implementing rainwater/roof water harvesting in private lands, large community buildings and institutional buildings. This would yield the following results:

- Maintain the ground water table in the catchment area of River Cauvery
- Sustainable water to the farming community in both Karnataka and Tamil Nadu
- Recharging of the open wells and bore wells
- Regular flow of water in all the tributaries of River Cauvery
- Reduces flooding of Rivers
- Reduces soil erosion
- Improves the quality of water
- Mitigates the effects of drought

Gulbarga District:

Action plans-

1. Along the road side to an extent of about 8 meters forest is to be grown, wherever possible. NGO's or local bodies to be identified to safe guard them.
2. If a farmers holds more than 20 acres of land he/she has to be motivated to grow at least one acre of tamarind, Neem, Mango or any other tree which are economic to him, which in turn help the environment.
3. Bore wells and open wells are to be recharged so that under ground water table will rise up.
4. Usage of farm yard/organic manure is to be motivated in the agricultural land instead of chemical fertilizers. This will increase the soil fertility and also increases biological activity, which leads to more water absorption capacity.
5. Promotion of Biodiversity education is must in school, college curriculum.

Action Plans with respect to different department of the state: (From RDPR)

Activity	Distribution of Functions		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Increasing Agricultural	1. Prepare comprehensive crop	1. Assist ZP in organising Farmers fairs,	1. Estimate crop yield and maintain data base regarding crops and cropping

Production	plan 2. Develop and maintain data base for cropping pattern, land use and inputs use for planning 3. Organise Kisan Melas, Fairs and Exhibitions 4. Protect bio-diversity 5. Promote profitable crop technologies	Kisan Melas, etc. 2. Organise on-farm verification trials and demonstration of new technologies 3. Report and initiate action plans for different items 4. Coordinate activities of field level extension workers and officials 5. Act as a link between ZP and GPs for transfer of knowledge, 6. Help in crop yield estimation through maintaining links with various agencies, GPs and farmers, 7. Advise suitable cropping system based on location specific characteristics. 8. Arrange awards to progressive farmers.	pattern ,2. Assist in preparation of crop plan ,3. Assist in advising farmers about remunerative crop activities and crop diversification 4. Assist in identifying progressive farmers for adoption and diffusion of new technologies 5. Help in providing custom hiring services for plant protection equipment and farm implements 6. Generate awareness in use of organic fertilisers and vermiculture
Assessment and Distribution of Inputs	1. Prepare consolidated plan for input requirement 2. Acquire and arrange distribution of inputs in time 3. Improve adequate storage facilities for inputs 4. Monitor distribution of quality inputs	1. Assess inputs needs for GPs inputs and forward consolidated request to TP 2. Ensure timely availability of required inputs to GPs 3. Arrange storage and transport facilities for inputs close monitoring of inputs delivery system	1. Assist in assessing needs of various such as seeds, fertilizers, pesticides. 2. Assist in timely distribution of adequate inputs to farmers
Credit	1. Prepare credit plan 2. Ensure timely credit availability and linkage between agriculture development and credit institutions, and monitor credit mobilisation. 3. Help in strengthening of cooperative credit institutions	1. Assist in preparing credit plan 2. Ensure timely credit from formal institutions. 3. Monitor credit delivery system.	1. Assist in assessing credit needs of various groups of farmers and crops 2. Exercise social control and regulate interest areas and recovery of loans from formal and informal credit institutions, 3. Help in formation of self-help Groups
Extension support	1. Maintain linkage with research and training organizations ,2. Ensure regular visits of extension staff and help in	1. Prepare plan for visit of extension workers and monitor their work. 2. Advice and identify extension officials for training,	1. Monitor the visit of extension workers to the village farms. 2. Identify suitable plots for conducting trials and demonstration

	dissemination of new technologies. 3. Ensure regular training of extension officials for updating their knowledge of advancements in technologies.	3. Assist scientists in identifying local problems for designing their research work relevant to local needs. 4. Ensure better linkages between farmers and extension staff. 5. Operate and run farmer service centers, Kisan Kendras and Raitha Samparka Kendras	3. Select farmers for participating in Kisan melas and training.
Soil Testing Soil Testing	Establish soil-testing laboratories. Monitor soil testing work	Monitor Soil testing work Help in identifying locations for soil testing work Help farmers for improvement of soil fertility in consonance with soil testing results	Assist technical experts in conducting soil tests. Help in ensuring feed back from soil testing to farmers.
Post-harvest management	1. Establish and improve storage facilities 2. Develop marketing infrastructure at suitable locations 3. Monitor regulated marketing 4. Ensure correct weights and measures.	1. Maintain godowns 2. Organize marketing committees and maintain market yards 3. Regulate market charges and ensure correct weights and measures 4. Provide, manage and run market information systems 5. Ensure prompt payment to the farmers	1. Help in organizing farmers for group sale in bulk 2. Assist in increasing awareness about better storage facilities for seeds and food grains.
Risk Management	1. Assess losses due to natural calamities and formulate relief plan 2. Monitor and supervise relief operations	1. Estimate crop losses and report action taken, 2. Monitor relief operations. 3. Assist in providing benefits from Crop insurance schemes. 4. Arrange crop insurance schemes and coordinate among insurance agencies 5. Prepare contingency agricultural plan	1. Report losses due to natural calamities and relief requirements 2. Supervise relief operations and distribution of material 3. Motivate and help in identifying farmers to take up crop insurance schemes. 4. Assist in the implementation of contingency plan

Item: 2- LAND IMPROVEMENT, IMPLEMENTATION OF LAND REFORMS, LAND CONSOLIDATION AND SOIL CONSERVATION

	Distribution of Functions

Activity	Distribution of Functions		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Implementation of Land ceiling measures	1. Coordinate with legally constituted machinery in all stages of its work and render necessary assistance to it either directly or through the TP and the GP as the case may be 2. Create Public opinion in favour of land ceiling and other measures of land reforms, 3. Monitor work in the ZP area and advise TPs and GPs on matters relating to implementation and monitoring.	1. Assist the legal machinery in conduct of legal proceedings (e.g. publication of notices in the entire area, identification of land in different GP areas etc.) 2. Co-ordinate the work between the GPs. 3. Compile GP wise data on land ceiling measures and individual monitoring progress of such measures for the TP area. 4. Assist the ZP in monitoring for the entire ZP Area	1. Identify potential surplus land owners and their total land in the GP area, 2. Assist the legal machinery in conduct of legal proceedings. 3. Identify families and individuals needing allotment of land. 4. Assist in organizing land development and productivity raising measures for allottees or groups of them.
Implementation of Tenancy Measures	1. Coordinate with the legally constituted machinery in all stages of its work and rendering of necessary assistance to it either directly or through the TP and the GP as the case may be, 2. Create of public opinion for facilitating the work 3. Monitor work in the ZP area and advise TPs and GPs on matters relating to implementation and monitoring.	1. Assist the legal machinery in its tasks	1. Assist in identification of tenancy including share-tenancy status, open as well as clandestine, 2. Assist the legal machinery in its task of securing as well as regulating tenancy rights, or conferring ownership rights. 3. Create public opinion and marshal of documentary and non-documentary evidence, particularly on the issue of use of the lands concerned.

Land Consolidation	1. Create public opinion in relation to consolidation about to be undertaken or ongoing 2. Educate and inform land holders and land users how and when they are involved. 3. Monitor the operation in association with TPs and GPs.	1. Provide assistance to the legal machinery for consolidation 2. Coordinate with the legal machinery on a continuing basis	1. Secure active and continuing involvement of inhabitants of the local area at different stages of the operations, 2. Assist the legal machinery in compilation of undocumented data on issues such as possession and use of land, different gradation of land rights, status of common land and other common property 3. Assist the legal machinery in ensuring that after consolidation of assigned plots or holdings possession actually accords with the implemented scheme of consolidation.
Participation in updating and maintenance Land records	1. Coordinate with the designated legal machinery and official agencies working outside the ambit of the ZP administration	1. Assist GPs and other designated machinery in the maintenance and updating of records of ownership, possession etc. 2. Maintain updated records for the entire TP area for easy reference to them by the local inhabitants.	1. Assist in continuous updating of data relating to seasonwise use of agricultural land. 2. Periodically update the data relating to the actual status of village common land such as pasture, wasteland, water reservoirs, waterways, roads, embankments, etc. 3. Assist the legal machinery in updating of land records (record-of-rights) and mutation proceedings
Protection and Maintenance of Village Commons etc.	1. Guide and coordinate the work of GPs & IPs. 2. Provide legal administrative and financial assistance to GPs & TPs as far as practicable, in the conduct of legal proceedings 3. Decide on disposal of village common property or their conversion to other uses with the concurrence of the GP concerned.	1. Coordinate the work of GPs where inter-GP collaboration is needed. 2. Coordinate with the legally constituted machinery involved in the matter	1. Primary responsibility for keeping all common property of local nature in good condition. 2. Keep watch over them so that they are not encroached upon or converted to uses not in the interest of the community . 3. Identify encroachment as well as conversion of illegal or wrong uses of commons and take action to evict such encroachers* 4. Provide assistance in and collection of evidence towards the conduct of the proceedings by such authority.

* Once we agree that land has to be within the Panchayat's administration, then one must make it clear that it is their duty to conduct eviction proceedings. This ensures greater credibility as far as recovery of taxes and land user charges are concerned.

Soil Conservation	1. Preparate district plan for soil and water conservation projects. 2. Desegrete this plan into TP level, GP level or even lower level deliverable units, 3. Harmonise the plan with other employment generating as well as area development plans Coordination with various agencies of the ZP as well as the district administration who will either participate in or whose work will impinge upon the implementation of the plan	1. Coordinate with officials of soil conservation machinery. 2. Inter GP coordination for smoothly carrying out soil conservation operations cutting across GP boundaries including creation of water channels	1. Assist the professional/official machinery for soil conservation work through helping group action by land owners, 2. Direct assistance in implementation e.g., organising owner labour as part of contributions of the cost of operations, 3. Post conservation vigilance to ensure that work done is not undone once again, 4. Create public opinion in favour of use of soil only in consonance with its properties, gradients etc., 5. Distribute subsidies and other assistance according to determined scales and priorities

ANIMAL HUSBANDRY DAIRYING AND POULTRY

Activity	Distribution of Functions		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Development of livestock	1. Assess the need and formulate projects for the establishment, improvement and maintenance of breeding farms for cattle, sheep, goats and hatcheries,	1. Distribute quality breeds to beneficiaries under various programmes 2. Propagate improved breed of livestock among farmers	1. Assist in identification of beneficiaries under various programmes 2. Motivate people to maintain quality breeds and adopt modern methods of maintaining livestock.
Veterinary Services	1. Establish, improve and maintain veterinary hospitals, Dispensaries, Rural Livestock Units (RLUs) and AI Centres, 2. Procure and supply medicines, equipment and other materials to hospitals, dispensaries, RLUs and AI Centres 3. Monitor the functions of veterinary services.	1. Supervise the functioning of veterinary services in the TP, 2. Maintain mobile veterinary unit to provide veterinary care and control diseases and epidemics.	1. Supervise the functioning of RLU and AI service centres, 2. Report out-break of diseases and epidemics.

