SSC Chattisgarh 5.4.1/RemDOC/Draft Action Plan/ver.1 SSC Chattisgarh

CHAPTER-I
INTRODUCTION

1. Background

The future of life on earth attracted world attention at the earth summit in Rio de Janeiro in 1992 when 155 nations of the world signed the Convention on Biological Diversity (CBD). It coordinates to form a global mutual understanding to protect habitat, species, genes to shift to sustainable modes of resource use and to make necessary policy, economic and managerial adjustments. It guarantees that the benefits to be given from the use of components of biological diversity are equitably shared across local, regional and global societies.

Further the nations out Rio—also adopted a comprehensive global mark plan for sustainable development and global environmental protection into 21st century. Named Agenda 21 the plan contains 40 chapters of non-binding recommendations spanning a full range of social, economic and environmental issues. One chapter is devoted to conservation of biological diversity and biodiversity related issues are featured throughout other chapters.

These aspects have let each nation to develop their own National Biodiversity Strategy and action plans. In response, the Department of forests and environment has established a National Biodiversity Strategy and Action Plan (NBSAP) under the aegis of N.G.O Kalpvriksha. United Nations Development Programme (UNDP) funds the NBSAP for preparation of NBSAP draft for India.

The NBSAP aims to formulate local, regional, state and national strategies and action plans for conservation and sustainable use of biological resources and achieving equity and fair benefit sharing of resources. The NBSAP is a process of development through a participatory planning process involving all major stakeholders.

To over come this lacuna of knowledge base Ministry of Environment and Forests, Government of India has prepared a National Policy and Macro level Action Strategy on biodiversity through a consultative process. And there is a need to prepare detailed action plans at sub-state, state, regional and national levels based on this frame work document. And this document of **Chattisgarh State Biodiversity Strategy and Action Plan** is part of this effort in Chhattisgarh State It is in this perspective that various biodiversity SAP's are being prepared by the states of India cutting over cross boundary habitats.

The Government of Chhattisgarh has identified the State Forest Department as nodal agency to prepare the Biodiversity Strategy and Action Plan as desired by Ministry of Forests and Environment (MOFE), Government of India for the State of Chhattisgarh.

2. Scope

The present CSBSAP covers the geographical area of the State of Chhattisgarh covering 16 districts. Uttar Pradesh to the North, Jharkhand to the North East, Orissa to the east, Andhra Pradesh to the south-east and south, Maharashtra to the south-west, Madhya Pradesh to the west and north-west form its boundaries.

Bastar, a large tribal district rich for its biodiversity and tribal heritage has been covered under the central Eco-Region along with Vidharba as part of the NBSAP process. For Northern hills of Chhattisgarh covering the districts of Surguja and Jashpur, a sub state SAP has been prepared. The SAP was drafted covering districts of Surguja and Jashpur. A substate SAP has been prepared. The SAP draft covers different thematic areas, overlapping biodiversity characteristic of the area, region or district. This document focuses on existing resources, causes for their degradation and suggestions for developing management strategies for recovery maintenance, improvement and sustainable use of biodiversity.



3. **Objectives**

There are 12 mega-diversity regions on the globe. India is one of them because of its richness in species (both animal and plant) India is unique India owes nearly 4900 plant species (as against 45000 species. found in India) are endemic also 62% of total animal species found in India (total 81000 species) are endemic to the nation (Moef 1994). Being a member of mega-diversity region, it is a social mandate on part of India to conserve not only the endemic species but also every bio-resource available.

The CSBSAP is being prepared to meet the broad objectives as:

1. Every form of life is essential for the ecological balance thus deserves conservation.
2. Biodiversity is an indicator of health of the environment. Our lives have a direct bearing for a vast array of goods and services from biodiversity, hence, priority should be accorded to its conservation management and sustainable use.
3. Biodiversity conservation is an asset, as it can yield sustainable benefits.
4. Biodiversity management should be based on ecological "principles based indigenous and scientific knowledge.
5. The government should protect interests of the local communities, in turn the communities must recognize the importance of Bio-diversity.
6. Fair and equitable sharing of benefits arising out of utilisation, or knowledge of bio resource found in the locality.

4.**Contents**

The CSBSAP contains biophysical and socio-economic details of Chhattisgarh. An account of existing natural ecosystems (Terrestrial and Aquatic system), Wild species and varieties (plants, animals and micro-organisms), agri-horticultural systems (Agriculture and horticultural crops) and socio-cultural including ethnic diversity (communities and cultural traits) are defined problems, role of various agencies and on going biodiversity related activities have been explicitly explained. Lastly, gaps and their strategies have found their way in the present planning. During the course of preparing this document, the interest of stakeholders at grassroot level has been considered. The document so prepared should meet the needs and aspirations of the local people in the maintenance of ecological balance.