Feeding and Fodder including support during droughts	1. Propagate production of nutritive fodder and promote proper feeding of animals, 2. Procure and establish fodder banks in drought areas	1. Organise cooperatives for fodder production and provide financial assistance, 2. Supply improved variety of fodder seeds, 3. Propagate modern methods of feeding to improve livestock productivity, 4. Supply fodder during droughts.	1. Help in establishing cooperative fodder farm 2. Allocate community land for fodder production. 3. Control grazing and improve grazing and pasture lands. 4. Distribute fodder during droughts.
Dairy Development	1. Develop and assist Dairy Development Boards or Cooperatives in the development of infrastructure for milk collection, collection centres, transportation and processing.	1. Develop and open new milk routes for milk collection, 2. Promote milk producers, cooperative societies 3. Ensure timely payment to milk producers 4. This has to be done at GP level 5. supply quality milch animals.	1. Assist in organizing milk producers cooperative societies, 2. identify beneficiaries for dairy development programme 3. Select beneficiaries under various programmes
Poultry Development	1. Develop infrastructure for poultry farming. 2. Production and supply of quality chicks to poultry farmers.	1. Train Poultry farmers, 2. Arrange for the supply of poultry feed.	1. Identify beneficiaries for poultry farming. 2. Allot or lease community land for establishing poultry complex. 3. Select beneficiaries and establish poultry complexes for them under various programmes.

ITEM :5- FISHERIES

Activity	**Distribution of Functions**		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Developing of Inland Fisheries	1. Formulate Projects for fisheries development. 2. Technically appraise and approve projects for development of inland water bodies for fisheries 3. Establish fish seed production farms.	1. Select beneficiaries for fisheries training. 2. Organise fishermen's cooperatives. 3. Distribute boats, nets and other equipment and give assistance to cooperatives and beneficiaries. 4. Monitor, supervise and report progress	1. Develop village pond for fisheries. 2. Lease village ponds to fishermen's cooperatives and groups 3. Identify beneficiaries for assistance under various programmes and assist them in organizing fishermen's cooperatives, 4. Assist TPs in the distribution of boats, nets and other equipment. 5. Supervise and report progress to

	4. Formulate Projects for fisheries development. 5. Arrange training of fishermen in modern management techniques for fish production. 6. Procure and supply fishing equipment for distribution among selected fishermen's cooperatives and beneficiaries. 7. Monitor and supervise plan implementation.		TPs. 6. Execute fishpond and tank improvement projects.
Development of Marine fisheries.	1. Procure and supply motorised and modern boats and equipment to selected groups of beneficiaries and cooperatives. 2. Develop brackish water fisheries. 3. Enforce environmental restrictions on marine acquaculture and brackish fish production activities 4. Install weather forecasting and early warning system for marine fishermen.	1. Select sites for marine acquaculture and brackish water fishing 2. Organise fishermen's cooperatives. 3. Distribute boats and equipment to selected beneficiaries and cooperatives 4. Monitor impact of marine acquaculture on environment	1. Identify beneficiaries and assist them in organising into fishermen's cooperatives. 2. Select Beneficiaries for assistance 3. Distribute boats and equipment to beneficiaries and cooperatives 4. Create awareness for and adopt safety measures during rough weather 5. Monitor the impact of Marine acquaculture on village environment and initiate impact mitigation measures
Development of Marketing Processing Infrastructure	1. Encourage private entrepreneurs to establish processing, packaging and storage facilities, 2. Assist in establishing other marketing infrastructure	1. Organise and train fishermen in processing, packaging and preservation of fish and fish products, 2. Develop tie-up arrangements between fishermen and processing units	
Welfare Measures	1. Promote group insurance schemes for fishermen, 2. Sanction relief to affected families during natural calamities,	1. Implement family and group insurance schemes for fishermen. 2. Distribute relief to families affected by calamities	1. Encourage fishermen to take up insurance schemes 2. Assess loss, damage and relief requirements of families affected by calamities

ITEM NO 6:SOCIAL FORESTRY

Activity	Distribution of Functions		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Social forestry and Farm Forestry	1. Promote Social Forestry and Farm Forestry 2. Promote and propagate social and farm forestry for improving ecology and environment. 3. Establish forest nurseries for supply of seedlings and saplings for distribution, 4. Propagate fuel fodder and timber producing plants and bio-diversity, 5. Organise vana-mahotsava	1. Identify degraded and wastelands and formulate social forestry projects, 2. Implement TP social forestry projects and those assigned by ZP 3. Plant trees along roads, rails and public places. 4. Produce and supply seedlings and saplings for social and farm forestry projects 5. Propagate fuel fodder and timber producing plants,	1. Identify degraded and waste lands for social and farm forestry and formulate projects with the support of the Grama Sabha, 2. Execute social forestry projects through village people, 3. Lease land to groups and individuals interested in social forestry on sharing basis, 4. Encourage private farmers for farm forestry and assist them 5. Distribute seedlings and saplings 6. Organise and participate in vana mahostsava 7. Ensure adequate production of fuel , fodder and timber for local use.
Marketing of Fuel/Fodder and timber	1. Establish links for marketing of forest products		1. Collect, distribute and sell fuel, fodder and timber

ITEM: 7- MINOR FOREST PRODUCE

Activity	Distribution of Functions		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Regeneration of MFP species	1. Plan raising MFP plantation in concentrated blocks to facilitate collection and marketing .2. Encourage cultivation of MFP in existing forest, degraded forest lands, barren and uncultivable area, and community wastelands. 3. Encourage plantation of MFP such as gum, resin, medicinal plants, aromatic plants, leaves, oil seeds, tans and dyes, grasses, seeds, canes, bamboo, etc. particularly in tribal areas. 4. Promoting plantation of MFP species	1. Establish MFP nurseries for propagation of MFP species.	1. Assist in identification of families willing to plant MFP species 2. Distribute MFP seedlings for plantation.

	in drought prone, desert areas and under social forestry activity under JGSY, particularly in tribal areas.		
Training	1. Organise training for scientific tapping of gums, resins, and grading of MFPs	1. Organise training at the TP level.	1. Select and forward trainees names to the TP
MFP Collection,	1. Monitor MFP collection activities in forest ranges, 2. Timely payment of collection	1. Organise itemwise MFP cooperatives like Tendu leaf	1. Organise pruning operation of Tendu trees before the leaf plucking season
Processing, and marketing charges.	1. Set up small scale industrial units for value addition to MFPs. 2. Fix support prices for MFP procurement. 3. Establish godowns for storage of MFPs. 4. Strengthen market intelligence and market extension	1. Liaise with forest department for constitution of Joint Forest Management Committee for MFP regeneration collection, processing and marketing. 2. Ensure value addition to MFP before it leaves the forest area	1. Promote collection primary processing and value addition to MFP before selling. 2. Ensure timely payment and adequate collection charges to MFP collectors.

ITEM: 8- SMALL SCALE INDUSTRIES INCLUDING FOOD PROCESSING INDUSTRIES

Activity	**Distribution of Functions**		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Industrial Resource potential survey	1. Formulate Projects by the DIC in coordination with KVIC/KVIB and other agencies based on Industrial Resource Potential survey.	1. Assist industrial resource potential survey.	1. Assist survey and project formulation.
Development of Infrastructure	1. Develop inter-linkages in institutions and organisations 2. Establish small industrial estates at suitable locations and develop other related infrastructure activities. 3. Identify location and develop food processing complexes.	1. Establish small rural industrial estates and complexes,	1. Identify suitable locations for rural industries.
Entrepreneur Development		1. Organise entrepreneurial Development Programmes	

		2. Select entrepreneurs and encourage private investments. 3. Establish Industrial counseling Information and guiding centres 4. Assist entrepreneurs in formulating viable projects, and cooperative industrial projects.	
Credit and financial assistance from various Government Departments and Agencies	1. Provide information and guidance about credit facilities and other financial incentives. 2. Coordinate credit support activities with financial institutions.	1. Assist in providing financial and other help to small industries.	

ITEM: 9- KHADI, VILLAGE AND COTTAGE INDUSTRIES

Activity	**Distribution of Functions**		
	Zilla Panchayat	**Taluk Panchayat**	**Grama Panchayat**
Planning, Monitoring and Supervision	1. Consolidate plans prepared by TPs for Khadi, Village and Cottage industries including artisan activities. 2. Monitor and supervise the overall progress in this sector, and ISB sector of SGSY	1. Prepare plan for Khadi, Village and Cottage Industries and other artisan activities integrating schemes of other agencies such as KVIC/KVIB/ Handloom/Handicraft Development	1. Assist TP in identifying potential activities and formulation of projects.
Training Skill Development and Transfer of technology to beneficiaries	1. Establish and identify Training Centres for Skill Development. 2. Allocate and sanction funds for Training and stipend to the trainees 3. Identify appropriate technologies and arrange for their transfer to workers.	1. Select beneficiaries for Training and Skill development and nominate them to training Institutes, 2. Arrange master craftspersons 3. Pay stipend to beneficiaries and honorarium / training cost to the trainers. 4. Transfer and upgradation of technology in different areas of production.	1. Identify beneficiaries for training through Gram Sabha.
Infrastructure Development	. Arrange supply of raw material, equipment, and other	1. Supply of raw material, equipment and other inputs to beneficiary workers.	1. Assist in Distribution of raw material equipment, etc.

	inputs to workers. 2. Tie up arrangements for marketing of products through Government and non-government marketing agencies. 3. Set up retail show rooms for products 4. Encourage cooperatives for production and marketing of products	2. Coordinate programmes of various agencies for infrastructure development such as construction of common workplaces, worksheets and market complexes. 3. Organise Cooperatives for production and marketing of products	2. Allow beneficiaries to use locally available raw material 3. Construct common worksheds / workplaces and market complexes.
Credit and financial support	1. Ensure credit support through credit plan. 2. Monitor and supervise credit flow and financial assistance from other agencies to cooperatives and individual units.	1. Ensure credit support. 2. Assist beneficiaries in formulating project plan. 3. Arrange for subsidy and financial support under various programmes to the beneficiaries. 4. Monitor, supervise and report progress.	1. Identify beneficiaries for financial support under various programmes 2. Assist loan recovery
Credit and financial assistance from various Government Departments and Agencies	1. Provide information and guidance about credit facilities and other financial incentives. 2. Coordinate credit support activities with financial institutions.	1. Assist in providing financial and other help to small industries.	

Annexure B: Hotspots of Hope

SlNo	Ecosystem	Plants	Animals	Habitat	Management Regime	Geographic Location	Taluk	District
1	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Rocky and sandy beach		Mundali	Bhatkal	Uttara Kannada
2	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Rocky beach		Dhareshwar/Vannall	Kumta	Uttara Kannada
3	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Sandy beach		Gudeangidi	Kumta	Uttara Kannada
4	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Sandy beach		Managuni	Ankola	Uttara Kannada
5	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Sandy beach		Honnebail	Ankola	Uttara Kannada
6	Moist and Dry deciduous forests	*Anogeisus latifolia, Santalum album, Terminalia sp., Acacia leucophloea, Tectona grandis*	*Elephant, Tiger, Leopard, Sambar, Dhole*	Forests	National Park	Bandipur	Gundlupet	Mysore

7	Moist and Dry deciduous forests	*Anogeisus latifolia, Santalum album, Terminalia sp., Acacia leucophloea, Tectona grandis*	*Elephant, Tiger, Leopard, Sambar, Dhole*	Forests	National Park	Nagarhole	Virajpet	Mysore
8	Dry deciduous forests	*Anogeisus latifolia, Terminalia sp., Tectona grandis, Dyospyros melanoxylon*	*Tiger, Leopard, Sambar, Dhole*	Forests	Tiger Reserve	Bhadra		Chikamagalur
9	Scrub/Thorny forests	*Holoptelia integrifolia, Dichrostachys sp., Acacia leucophloea, Dyospyros melanoxylon*	*Sloth Bear*	Dry Deciduous/Scrub Forest	WLS	Daroji Sloth Bear Sanctuary	Harapanahalli	Bellary
10	Estuary		*Fishes, estuarine invertebrates*	Estuary		Sharavathy Estuary		Uttara Kannada
11	Estuary		*Fishes, estuarine invertebrates*	Estuary		Kali	Karwar	Uttara Kannada
12	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*	*Amphibians*	All	Reserve Forest	Agumbe Ghat		Shimoga,Udupi
13	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Mesua ferrea*	*Lion-tailed Macaque*	Evergreen Forests	WLS	Sharavati Valley	Honnavar	Uttara Kannada
14	Evergreen Forests	*Saraca asoka, Rattan*	*Lion-tailed Macaque*	Evergreen Forests	WLS	Mookambika WLS	Kundapura	Udupi
15	Evergreen Forests	*Dipterocarpus indicus, Chrysophyllum sp., Myristica malabarica, Mesea ferrea*	*Nilgiri Langur*	Evergreen Forests	WLS	Brahmagiri WLS	Bagamandala	Kodagu

16	Evergreen Forests	*Dendrobium, Rhynchostylis, Catlea, Luisia*	*Nilgiri Langur*	Evergreen Forests	Reserve Forest	Tadiandamol		Kodagu
17	Evergreen Forests	*Rhynchostylis, Catlea, Luisia*		Evergreen Forests	Reserve Forest	Kemmannagundi	Tarikere	Chikamagalur
18	Evergreen Forests	*Dipterocarpus indicus*	*Lion-tailed Macaque*	*Dipterocarpus indicus* Forests		Karikan	Honavar	Uttara Kannada
19	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests		Karikallani Gudda	Siddapur	Uttara Kannada
20	Evergreen Forests	*Corypha umbraculifera*		Umbrella Palm Forests		Yana	Kumta	Uttara Kannada
21	Evergreen Forests	*Riparian flora*		Riparian Forests		Aghanashini River bank	Siddapur	Uttara Kannada
22	Evergreen Forests	*Riparian flora*		Riparian Forests		Aghanashini River bank	Kumta	Uttara Kannada
23	Evergreen Forests	*Riparian flora*		Riparian Forests		Sharavathy bank	Honavar	Uttara Kannada
24	Evergreen Forests	*Riparian flora*		Evergreen Forests		Castle Rock	Joida	Uttara Kannada

25	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Torme	Siddapur	Uttara Kannada
26	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Malemane Village	Siddapur	Uttara Kannada
27	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Hemgar Village	Siddapur	Uttara Kannada
28	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Kudgund Village	Siddapur	Uttara Kannada
29	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Hukli Village	Siddapur	Uttara Kannada
30	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Mahime Village	Honavar	Uttara Kannada
31	Evergreen Forests	*Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica*	*Phylloneura westermanii (Monotypic damselfly)*	Myristica Swamps		Harigar & Unchalli	Sirsi	Uttara Kannada
32	Evergreen Forests	*Poeciloneuron indicum*	*Lion-tailed Macaque*	*Poeciloneuron indicum* Forests	National Park	Bhagavati Valley		Dakshina Kannada,Chikamagalur, Udupi

33	Grasslands	*Grasses, ground orchids and other herbs*		Montane Grasslands	National Park	Kudremukh National Park		Dakshina Kannada,Chikamagalur, Udupi
34	Grasslands	*Grasses, ground orchids and other herbs*	*Greybreasted Laughing Thrush, Whitebellied Shortwing*	Montane Grasslands	Sanctuary	Brahmagiri WLS		Kodagu
35	Grasslands	*Grasses, ground orchids and other herbs*		Grasslands	Sanctuary	BRT-Hills	Kollegal	Chamarajanagar
36	Highest Monolith Rock in Asia			Rocky Mountain	Revenue	Madhugiri	Madhugiri	Tumkur
37	Human Habitation		*Painted Stork*	Human Habitation	Revenue	Kaggaladu	Sira	Tumkur
38	Human Habitation	*Baobab*		Human Habitation	Revenue	Savanoor Town	Savanoor	Haveri
39	Island			Island		St. Mary's Island	Udupi	Udupi
40	Mangrove	*Mangrove vegetation*		Mangrove		Honavar	Honavar	Uttara Kannada
41	Mangrove			Mangrove		Nethravathi	Mangalore	Dakshina Kannada
42	Moist Deciduous Forest			Moist Deciduous Forest	WLS	Dandelli	Haliyal	Uttara Kannada
43	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Tippa Gondanahalli Reservoir		Bangalore-Rural

44	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Kanva Reservoir		Bangalore-Rural
45	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Hoskote		Bangalore-Rural
46	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Thailur		Bangalore-Rural
47	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Krishnaraja Sagar Reservoir		Mandya
48	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Kabani Backwaters		Mysore
49	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Hadinaru		Mysore
50	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Nugu		Mysore
51	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Muduvadi		Kolar
52	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Akki Alur		Dharwad
53	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Makaravalli		Dharwad
54	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Gudavi	Sorab	Shimoga

55	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Mandagadde	Theerthalli	Shimoga
56	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Nidige		Shimoga
57	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Ghataprabha Reservoir		Belgam
58	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Hidkal Reservoir		Belgam
59	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Attiveri		Uttara Kannada
60	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Soolekere	Channagiri	Davangere
61	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Kallambella	Sira	Tumkur
62	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Theeta	Koratgere	Tumkur
63	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Kunigal	Kunigal	Tumkur
64	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Narasambudi		Mysore
65	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Nagavalli Kere	Tumkur	Tumkur

66	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Shishila	Belthangadi	Dakshina Kannada
67	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Cauveri River between Muthati-Mekadatu	Kanakapura	Bangalore-Urban
68	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Sringeri	Sringeri	Chikamagalur
69	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Ranganathittu	Srirangapatna	Mandya
70	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Ramanathapura	Arkalgud	Hassan
71	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Nisargadhama	Kushalnagar	Kodagu
72	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Jammatgi	Sringeri	Dakshina Kannada
73	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Cippalgudda	Thirthahalli	Shimoga
74	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Bachanayakanahalli	Karkala	Dakshina Kannada
75	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Todikana	Sulia	Dakshina Kannada
76	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Thingale	Karkala	Udupi
77	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Part of Payaswini	Sulia	Dakshina Kannada

78	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Chaya-Bhagawati Falls area Down Stream of Naryanpur Dam	Lingsugur	Bijapur
79	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Kabini River	H.D.Kote	Mysore
80	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Caveri River near Kollegal	Kollegal	Chamarajnagar
81	River	*Members of Podostemaceae*	*Fishes*			Chunchunkatte-River Cauvery	K.R.Nagar	Mysore
82	Rocks			Rocky Mountain	Revenue	Yana	Kumta	Uttara Kannada
83	Sacred Groves			Evergreen Forests		Kodagu Devarakadu		Kodagu
84	Sacred Groves			Evergreen Forests		Pillar Kann	Udupi	Udupi
85	Sacred Groves			Evergreen Forests		Siddapur	Sorab	Uttara Kannada
86	Scrub Forest		*Wolf and Fox*	Scrub Forest		Melkote		Mandya
87	Scrub Forest		*Sloth Bear*	Scrub Forest		Sandur valley		Bellary

88	Agricultural land	*Ragi varities(Mallige, Majjige, Gidda, Jenumuthige, Ambukavi, Pichakaddi, Rathnachudi) Paddy(Raskadam gandhasale, Salem sanna Raskadam, Godhavari Isuku Vadlu, Annekombina batha, Salem sanna Basumathi)*			Revenue	Yeridyapanahalli	Kanakapura	Bangalore
89	Beach		*Olive Ridley Turtle*	Sandy beach		Devbag	Karwar	Uttara Kannada
90	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*	*Amphibians*	All	Reserve Forest	Sirsi	Sirsi	Uttara Kannada
91	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*	*Amphibians*	All	Reserve Forest	Siddapur	Siddapur	Uttara Kannada
92	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*	*Amphibians*	All	Reserve Forest	Badal	Kumta	Uttara Kannada
93	Estuary		*Fishes, estuarine invertebrates*	Estuary		Gangolli	Honnavar	Uttara Kannada
94	Estuary		*Fishes, estuarine invertebrates*	Estuary		Aghanashini	Kumta	Uttara Kannada
95	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Mesua ferrea*	*Lion-tailed Macaque*	Evergreen Forests	WLS	Pushpagiri	Somvarpet	Kodagu
96	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Dodmane	Siddapur	Uttara Kannada

97	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Devimane	Sirsi	Uttara Kannada
98	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Malemane	Siddapur	Uttara Kannada
99	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Chorla	Khanapur	Belgaum
100	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Siddapur	Siddapur	Uttara Kannada
101	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Gerusoppa	Siddapur	Uttara Kannada
102	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Yellapur	Yellapur	Uttara Kannada
103	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Talewadi	Khanapur	Belgaum
104	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta*		Relic Evergreen Forests	Reserve Forest	Anmode	Jogalpet	Belgaum

105	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Navilthirtha	Saudathi	Belgaum
106	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Narayanpura	Bagalkot	Bagalkot

Annexure C: Hotspots of Despair

SlNo	Ecosystem	Plants	Animals	Habitat	Management Regime	Geographic Location	Causal factor	Taluk	District
1	Agro ecosystem	*Crop Diversity*		Agroecosystems		All taluks			All districts
2	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Rocky and sandy beach		Shirali / Alvekodi	Urban Effluents, Garbage dumping, CRZ Violation	Bhatkal	Uttara Kannada
3	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Rocky and sandy beach		Bailur/Murdeshwar	Unplanned tourism, CRZ	Bhatkal	Uttara Kannada
4	Beach	*Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima*	*Marine invertebrates*	Sandy beach		Gangavali	Destruction of Mangroves	Kumta	Uttara Kannada
5	Dry deciduous forests		*Wroughton's Free Tailed Bat(Otomops wroughtoni)*	Cave		Barapede Cave, Talewadi	Hydro electric project		Belgam
6	Dry deciduous forests	*Anogeisus latifolia, Terminalia sp., Acacia leucophloea, Dyospyros melanoxylon*	*Yellow Throated Bulbul*	Scrub-Deciduous Forest	Reserve Forest	Devarayana Durga	Roads	Tumkur	Tumkur

7	Estuary		*Fishes, estuarine invertebrates*	Estuary		Aghanashini	Shell Miming, Aquaculture, Destruction of Magnroves	Kumta	Uttara Kannada
8	Estuary		*Fishes, estuarine invertebrates*	Estuary		Aghanashini	Shell Miming, Aquaculture, Destruction of Magnroves	Siddapur	Uttara Kannada
9	Estuary		*Fishes, estuarine invertebrates*	Estuary		Kali	Sand Mining, Industrial pollution	Karwar	Uttara Kannada
10	Evergreen Forests	*Canarium strictum, Garcinia gummi-gutta, Syzigyum gardnerii, Depterocarpus indicus,*	*Amphibians*	All	National Park	Kudremukh National Park	Mining		Chikamagalur, Udupi,Dakshina Kannada
11	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Mesea ferrea*	*Amphibians*	All	Sanctuary	Brahmagiri WLS	Mini Hydel Project		Coorg
12	Evergreen Forests	*Syzigyum gardnerii, Artocarpus heterophyllus, Chrysophyllum sp.*	*Amphibians*	All	Reserve Forest	Bisle Ghat	Roads		Coorg
13	Evergreen Forests	*Dipterocarpus indicus, Myristica malabarica, Tetramelus nodiflora*	*Elephant*	Evergreen Forests	Reserve Forest	Charmadi Ghat	Petroleum Pipeline	Belthangadi	Dakshina Kannada

14	Evergreen Forests	*Eleaocarpus munronii, Pterospermum acerifolium, Embelia ribes*	*Lion-tailed Macaque*	Evergreen Forests	Reserve Forest	Agumbe Ghat	Roads	Thirthahalli,Karkala	Shimoga,Udupi
15	Evergreen Forests	*Canarium strictum, Garcinia gummi-gutta, Syzigyum gardnerii, Depterocarpus indicus,*	*Lion-tailed Macaque*	Evergreen Forests	National Park	Kudremukh National Park	Mining		Chikamagalur, Udupi,Dakshina Kannada
16	Evergreen Forests	*Homonoia riparia, Terminalia arjuna, Polygonum chinensis,*		Riparian Forests		Aghanashini River bank	Fragmentation of Riparian Vegetation	Sirsi	Uttara Kannada
17	Evergreen Forests	*Homonoia riparia, Terminalia arjuna,Polygonum chinensis,*		Riparian Forests		Sharavathy bank	Forest Fragmentation, Encroachment	Siddapur	Uttara Kannada
18	Fruit Bats conserved Sacred Grove		*Bats*	Semievergreen Forests	Private	Kolli Bavali Vana (Durgaparameswari Temple)	Deforestation	Belthangadi	Dakshina Kannada
19	Grasslands	*Grasses, other herbs and ground orchids*	*Black Buck*	Grasslands	Sanctuary	Rannebennur	Monoculture		Haveri
20	Human Habitation		*Grey Pelican, Painted Stork*	Human Habitation	Revenue	Kokre Bellur	Ecotourism and Habitat Loss	Maddur	Mandya
21	Human Habitation	*Paracautlea bhatii*		Laterite hill tops	Revenue	Manipal and Alevur	Urbanization	Udupi	Udupi
22	Island		*Sea birds*	Island		Netrani Island	Naval base activities		Uttara Kannada

23	Island		*Sea birds*	Island		Anjadiv Island	Naval base activities		Uttara Kannada
24	Mangrove	*Candelia, Avecennia, Rhizophora*		Mangrove		Mulki	Threat of clearing of mangroves	Mangalore	Dakshina Kannada
25	Mangrove	*Candelia, Avecennia, Rhizophora*		Mangrove		Kundapur	Threat of clearing of mangroves	Kundapur	Udupi
26	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Nalligudda	Urbanization		Bangalore-Rural
27	Reservoir/Lakes		*Water Fowl*	Reservoir/Lakes	Irrigation Department	Naregal		Naregal	Dharwad
28	Sea side		*Water Fowl*	Sea side	CRZ	Tanner Bhavi	Barge mounted projects	Mangalore	Dakshina Kannada
29	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Aghanashini River	Forest Encroachment, Monoculture	Kumta	Uttara Kannada
30	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Sharavati River	Monoculture, Encroachment	Sagar,Honavar	Uttara Kannada/Shimoga
31	River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Netravati River	River Diversion Scheme	Mangalore	Dakshina Kannada

32	Sacred Groves			Tamrind		Nallur Sacred Groove	No Protection	Devanahalli	Bangalore-Rural
33	Sacred Groves			Evergreen Forests		Sorab Taluk	Decline of Sacred Kans	Sorab	Shimoga
34	Scrub Forest		*Black Buck*	Scrub Forest	Revenue/Forest	Mydenahalli	Habitat loss	Sira	Tumkur
35	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Bellandur	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore South	Bangalore-Urban
36	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Varthur	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore South	Bangalore-Urban
37	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Ulsoor	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore South	Bangalore-Urban

38	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Agara	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore South	Bangalore-Urban
39	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Nagavara	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore North	Bangalore-Urban
40	Lakes		*Freshwater Fishes*	Lake	Irrigation Department	Yeshvanthpur	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore North	Bangalore-Urban
41	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Tunga	Flow of untreated sewages,dumping of wastes, washing of vehicles	Harihar	Davanagere

42	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Bhadra	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bhadravathi	Shimoga
43	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Vrishabhavathi	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bangalore South	Bangalore-Rural
44	Reservoir/Lakes		*Freshwater Fishes*	Reservoir/Lakes	Irrigation Department	Byramangala	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bidadi	Bangalore-Rural
45	Sea side		*Marine invertebrates*	Sandy beach		Someswar	Occupational pressure		Dakshina Kannada
46	Sea side		*Marine invertebrates*	Sandy beach		Mulur	Occupational pressure	Udupi	Udupi
47	Sea side		*Marine invertebrates*	Sandy beach		Tekkatte	Occupational pressure	Kundapur	Udupi

48	Sea side		*Marine invertebrates*	Sandy beach		Uliargoli	Occupational pressure	Udupi	Udupi
49	Sea side		*Marine invertebrates*	Sandy beach		Kapu	Occupational pressure	Udupi	Udupi
50	Sea side		*Marine invertebrates*	Sandy beach		Hejamadi	Occupational pressure	Udupi	Udupi
51	Sea side		*Marine invertebrates*	Sandy beach		Tonse	Occupational pressure	Udupi	Udupi
52	Sea side		*Marine invertebrates*	Sandy beach		Pavanje	Occupational pressure	Mangalore	Dakshina Kannada
53	Sea side		*Marine invertebrates*	Sandy beach		Baikampadi industrial estate	Water pollution	Mangalore	Dakshina Kannada
54	Sea side		*Marine invertebrates*	Sandy beach		Panambur	Water pollution	Mangalore	Dakshina Kannada
55	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Nethravathi	Saline intrusion	Mangalore	Dakshina Kannada
56	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Pavanje	Saline intrusion	Mangalore	Dakshina Kannada
57	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Kali	Saline intrusion	Kumta	Uttara Kannada
58	Estuary		*Fishes, estuarine invertebrates*	Estuary		Gurupur	Siltation	Belthangadi	Dakshina Kannada
59	Estuary		*Fishes, estuarine invertebrates*	Estuary		Nethravathi	Siltation	Mangalore	Dakshina Kannada
60	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Kali	Siltation	Kumta	Uttara Kannada

61	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Kundapur	Siltation	Kundapur	Udupi
62	Sea side		*Marine invertebrates*	Sandy beach		Ullal	Costal erosion	Mangalore	Dakshina Kannada
63	Sea side		*Marine invertebrates*	Sandy beach		Bengre	Costal erosion	Mangalore	Dakshina Kannada
64	Sea side		*Marine invertebrates*	Sandy beach		Sasithlu	Costal erosion	Mangalore	Dakshina Kannada
65	Sea side		*Marine invertebrates*	Sandy beach		Udyavara	Costal erosion	Udupi	Udupi
66	Sea side		*Marine invertebrates*	Sandy beach		Hoode	Costal erosion	Udupi	Udupi
67	Mangrove	*Mangrove vegetation*		Mangrove		Kadra	Clearing of mangroves	Kumta	Uttara Kannada
68	Mangrove	*Mangrove vegetation*		Mangrove		Kodibag	Clearing of mangroves	Karwar	Uttara Kannada
69	Mangrove	*Mangrove vegetation*		Mangrove		Karwar	Clearing of mangroves	Karwar	Uttara Kannada
70	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Tungabhadra	Pollution in river	Harihar	Davanagere
71	River		*Freshwater Fishes*	Streams/Rivers	Irrigation Department	Bhadra	Pollution in river	Bhadravati	Shimoga

Annexure D : Biodiversity Elements of Significance

1. Wild relatives of cultivated plants

1	*Acacia catechu*
2	*Amorphophallus sp*
3	*Artocarpus hirsutus*
4	*Bambusa arundinacea*
5	*Carissa carandas*
6	*Cinnamomum malabathrum*
7	*Cinnamomum verum*
8	*Citrus sp*
9	*Colocasia sp*
10	*Crotalaria prostrata*
11	*Crotalaria sp*
12	*Curcuma neilgherrensis*
13	*Curcuma sp*
14	*Dioscorea pentaphylla*
15	*Dioscorea sp*
16	*Dioscorea sp bl*
17	*Dioscorea sp si*
18	*Emblica officinalis*
19	*Garcinia gummi-gutta*
20	*Garcinia indica*
21	*Garcinia morella*
22	*Garcinia talbotii*
23	*Gymnacranthera canarica*
24	*Ipomoea pes-caprae*
25	*Ipomoea sp*
26	*Jasminum sp*
27	*Knema attenuata*
28	*Mangifera indica*
29	*Murraya koenigii*
30	*Musa sp w*
31	*Myristica dactyloides*
32	*Myristica fatua*
33	*Myristica malabarica*
34	*Pinanga dicksonii*
35	*Piper hookeri*
36	*Piper nigrum*
37	*Piper sp*
38	*Piper sp bl*
39	*Piper sp nl*
40	*Piper sp tssl*
41	*Sapindus laurifolius*
42	*Syzygium caryophyllatum*
43	*Syzygium cumini*
44	*Syzygium gardneri*
45	*Syzygium hemisphericum*
46	*Syzygium laetum*
47	*Vigna sp*
48	*Zingiber sp*
49	*Ziziphus rugosa*
50	*Zizyphus oenoplia*

2. Threatened plant species

Sno.	Family	Species	Status	Scale	Source
1	Acanthaceae	Adhatoda beddomei	CR	G	FRLHT
2	Malvaceae	Abutilon ramosum Guillemin & Perrottet	I		WCMC
3	Passifloraceae	Adenia hondala	VU		FRLHT
4	Rutaceae	Aegle marmelos	VU		FRLHT
5	Orchidaceae	Aerides maculosum Lindley	?		WCMC
6	Orchidaceae	Aerides ringens (Lindley) Fischer	?		WCMC
7	Meliaceae	Aglaia canarensis Gamble	I		WCMC
8	Meliaceae	Aglaia talbotii Sund.	V		WCMC
9	Annonaceae	Alphonsea madaraspatana Beddome	?		WCMC
10	Zingiberaceae	Amomum microstephanum Baker	R		WCMC
11	Araceae	Amorphophallus commutatus	VU	G	FRLHT
12	Araceae	Amorphophallus hohenackeri Engl.	I		WCMC
13	Araceae	Amorphophallus mysorensis Barnes et Fischer	I		WCMC
14	Vitaceae	Ampelocissus araneosa	VU	G	FRLHT
15	Vitaceae	Ampelocissus indica	EN		FRLHT
16	Commelinaceae	Aneilema ochraceum Dalz.	I		WCMC
17	Aristolochiaceae	Apama siliquosa Lamk.	?		WCMC
18	Meliaceae	Aphanamixis polystachya	VU		FRLHT
19	Palmae	Arenga wightii Griff.	V		WCMC
20	Araceae	Arisaema barnesii C. Fischer	I		WCMC
21	Araceae	Arisaema murrayi Hook.f.	I		WCMC
22	Aristolochiaceae	Aristolochia tagala	VU		FRLHT
23	Gramineae	Arthraxon depressus Stapf ex C. Fischer	I		WCMC
24	Gramineae	Arthraxon meeboldii Stapf	I		WCMC
25	Moraceae	Artocarpus hirsutus	VU	G	FRLHT
26	Liliaceae	Asparagus asiaticus L.	I		WCMC
27	Malpighiaceae	Aspidopterys canarensis Dalz.	R		WCMC
28	Meliaceae	Azadirachta indica L.	?		WCMC
29	Euphorbiaceae	Baliospermum montanum	VU		FRLHT
30	Begoniaceae	Begonia canarana Miq.	E		WCMC
31	Lauraceae	Beilschmiedia bourdilloni Brandis	I		WCMC
32	Commelinaceae	Belosynapsis vivipara (Dalz.) Sprague & Fischer	V		WCMC
33	Gramineae	Bhidea burnsiana Bor	R		WCMC
34	Euphorbiaceae	Blachia reflexa Benth.	I		WCMC
35	Nyctaginaceae	Boerhavia crispa Heyne ex Hook.f.	I		WCMC
36	Zingiberaceae	Boesenbergia pulcherrima (Wallich) Kuntze	I		WCMC
37	Asclepiadaceae	Brachystelma ciliatum Arekal & Ramakrishna	?		WCMC
38	Asclepiadaceae	Brachystelma kolarensis Arekal & Ramakrishna	?		WCMC
39	Orchidaceae	Bulbophyllum elegantulum (Rolfe) J.J. Smith	V		WCMC
40	Orchidaceae	Bulbophyllum mysorense J.J. Smith	I		WCMC

41	Leguminosae	Cajanus sericus (Benth.) Maesen	I		WCMC
42	Palmae	Calamus brandisii Becc. ex Becc. & Hook.f.	I		WCMC
43	Palmae	Calamus dransfieldii Renuka	?		WCMC
44	Palmae	Calamus karnatakensis Renuka & Lakshmana	?		WCMC
45	Palmae	Calamus lacciferus Lakshmana & Renuka	?		WCMC
46	Palmae	Calamus lakshmanae Renuka	?		WCMC
47	Palmae	Calamus metzianus Schlecht	?		WCMC
48	Palmae	Calamus nagbettai R.R. Fernandez & Dey	I		WCMC
49	Palmae	Calamus prasinus Lakshmana & Renuka	?		WCMC
50	Palmae	Calamus stoloniferus Renuka	?		WCMC
51	Palmae	Calamus thwaitesii Becc.	I		WCMC
52	Palmae	Calamus thwaitesii Becc. canaranus Becc.	?		WCMC
53	Clusiaceae	Calophyllum apetalum	VU	G	FRLHT
54	Asclepiadaceae	Calotropis gigantea (L.) R. Br.	nt		WCMC
55	Combretaceae	Calycopteris floribunda (Roxb.) Lam.	?		WCMC
56	Burseraceae	Canarium strictum	VU	G	FRLHT
57	Capparaceae	Capparis rheedii DC.	R		WCMC
58	Capparaceae	Capparis rotundifolia Rottler	I		WCMC
59	Rhizophoraceae	Cassipourea ceylanica (Gardn) Alston	?		WCMC
60	Vitaceae	Cayratia pedata	EN	G	FRLHT
61	Compositae	Centratherum mayurii C. Fischer	I		WCMC
62	Compositae	Centratherum ritchiei Hook.f.	I		WCMC
63	Compositae	Centratherum tenue C.B. Clarke	I		WCMC
64	Campanulaceae	Cephalostigma flexuosum Hook.f. & Thomson	I		WCMC
65	Asclepiadaceae	Ceropegia attenuata Hook.	R		WCMC
66	Asclepiadaceae	Ceropegia barnesii Bruce & Chatterjee	E		WCMC
67	Asclepiadaceae	Ceropegia fantastica Sedgw.	Ex/E		WCMC
68	Asclepiadaceae	Ceropegia fimbrifera Beddome	V		WCMC
69	Asclepiadaceae	Ceropegia metziana Miq.	R		WCMC
70	Asclepiadaceae	Ceropegia pusilla Wight & Arn.	R		WCMC
71	Asclepiadaceae	Ceropegia spiralis Wight	V		WCMC
72	Gramineae	Chandrasekharania keralensis Uniyal & Pal	?		WCMC
73	Liliaceae	Chlorophytum glaucum Dalz.	I		WCMC
74	Apocynaceae	Chonemorpha fragrans	EN		FRLHT
75	Lauraceae	Cinnamomum macrocarpum	VU	G	FRLHT
76	Lauraceae	Cinnamomum riparium Gamble	R		WCMC
77	Lauraceae	Cinnamomum sulphuratum	VU	G	FRLHT
78	Lauraceae	Cinnamomum wightii	EN	G	FRLHT
79	Commelinaceae	Commelina indehiscens Barnes	R		WCMC
80	Boraginaceae	Cordia evolutior Gamble	?		WCMC
81	Menispermaceae	Coscinium fenestratum	CR		FRLHT

82	Leguminosae	Crotalaria digitata Hook.	R		WCMC
83	Leguminosae	Crotalaria filipes Benth.	I		WCMC
84	Leguminosae	Crotalaria globosa Wight & Arn.	R		WCMC
85	Leguminosae	Crotalaria laburnifolia L.	?		WCMC
86	Leguminosae	Crotalaria lutescens Dalz.	R		WCMC
87	Leguminosae	Crotalaria priestleyoides Benth. ex Baker	R		WCMC
88	Leguminosae	Crotalaria rigida Heyne ex Roth	R		WCMC
89	Leguminosae	Crotalaria sandoorensis Beddome ex Gamble	E		WCMC
90	Lauraceae	Cryptocarya stocksii Meissner	I		WCMC
91	Araceae	Cryptocoryne ciliata Fisch.	I		WCMC
92	Araceae	Cryptocoryne cognata Schott	I		WCMC
93	Araceae	Cryptocoryne cognatoides Blatter & McCann	V		WCMC
94	Araceae	Cryptocoryne wightii Schott	I		WCMC
95	Zingiberaceae	Curcuma montana Roxb.	I		WCMC
96	Zingiberaceae	Curcuma pseudomontana	VU	G	FRLHT
97	Compositae	Cyathocline lutea Law ex Wight	R		WCMC
98	Leguminosae	Cynometra bourdillonii Gamble	V		WCMC
99	Leguminosae	Cynometra travancorica Beddome	R		WCMC
100	Leguminosae	Dalbergia latifolia Roxb.	nt		WCMC
101	Euphorbiaceae	Dalechampia stenoloba Sundar. & Kulk.	R		WCMC
102	Periplocaceae	Decalepis hamiltonii	EN	G	FRLHT
103	Malvaceae	Decaschistia triloba Wight	I		WCMC
104	Orchidaceae	Dendrobium aphyllum (Roxb.) C. Fischer	I		WCMC
105	Orchidaceae	Dendrobium crepidatum Lindley	?		WCMC
106	Orchidaceae	Dendrobium jerdonianum Wight	?		WCMC
107	Orchidaceae	Dendrobium macrostachyum Lindley	?		WCMC
108	Orchidaceae	Dendrobium peguanum (Lindley) Lindley	?		WCMC
109	Orchidaceae	Dendrobium transparens Wallich ex Lindley	?		WCMC
110	Commelinaceae	Dictyospermum ovalifolium Wight	R		WCMC
111	Gramineae	Dimeria woodrowii Stapf	R		WCMC
112	Ebenaceae	Diospyros candolleana	VU	G	FRLHT
113	Ebenaceae	Diospyros paniculata	VU	G	FRLHT
114	Dipterocarpaceae	Dipterocarpus indicus Bedd.	nt		WCMC
115	Droseraceae	Drosera indica	EN		FRLHT
116	Droseraceae	Drosera peltata	EN		FRLHT
117	Meliaceae	Dysoxylum malabaricum	EN	G	FRLHT
118	Elaeocarpaceae	Elaeocarpus munronii (Wt.) Mast.	R		WCMC
119	Leguminosae	Eleiotis trifoliolata Cooke	R		WCMC
120	Myrsinaceae	Embelia ribes	VU		FRLHT
121	Myrsinaceae	Embelia tsjeriam-cottam	VU		FRLHT
122	Tiliaceae	Erinocarpus nimmonii Graham	R		WCMC
123	Eriocaulaceae	Eriocaulon barba-caprae Fyson	Ex/E		WCMC
124	Eriocaulaceae	Eriocaulon barbeyanum Ruhl.	Ex/E		WCMC
125	Eriocaulaceae	Eriocaulon dalzellii Koern.	I		WCMC
126	Eriocaulaceae	Eriocaulon margaretae Fyson	I		WCMC
127	Eriocaulaceae	Eriocaulon mysorense Fyson	R		WCMC
128	Eriocaulaceae	Eriocaulon thomasi Fyson	R		WCMC

129	Myrtaceae	Eugenia cotinifolia Jacq. codyensis (Munro ex Wight) Ashton	I		WCMC
130	Orchidaceae	Eulophia cullenii	CR	G	FRLHT
131	Orchidaceae	Eulophia herbacea Lindley	?		WCMC
132	Orchidaceae	Eulophia ochreata Lindley	?		WCMC
133	Orchidaceae	Eulophia ramentacea Lindley ex Wight	I		WCMC
134	Celastraceae	Euonymus angulatus Wight	E		WCMC
135	Euphorbiaceae	Euphorbia tortilis Rottler ex Wight	?		WCMC
136	Moraceae	Ficus benjamina L. comosa (Roxb.) Kurz	?		WCMC
137	Leguminosae	Flemingia gracilis (Mukerjee) Ali	R		WCMC
138	Cyperaceae	Fuirena trilobites C.B. Clarke	?		WCMC
139	Clusiaceae	Garcinia indica	VU	G	FRLHT
140	Clusiaceae	Garcinia morella	VU		FRLHT
141	Clusiaceae	Garcinia talbotii Raiz. ex Santapau	I		WCMC
142	Clusiaceae	Garcinia travancorica	EN	G	FRLHT
143	Rubiaceae	Gardenia gummifera	VU	G	FRLHT
144	Liliaceae	Gloriosa superba	VU		FRLHT
145	Rutaceae	Glycosmis macrocarpa	VU	G	FRLHT
146	Gramineae	Glyphochloa divergens (Hook.) Clayton	R		WCMC
147	Tiliaceae	Grewia heterotricha Mast.	I		WCMC
148	Myristicaceae	Gymnacranthera canarica (King) Warb	I		WCMC
149	Asclepiadaceae	Gymnema khandalense	EN	G	FRLHT
150	Asclepiadaceae	Gymnema montanum	EN	G	FRLHT
151	Orchidaceae	Habenaria crassifolia A. Rich.	?		WCMC
152	Orchidaceae	Habenaria gibsani foetida Blatter & McCann	?		WCMC
153	Orchidaceae	Habenaria marginata Colebr. flavescens (Hook.f.) Cooke	?		WCMC
154	Rubiaceae	Hedyotis cyanantha Kurz	R		WCMC
155	Rubiaceae	Hedyotis stocksii (Hk.f. & Th.) R. Rao & Hemadri	I		WCMC
156	Boraginaceae	Heliotropium keralense	CR	G	FRLHT
157	Umbelliferae	Heracleum aquilegifolium C.B. Clarke	I		WCMC
158	Apiaceae	Heracleum candolleanum	VU	G	FRLHT
159	Asclepiadaceae	Holostemma ada-kodien	VU		FRLHT
160	Dipterocarpaceae	Hopea canarensis Hole	?		WCMC
161	Dipterocarpaceae	Hopea glabra W. & A.	nt		WCMC
162	Dipterocarpaceae	Hopea jacobi C. Fischer	R		WCMC
163	Dipterocarpaceae	Hopea parviflora Bedd.	nt		WCMC
164	Dipterocarpaceae	Hopea ponga (Dennst.) Mabberley	nt		WCMC
165	Dipterocarpaceae	Hopea racophloea Dyer	nt		WCMC
166	Gramineae	Hubbardia heptaneuron Bor	Ex		WCMC
167	Linaceae	Hugonia belli Sedgwick	R		WCMC
168	Caesalpiniaceae	Humboldtia vahliana	EN	G	FRLHT
169	Flacourtiaceae	Hydnocarpus alpina	VU	G	FRLHT
170	Flacourtiaceae	Hydnocarpus macrocarpa	EN	G	FRLHT
171	Flacourtiaceae	Hydnocarpus pentandra	VU	G	FRLHT
172	Podostemaceae	Hydrobryopsis sessilis (Willis) Engl.	I		WCMC
173	Acanthaceae	Hygrophila pinnatifida (Dalz.) Sreemadh.	I		WCMC
174	Balsaminaceae	Impatiens acaulis Arn.	I		WCMC

175	Balsaminaceae	Impatiens barberi Hook.f.	I		WCMC
176	Balsaminaceae	Impatiens dassysperma Wight	I		WCMC
177	Balsaminaceae	Impatiens dendricola C. Fischer	I		WCMC
178	Balsaminaceae	Impatiens lucida Heyne	I		WCMC
179	Balsaminaceae	Impatiens nataliae Hook.f.	I		WCMC
180	Balsaminaceae	Impatiens stocksii Hook.f.	I		WCMC
181	Balsaminaceae	Impatiens talbotii Hook. f.	E		WCMC
182	Leguminosae	Indigofera constricta (Thwaites) Trimen	R		WCMC
183	Liliaceae	Iphigenia magnifica Ansari & R. Rao	V		WCMC
184	Liliaceae	Iphigenia sahyadrica Ansari & R. Rao	E		WCMC
185	Liliaceae	Iphigenia stellata	EN		FRLHT
186	Gramineae	Isachne gracilis C.E. Hubb.	I		WCMC
187	Gramineae	Isachne lisboae Hook.f.	I		WCMC
188	Gramineae	Isachne meeboldii C. Fischer	R		WCMC
189	Gramineae	Isachne mysorensis Raghavan	R		WCMC
190	Gramineae	Isachne setosa Hook. f.	R		WCMC
191	Rubiaceae	Ixora lawsoni Gamble	I		WCMC
192	Periplocaceae	Janakia arayalpathra	CR	G	FRLHT
193	Oleaceae	Jasminum officinale L.	nt		WCMC
194	Acanthaceae	Justicia salsoloides T. Anderson	I		WCMC
195	Crassulaceae	Kalanchoe glandulosa Hochst. ex A. Rich	?		WCMC
196	Caesalpiniaceae	Kingiodendron pinnatum	VU	G	FRLHT
197	Leguminosae	Kingiodendron pinnatum (Roxb. ex DC.) Harms	R		WCMC
198	Araceae	Lagenandra meeboldii (Engl.) C. Fischer	I		WCMC
199	Lythraceae	Lagerstroemia thomsonii Koehne	I		WCMC
200	Rubiaceae	Lasianthus capitulatus Wight	I		WCMC
201	Labiatae	Leucas angustissima Sedgw.	R		WCMC
202	Oleaceae	Ligustrum decaisnei C.B. Clarke beddomei Gamble	I		WCMC
203	Liliaceae	Lilium neilgherrense Wight	I		WCMC
204	Orchidaceae	Liparis nervosa (Thunb.) Lindley	?		WCMC
205	Lauraceae	Litsea mysorensis Gamble	I		WCMC
206	Orchidaceae	Luisia teretifolia Gaudich.	?		WCMC
207	Acanthaceae	Mackenziea caudata (T. And.) Ramam.	I		WCMC
208	Sapotaceae	Madhuca insignis (Radlk.) H.J. Lam	Ex/E		WCMC
209	Sapotaceae	Madhuca longifolia	VU		FRLHT
210	Sapotaceae	Madhuca neriifolia	VU		FRLHT
211	Asclepiadaceae	Marsdenia raziana Yog. et Subr.	R		WCMC
212	Convolvulaceae	Merremia turpethum	VU		FRLHT
213	Magnoliaceae	Michelia champaca	EN		FRLHT
214	Magnoliaceae	Michelia nilagirica	VU	G	FRLHT
215	Tiliaceae	Microcos heterotricha	I		WCMC
216	Cucurbitaceae	Momordica subangulata Blume	I		WCMC
217	Commelinaceae	Murdannia versicolor (Dalz.) Bruckner	I		WCMC
218	Myristicaceae	Myristica dactyloides	VU		FRLHT
219	Myristicaceae	Myristica fatua Houtt. magnifica (Beddome) Sincl.	I		WCMC
220	Myristicaceae	Myristica malabarica	VU	G	FRLHT
222	Compositae	Nanothamnus sericeus Rhoma.	R		WCMC

223	Rubiaceae	Neanotis carnosa (Dalz.) W. Lewis	I		WCMC
224	Rubiaceae	Neanotis monosperma (Wight & Arn.) W. Lewis	I		WCMC
225	Rubiaceae	Neanotis montholonii (Hook.f.) W. Lewis	I		WCMC
226	Rubiaceae	Neanotis prainiana (Talbot) Lewis	V		WCMC
227	Rubiaceae	Neanotis quadrilocularis (Th.) Lewis.	?		WCMC
228	Rubiaceae	Neanotis rheedii (Wight & Arn.) W. Lewis	I		WCMC
229	Orchidaceae	Nervilia aragoana Gaudich.	?		WCMC
230	Orchidaceae	Nervilia crispata (Blume) Schltr.	?		WCMC
231	Orchidaceae	Nervilia infundibulifolia Blatter & McCann	?		WCMC
232	Orchidaceae	Nervilia juliana (Roxb.) Schltr.	I		WCMC
233	Orchidaceae	Nervilia prainiana (Blume) Makino	?		WCMC
234	Acanthaceae	Nilgirianthus campanulatus (Wight) Bremek.	I		WCMC
235	Acanthaceae	Nilgirianthus ciliatus	EN	G	FRLHT
236	Leguminosae	Nogra dalzellii (Baker) Merr.	V		WCMC
237	Icacinaceae	Nothapodytes nimmoniana	EN		FRLHT
238	Orchidaceae	Oberonia bicornis Lindley	?		WCMC
239	Orchidaceae	Oberonia brachyphylla Blatt. & McCann	R		WCMC
240	Orchidaceae	Oberonia recurva Lindley	?		WCMC
241	Orchidaceae	Oberonia tenuis Lindley	?		WCMC
242	Gramineae	Ochlandra talbotii Brandis	?		WCMC
243	Rubiaceae	Ochreinauclea missionis	VU	G	FRLHT
244	Asclepiadaceae	Oianthus beddomei Hook.f.	I		WCMC
245	Asclepiadaceae	Oianthus disciflorus Hook.f.	I		WCMC
246	Rubiaceae	Ophiorrhiza brunonis Wight & Arn.	Ex		WCMC
247	Rubiaceae	Ophiorrhiza codyensis Gamble	I		WCMC
248	Annonaceae	Orophea uniflora Hook.f. & Thomson	I		WCMC
249	Bignoniaceae	Oroxylum indicum	VU		FRLHT
250	Melastomataceae	Osbeckia stellata Buch. Ham. ex Ker-Gawler hispidissima (Wight) Hansen	I		WCMC
251	Amaryllidaceae	Pancratium parvum Dalz.	I		WCMC
252	Pandanaceae	Pandanus canaranus Warb.	I		WCMC
253	Boraginaceae	Paracaryum coelastinum (Lindley) Benth.	I		WCMC
254	Boraginaceae	Paracaryum malabaricum C.B. Clarke	I		WCMC
255	Zingiberaceae	Paracautleya bhatii Smith	V		WCMC
256	Orchidaceae	Peristylus brachyphyllus A. Rich.	?		WCMC
257	Orchidaceae	Peristylus secundus (Lindley) Rathakr.	?		WCMC
258	Lauraceae	Persea macrantha	EN		FRLHT
259	Orchidaceae	Phalaenopsis mysorensis J. Saldanha	?		WCMC
260	Acanthaceae	Phlebophyllum canaricum (Beddome) Bremak.	I		WCMC
261	Acanthaceae	Phlebophyllum lanatum (Nees) Bremak.	I		WCMC
262	Euphorbiaceae	Phyllanthus talbotii Sedw.	R		WCMC
263	Piperaceae	Piper barberi	CR	G	FRLHT
264	Piperaceae	Piper mullesua	VU		FRLHT
265	Lamiaceae	Plectranthus nilgherricus	EN	G	FRLHT
266	Rubiaceae	Plectronia ficiformis (Hook.f.) Gamble	I		WCMC
267	Annonaceae	Polyalthia longifolia (Sonn.) Thwaites	nt		WCMC
268	Orchidaceae	Polystachya flavescens (Blume) J.J. Smith	?		WCMC

269	Umbelliferae	Polyzygus tuberosus Dalz.	R		WCMC
270	Araceae	Pothos armatus C. Fischer	I		WCMC
271	Araceae	Pothos thomsonianus Schott	I		WCMC
272	Fabaceae	Pseudarthria viscida	VU		FRLHT
273	Fabaceae	Pterocarpus santalinus	CR	G	FRLHT
274	Sterculiaceae	Pterospermum reticulatum Wight & Arn.	R		WCMC
275	Fabaceae	Pueraria tuberosa	CR		FRLHT
276	Myrsinaceae	Rapanea striata Mez	I		WCMC
277	Apocynaceae	Rauvolfia serpentina	EN		FRLHT
278	Araceae	Rhaphidophora pertusa	VU		FRLHT
279	Leguminosae	Rhynchosia beddomei Baker	R		WCMC
280	Orchidaceae	Rhynchostylis latifolia C. Fischer	I		WCMC
281	Rosaceae	Rosa involucrata Roxb.	I		WCMC
282	Lythraceae	Rotala fimbriata Wight	?		WCMC
283	Lythraceae	Rotala macrandra Koehne	?		WCMC
284	Lythraceae	Rotala ritchiei (C.B. Clarke) Koehne	Ex/E		WCMC
285	Rosaceae	Rubus fockei Gandhi	I		WCMC
286	Acanthaceae	Rungia linifolia Nees	I		WCMC
287	Annonaceae	Sageraea laurifolia (Grah.) Blatter	I		WCMC
288	Celastraceae	Salacia macrosperma Wight	I		WCMC
289	Celastraceae	Salacia malabarica Gamble	Ex/E		WCMC
290	Hippocrateaceae	Salacia oblonga	EN		FRLHT
291	Hippocrateaceae	Salacia reticulata	CR		FRLHT
292	Santalaceae	Santalum album Linn.	nt		WCMC
293	Caesalpiniaceae	Saraca asoca	EN		FRLHT
294	Gramineae	Schizachyrium paranjpyeanum (Bhide) Raizada et Jain	R		WCMC
295	Oleaceae	Schrebera swietenioides	VU		FRLHT
296	Umbelliferae	Schultzia benthami C.B. Clarke	I		WCMC
297	Anacardiaceae	Semecarpus travancorica	EN	G	FRLHT
298	Compositae	Senecio dalzellii C.B. Clarke	I		WCMC
299	Compositae	Senecio mayurii C. Fischer	R		WCMC
300	Dipterocarpaceae	Shorea robusta Gaertner f.	nt		WCMC
301	Dipterocarpaceae	Shorea roxburghii G. Don	nt		WCMC
302	Dipterocarpaceae	Shorea tumbuggaia	CR	G	FRLHT
303	Marantaceae	Stachyphrynium spicatum (Roxb.) Schumann	I		WCMC
304	Acanthaceae	Stenosiphonium setosum T. Anderson	I		WCMC
305	Loganiaceae	Strychnos aenea	EN	G	FRLHT
306	Loganiaceae	Strychnos colubrina L.	I		WCMC
307	Gentianaceae	Swertia beddomei C.B. Clarke	I		WCMC
308	Gentianaceae	Swertia corymbosa	VU	G	FRLHT
309	Gentianaceae	Swertia lawii	EN	G	FRLHT
310	Symplocaceae	Symplocos racemosa	VU		FRLHT
311	Myrtaceae	Syzygium munronii (Wight) Balakr.	?		WCMC
312	Myrtaceae	Syzygium stocksii (Duthie) Gamble	I		WCMC
313	Myrtaceae	Syzygium travancoricum	EN	G	FRLHT
314	Rubiaceae	Tarenna agumbensis Sundararaghaven	V		WCMC
315	Leguminosae	Tephrosia pentaphylla (Roxb.) Sweet	I		WCMC

316	Ranunculaceae	Thalictrum dalzellii Hook.	I		WCMC
317	Araceae	Theriophonum dalzellii Schott	R		WCMC
318	Menispermaceae	Tinospora sinensis	VU		FRLHT
319	Euphorbiaceae	Tragia bicolor	VU	G	FRLHT
320	Trichopodaceae	Trichopus zeylanicus	EN	G	FRLHT
321	Araceae	Typhonium bulbiferum Dalzell in Hooker	R		WCMC
322	Periplocaceae	Utleria salicifolia	CR	G	FRLHT
323	Valerianaceae	Valeriana leschenaultii	CR	G	FRLHT
324	Orchidaceae	Vanilla walkeriae Wight	I		WCMC
325	Dipterocarpaceae	Vateria indica Linn	nt		WCMC
326	Dipterocarpaceae	Vateria macrocarpa	CR	G	FRLHT
327	Dipterocarpaceae	Vatica chinensis Linn	V		WCMC
328	Loganiaceae	Viscum mysorense Gamble	I		WCMC
329	Rubiaceae	Wendlandia lawii Hook.f.	I		WCMC
330	Alismataceae	Wiesneria triandra (Dalz.) Mich.	I		WCMC
331	Zingiberaceae	Zingiber cernuum Dalz.	I		WCMC
332	Rhamnaceae	Ziziphus horrida Roth	I		WCMC
333	Rhamnaceae	Ziziphus jujuba Miller	nt		WCMC

3. Threatened fish species

Sl.No.	**Fresh water fishes**
1	*Cirrhinus cirrhosa*
2	*Labeo bata*
3	*Labeo fimbriatus*
4	*Labeo calbasu*
5	*Labeo porcellus*
6	*Labeo potail*
7	*Gonoproktopterus curmuca*
8	*Gonoproktopterus dubius*
9	*Gonoproktopterus micropogon micropogon*
10	*Puntius carnaticus*
11	*Puntius dorsalis*
12	*Puntius pulchellus*
13	*Puntius puckelli*
14	*Puntius narayani*
15	*Thynnichthys sandkhol*
16	*Mystus krishnensis*
17	*Mystus punctatus*
18	*Pangasius pangasius*
19	*Neotropius khavalchor*
20	*Silonia childrenii*
21	*Bagarius yerrelli*
22	*Channa marulius*
23	*Channa striatus*
24	*Wallago attu*
25	*Clarias batrachus*
26	*Heteropneustes fossilis*
27	*Aorichthys aor*
28	*Aorichthys seenghala*
29	*Rita gogra*
30	*Rita pavimentata*
31	*Botia striata*
32	*Horaichthys setnai*
33	*Tor mussullah*
	Marine/Esutarine/Brakishwater Fishes
1	*Sardinella longiceps*
2	*Anadontostoma chacunda*
3	*Megalops cyprinoides*
4	*Chanos chanos*
5	*Arius tenuispinis*
6	*Arius jella*
7	*Mystus gulio*
8	*Lates calcarifer*
9	*Lutjanus argentimaculatus*
10	*Mugil cephalus*

11	*Formio niger*
12	*Cybium spp.*
13	*Cynoglossus spp.*
	Riverine Fishes
1	*Cirrhinus cirrhosa*
2	*Cirrhinus reba*
3	*Labeo bata*
4	*Labeo kontius*
5	*Labeo nigrescens*
6	*Gonoproktopterus curmuca*
7	*Puntius carnaticus*
8	*Puntius narayani*
9	*Neolissochilus hexagonolepis*
10	*Macrognathus aral*
11	*Anguilla bengalensis bengalensis*
	Reservoir Fishes
1	*Labeo fimbriatus*
2	*Labeo calbasu*
3	*Puntius filamentosus*
4	*Puntius pulchellus*
5	*Puntius sarana sarana*
6	*Mystus krishnensis*
7	*Bagarikus yerrelli*
8	*Aorichthys aor*
9	*Aorichthys seenghala*
10	*Wallago attu*
	Extinct Fish species
	Gonoproktopterus thomassi

4. Threatened bird species

sl.No	Common Name	Scientific Name	Category	Habitat
1	White-Backed Vulture	*Gyps bengalensis*	Critical	Dry plains
2	Long-billed Vulture	Gyps indicus	Critical	Dry plains
3	Great Indian Bustard	*Ardeotis nigriceps*	Endangered	Grasslands
4	Lesser Florican	*Sypheotides indica*	Endangered	Grasslands
5	Spot-billed Pelican	*Pelecanus philippensis*	Vulnerable	Wetlands
6	Lesser Adjutant	*Leptoptilos javanicus*	Vulnerable	Wetlands
7	Pallas's Fish-Eagle	*Haliaeetus leucoryphus*	Vulnerable	Wetlands
8	Lesser Kestrel	*Falco naumanni*	Vulnerable	Grasslands
9	Sociable Lapwing	*Vanellus gregarious*	Vulnerable	Wetlands
10	Nilgiri Wood Pigeon	*Columba elphinstonii*	Vulnerable	Evergreen Forests
11	Yellow-throated Bulbul	*Pycnonotus xantholaemus*	Vulnerable	Dry deciduous Forests
12	White-bellied shortwing	*Brachypteryx major*	Vulnerable	Shola
13	Broad-tailed Grass bird	*Schoenicola platyura*	Vulnerable	High altitude Grasslands
14	Pied or White-naped Tit	*Parus nuchalis*	Vulnerable	Dry deciduous Forests
15	Green Munia	*Amandava formosa*	Vulnerable	Wetlands
16	Darter	*Anhinga melanogaster*	Criteria nearly met	Wetlands
17	Painted Stork	*Mycteria leucocephala*	Criteria nearly met	Wetlands
18	Black-necked Stork	*Ephippiiorhaynchus asiaticus*	Criteria nearly met	Wetlands
19	Oriental White Ibis	*Threskiornis melanocephalus*	Criteria nearly met	Wetlands
20	Ferruginous Pochard	*Aythya nyroca*	Criteria nearly met	Wetlands
21	Greater Grey-headed Fish Eagle	*Ichthyophaga ichthyaetus*	Criteria nearly met	Wetlands
22	Red-headed Vulture	*Sacrogyps calvus*	Criteria nearly met	Dry deciduous Forests
23	Pallid Harrier	*Circus macrourus*	Criteria nearly met	Grasslands
24	Asian Dowitcher	*Limnodromus semipalmatus*	Criteria nearly met	Wetlands
25	Malabar Pied Hornbill	*Anthracoceros coronatus*	Criteria nearly met	Evergreen Forests
26	Great Pied Hornbill	*Buceros bicornis*	Criteria nearly met	Evergreen Forests
27	Grey-breasted Laughing thrush	*Garrulax jerdoni*	Criteria nearly met	Shola
28	White Stork	*Ciconia ciconia*	Locally Threatened	Wetlands
29	Large Cormorant	*Phalacrocorax carbo*	Locally Threatened	Wetlands
30	White Necked Stork	*Ciconia episcopus*	Locally Threatened	Wetlands
31	Spoon Bill	*Platalea leucorodia*	Locally Threatened	Wetlands
32	Lesser Whistling Teal	*Dendrocygna javanica*	Locally Threatened	Wetlands
33	Bar Headed Geese	*Anser anser*	Locally Threatened	Wetlands
34	Black Bellied Tern	*Sterna acuticauda*	Locally Threatened	Wetlands
35	Small Indian Practincole	*Glareola lactea*	Locally Threatened	Wetlands
36	Black Ibis	*Pseudibis papillosa*	Locally Threatened	Wetlands
37	Glossy Ibis	*Plegadis falcinellus*	Locally Threatened	Wetlands
38	Great Stone Plover	*Esacus magnirostris*	Locally Threatened	Wetlands
39	White Bellied Sea Eagle	*Haliaeetus leucogaster*	Locally Threatened	Wetlands

40	Lesser Adjutant Stork	*Leptoptilos javanicus*	Locally Threatened	Wetlands
41	Avocet	*Recurvirostra avosetta*	Locally Threatened	Wetlands
42	Lesser Frigate Bird	*Fregata minor*	Locally Threatened	Wetlands
43	White Ibis	*Threskiornis aethiopica*	Locally Threatened	Wetlands
44	Flamingo	*Phoeniconaias minor*	Locally Threatened	Wetlands
45	Demoiselle Crane	*Anthropoides virgo*	Locally Threatened	Wetlands
46	Alexandrine Parakeet	*Psittacula eupatria*	Locally Threatened	Dry deciduous Forests
45	Great Black Woodpecker	*Dryocopus*	Locally Threatened	Evergreen Forests
45	Ceylon Frogmouth	*Batrachostomus moniliger*	Locally Threatened	Evergreen Forests

5. Other threatened animal species

The threatened animal of Karnataka				
	(Source: WCMC,	1994)		
SlNo.	**Class**	**Family**	**Scientific Name**	**Common Name**
	Insecta			
	Butterflies			
1		Danaidae	*Idea malabarica*	Malabar Tree Nymph
	Reptilia			
2		Crocodylidae	*Crocodylus palustris*	Mugger
3		Boidae	*Python molurus*	Indian Python
4		Cheloniidae	*Eretmochelys imbricata*	Hawksbill Turtle
5			*Lepidochelys olivacea*	Olive Ridley
6		Emydidae	*Geoclemys hamiltonii*	Black Pond Turtle
7			*Geoemyda silvatica*	CochinForest Cane
8		Testudinidae	*Indotestudo forstenii*	
	Amphibia			
9		Bufonidae	*Pedostibes tuberculosus*	MalabarTreeToad
10		Microhylidae	*Melanobatrachus indicus*	Black Microhylid
	Mammalia			
11		Bovidae	*Antilope cervicapra*	Blackbuck
12			*Bos gaurus*	Gaur
13			*Tetracerus quadricornis*	Four-horned Antelope
14		Canidae	*Canis lupus*	Grey Wolf
15			*Cuon alpinus*	Asiatic WildDog
16			*Vulpes bengalensis*	Bengal Fox
17		Felidae	*Panthera tigris*	Tiger
18			*Prionailurus rubiginosa*	Rusty-spotted Cat
19			*Prionailurus viverrinus*	Fishing Cat
20		Mustelidae	*Aonyx cinerea*	Oriental Small-clawed Otter
21			*Lutra perspicillata*	Smooth-coated Otter
22			*Martes gwatkinsii*	Nilgiri Marten
23		Ursidae	*Melursus ursinus*	Sloth Bear
24		Viverridae	*Paradoxurus jerdoni*	Jerdon's Palm Civet
25		Molossidae	*Otomops wroughtoni*	Wroughton's Free-tailed Bat
26		Cercopithecidae	*Macaca silenus*	Lion-tailed Macaque
27			*Trachypithecus johnii*	NilgiriLeaf Monkey
28		Elephantidae	*Elephas maximus*	Indian Elephant

6. Amphibians

The Western Ghats is one of the amphibian hotspots of the world. Of the 117 species of amphibians reported from the region, 111 (95%) are known from the latitudes 8-13°N. Within this zone, area between 11-12°N and 12-13°N are the richest with fifty-one and fifty-five species respectively. The Western Ghats of Coorg, Hassan, Chikamagalur, Mangalore and Udupi districts fall under this latitudinal zone. Frogs such as *Ansonia ornata*, is known only from the Brahmagiris (Coorg) and Naravi range (Kudremukh National Park) of Coorg and Dakshin Kannada districts respectively. A recently concluded study at the Kudremukh National Park reported 35 species of amphibians and discovered a new frog species *Nyctibatrachus hussainii*. The Kempholey, in the Hassan district is a hotspot for amphibians and a large number of species, such as *Bufo brevirostris, Ramanella marmorata, Nanobatrachus kempholeyensis* and *Nyctibatrachus sylvaticus* are restricted to this locality. Most of the endemic frogs are confined to the evergreen forests of this region and they are entirely depended on torrential streams for their breeding. The major threats to the amphibian diversity of the region include, agriculture expansion and stream impoundment. Though the region is known to be an amphibian hotspot, there are no recent systematic studies and most of the species are known only from the literature.

Reference:

1. Daniels, R.J.R (1992). Geographical distribution patterns of amphibians of the Western Ghats, India. J.Biogeography, 19;521-529.

2. Daniels, R.J.R (1997). A field guide to the frogs and toads of the Western Ghats, India. Cobra, Vols 27, 28 and 29.

3. Krishnamurthy, S.V (1999). Amphibian diversity in a few selected environs of Western Ghats. In: Biodiversity of the Western Ghats complex of Karnataka: Resource potential and sustainable utilisation. (Eds: Hussain, S.A and Achar, K.P). Biodiversity Initiative Trust, Mangalore, pp 253.

7. Marine mammals

Some of the Marine mammals that could possibly occur along the sea coast of Karnataka: Source: **Dipani Sutaria**
Distribution records of marine mammals from Bombay to Kanyakumari from published accounts.
B=Beached or Live stranding, C=Carcass or skeleton, L=Landed or fishing by catch, S=Positive sighting.
Nomenclature: Rice (1998).

Species	**Common name**	**Bombay to Mangalore**	**Mangalore to Kanyakumari**	**Oceanic Arabian Sea**	**IUCN status**	**Worldwide Habitat information**
Delphinus capensis tropicalis	Common dolphin	BL	L		Insufficiently known	coastal and offshore water
Grampus griseus	Risso's dolphin	S	S		Insufficiently known	offshore
Pseudorca crassidens	False killer whale	C	BCL	C	Insufficiently known	semi-enclosed seas
Sousa chinensis	Indo pacific humpback dolphin	BL	BCLS		Insufficiently known	warm shallow coast, estuaries
Stenella attenuata	Pantropical spotted dolphin			S	Insufficiently known	cool, deep offshore water
Stenella longirostris	Spinner dolphin		CL	S	Insufficiently known	inshore and offshore waters
Tursiops aduncus/truncatus	Bottlenose dolphin	S?	BCLS		Insufficiently known	inshore and offshore waters
Neophocaena phocaenoides	Finless Porpoise	CLS	BCL		Insufficiently known	shallow inshore waters, rivers, estuaries
Kogia breviceps	Pygmy sperm whale		B		Insufficiently known	oceanic waters
Kogia sima	Dwarf Sperm whale		C		Insufficiently known	oceanic waters
Physeter macrocephalus	Sperm whale	B	C		Insufficiently known	oceanic waters
Balaenoptera borealis	Sei whale		B		Vulnerable	oceanic waters
Balaenoptera edeni	Bryde's whale	B	B		Insufficiently known	inshore and offshore waters
Balaenoptera musculus	Blue whale	B	CB		Endangered	offshore waters
Balaenoptera physalus	Fin whale	B	B	C	Vulnerable	offshore waters
Megaptera novaeangliae	Humpback whale		B		Vulnerable	inshore and offshore waters

Annual Census report of Wild Animal of Karnataka State for the year 1997-1998

(Source: Karnataka Forest Department)

Sl. No	NAME OF THE CIRCLE	NAME OF THE DIVISION	Tiger	Gaur	Elephant	Panther	Bear	Wild Boar	Deer	Bison	Sambar	Fox
1.	BANGALORE CIRCLE	Bangalore Rural	-	-	37	7	-	-	-	-	-	-
		Bangalore Urban	-	-	-	-	-	-	-	-	-	-
		Kolar	-	-	-	-	-	-	-	-	-	-
		Total of B'lore Grde	-	-	37	7	-	-	-	-	-	-
2.	BELLARY CIRCLE	Bellary	-	-	-	20	96	-	-	-	-	-
		Chitradurga	_	.	.	104	232	-	1080	_	-	704
		Total of Bellary Circle,	-	-	-	124	328	—	1080	-	-	704
3.	BELGAUM CIRCLE	Belgaum	10		71	23	250	2020	233	-	108	
		Ghataprabha	-	-	-	-	-	-	-	-	-	-
		Baealokot	-	-	-	-	-	-	-	-	-	-
		Total of Belgaum Circle,	*1 0*		*71*	*23*	*250*	*2020*	233	-	*108*	-
4.	KANARA CIRCLE	Sirsi	1	_	-	-	251	133	64	102	*19*	9
		Haliyal	**1**1	_	45	9	175	451	830	672	103	61
		Yellapur	8	_		5	156	375	754	571	86	30
		Honavar	21	_	1	34	190	357	351	376	23	67
		Karwar	28	.	3	14	120	438	437	216	13	23
		Total ofKanara Circle.	*69*	—	52	*62*	*892*	*1754*	*2436*	1937	*244*	*190*
5.	GULBARGA CIRCLE	Gulbarga	-	-	-	-	-	1200	340	-	-	1160
		Bidar	-	-	-	-	-	-	-	-	-	-
		Raichur	-	-	-	-	-	-	-	-	-	-
		Total of Gulbarga Circle	-	-	-	-	-	1200	340	-	-	1160
6.	HASSAN CIRCLE	Hassan	-	-	-	-	-	-	-	-	-	
		Tumkur	-	-	-	-	-	-	-	-	-	
		Total of Hassan	-	-	-	-	-	-	-	-	-	
7.	KODAGU CIRCLE	Madikeri	-	-	-	-	-	-	-	-	-	
		Mangalore	5	-	61			1165	174	260	-	
		Kundapura	33	-	-	61	-	-	-	-		
		Total of Kodagu Circle	38	-	61	61		1165	174	-		
8.	MYSORE CIRCLE	Mysore	-	-	-	-	-	-	-	-	-	

		Kollegal	-	-	-	-	-	-	-	-	-	
		Hunsur	2	-	-	-	-	-	-	-	-	
		Mandya	-	-	-	-	-	-	-	-	-	
		Total of Mysore Circle	2	-	-	-	-	-	-	-	-	
9.	SHIMOGA CIRCLE	Shimoga	25	-	27	-			-	619	16	35
		Bhadravathi	19	-	-	72	131	2914	-	-	-	
		Sagar	-	-	-	-	-	-	-	-	-	
		Chikmangulur	23	-	20	27	780	470	-	-	-	
		Koppa	16	-	6	4		614	174		59	
		Total of Shimoga	83	-	53	103	911	4730	215	35	167	
10.	WILDLIFE NORTH NORTH CIRCLE SHIMOGA	Bhadra Wildlife Division.	13	-	203	-	-	-	-	-	-	
		Shimoga Wildlife Division.	9	-	-	20	4	919	1100	-	238	
		Kudremukh WL Division.	-	-	4	54	39	116	121	425	296	
		Dandeli Wildlife Division	11	-	45	9	390	-	2090	1817	518	
		Dhanvad Wildlife Sub-division.	-	-	-	23	53	-	5786	-	-	52
		Total of WL North Circle.	*33*	-	*252*	*106*	*486*	*1035*	*9097*	*2242*	*1052*	52
11.	WILDLIFE SOUTH	Hunsur Wildlife Division.	56	170	707	-	-	-	1164	-	96	-
		Chamarajnagar Wildlife Division.	24	1190	645	-	-	3561	3509	1490	943	-
		Wildlife Sub-Division Madikeri	*5*	-	-	12	-	-	-	-	-	-
		Wildlife Sub-Division Mysore	*2*	-	-	-	-	-	-	—	-	-

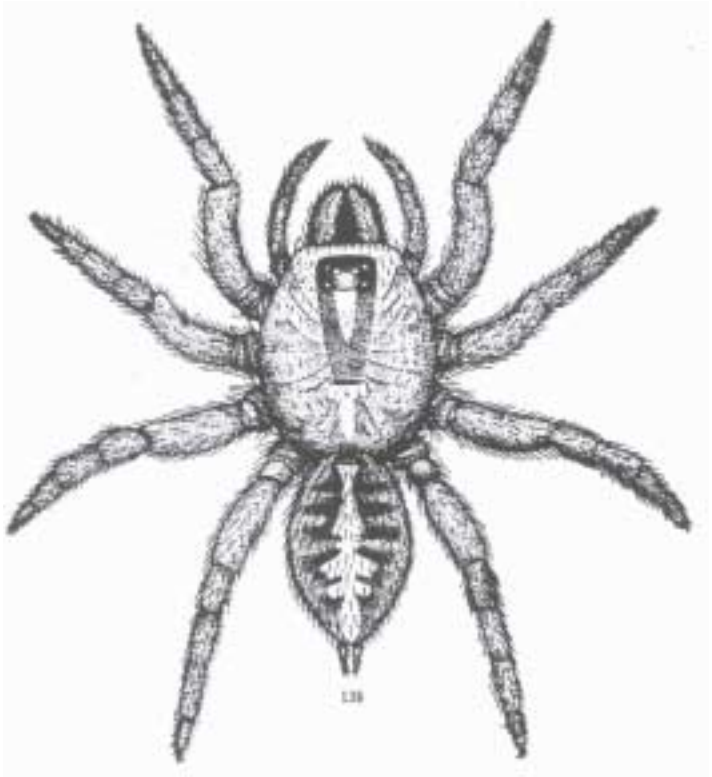
		Total of WL South Circle.	*87*	*1360*	*1352*	*12*	-	*3561*	*4673*	*1490*	*1039*	-
12.	PROJECT TIGER MYSORE	Project Tiger Division	*1 2*	-	3471	88	-	-	8204	*2421*	2386	-
		Total of WL PT, Mysore	*7 2*		*3471*	*88*	-	-	*8204*	*2427*	*2386*	-
13.	BNP *AND* CAUYERY WL DIVISION	Banner hatta	-	-	52	11	9	20	*12*	52	*2*	11
		Cauvery Wildlife Division Kanakapura	1	-	697	23	26	395	746	41	-	-
		Total	J	-	*749*	*34*	*35*	*415*	*818*	*93*	*2*	11
GRAND TOTAL			**395**	**1360**	**6098**	**620**	**2902**	**15880**	**27270**	**8484**	**4998**	**2117**

8. Proposed heritage sites

1. Yana - Rock mountain and umbrella palm site- Kumta Taluk; Uttara Kannada district
2. Pilar Kan-Sacred grove-Udupi taluk; Udupi district
3. St. Mary's Island – Udupi Taluk; Udupi district
4. Devbag – Turtle breeding site- Karwar Taluk; Uttara Kannada district
5. Kolli Bavali Vana- Bat sacred grove- Belthangadi taluk; Dakshina Kannada district
6. Kokre Bellur – Heronary- Maddur Taluk; Mandya District
7. Nallur Sacred Tamrind Grove – Devanahalli Taluk; Bangalore –Rural
8. Mydenahalli proposed black buck sanctuary – Sira Taluk; Tumkur district
9. Anjadiv Island- Honnavara Taluk; Uttara Kannada district
10. Myristica swamp and its surroundings in Mahime village in Honavar taluk; Uttara Kannada district
11. Karikanamman forest in Honavar taluk; Uttara Kannada district
12. Katlekan forest in Siddapur taluk; Uttara Kannada district
13. Bheemgad bat sanctuary in Khanapur Taluk, Belgaum district

9. Pictures of some new species described from Karnataka

Paracoutlea bhatii.



Ornithoctonus gadgilii

Parabatasio sharavatiensis

Nyctibatrachus hussaini