5. **Methodology of the Document**

The process of formulating the Chhattisgarh State Biodiversity Strategy and Action Plan was initiated with the constitution of a State Steering Committee comprising of 17 members. The SSC members were drawn from representative of public, government department officials, NGOs, Professionals and individual experts. The SSC in its first meeting decided to entrust the DFO of various divisions to prepare SAP. However, in view of the heavy work load on these officials in the newly created state, it was decided to invite perceptions of various experts such as professors, forest departments officials, NGOs activists, social group, private people, land communities etc. On conserved biodiversity Thematic Area covering relevant Biodiversity components as per the suggested guidelines of the NBSAP. The CGSAP was thus conceptuluted review of meeting involving the experts with the available inputs.

Workshop and conferences were held at the level of the conservator's office covering the entire state of Chhattisgarh. The members of public, department officials, NGOs activities, social group, private people etc attended these meetings. Out come of the workshop and conference have been added in the draft after cross checking them with the published authentic materials. In addition to these concepts, view, information from the general public was invited, through the advertisements in the most circulated News Papers of Chhattisgarh. Valuable articles and information received are incorporated in the draft. The whole process followed on well structured systematic approach.

In the district of Bastar, inventorisation of abundance of medicinal herbs has been done by Forest Depatment and the scope of their trade is being explored. In the district of Jashpur, inventorisation of available bio-resource in bio-diversity conservation priority areas is done with the help of village level meetings and Janpanchayat. Resource persons for detailed survey are identified and the negotiations are going on.

CHAPTER – II

PROFILE OF AREA

Geographical Profile

Chhattisgarh state is carved out of the erstwhile Madhya Pradesh . It lies between 17°46'–24°8' N latitude and 80°15'–84°24' E longitude. The state measures 640 km from north to south and 336 km from east to west with a total area of 1,35,194 sq. km. The state shares its boundaries with the 6 Indian states i.e. Madhya Pradesh on the north-west, Uttar Pradesh on the north, Jharkhand on the north-east, Orissa on the south-east, Andhra Pradesh on the south and Maharashtra on the south-west.

The geological structure of Chhattisgarh mainly consists of Achaean and Cudappah rocks but Dharwad, Gondwana, Deccan Trap and old Alluvial Laterite rock systems are also found in some pockets of the state.

The mainland of Chhattisgarh comprises three physiographic regions:

A. Mountains
B. Plateau and Pat Regions
C. Plains / River Basins

These regions can be further sub divided as:

A. Mountains
   1. Maikal Range (Rajnandgaon, Kawardha and Bilaspur districts)
   2. Chhuri-Udaipur Hills (Korba and Raigarh districts)
   3. Changbhakhar-Devgarh Hills (Koriya and Surguja districts)
   4. Abujhmad Hills (Narayanpur, Bijapur, Bhopalpatnam and Pakhanjur tehsils)

B. Plateau and Pat Regions
   1. Pat regions (Surguja and Jashpur districts)
   2. Pendra-Lormi Plateau (Lormi, Pendra Road, Kota, and Pandaria tehsils)
   3. Dhamtari-Mahasamund Uplands (Saraipali, Mahasamund, Kasdol, Nagri, Gariyabandh, Devbhog, Kurud and Dhamtari tehsils.)
   4. Durg Uplands (Rajnandgaon and Durg districts)
   5. Bastar Plateau / Dandakaranya Plateau (Kanker, Bastar and Dantewara districts

C. Plains / River Basins
   1. Kanhar Basin

2. Rihand Basin
3. Surguja Basin
4. Hasdo-Rampura Basin
5. Korba Basin
6. Raigarh Basin
7. Bilaspur-Raigarh Plains
8. Sarangarh Plains
9. Durg- Raipur Plains
10. Kotri Basin
11. Bastar Plains

Drainage Patterns

Mahanadi is the main and the largest river of Chhattisgarh. It is called the "Life Line of Chhattisgarh". The drainage patterns of the state contribute to the tributaries of the following river systems:

1. Mahanadi
2. Ganga
3. Narmada
4. Godavari

The main rivers of the state are Mahanadi, Mand, Shivnath, Hasdo, Kelo, Eeb, Pairi, Sondhur, Jonk, Lat, Sukha, Dudh, Kharun, Arpa, Maniyari, Indravati, Sabari, Chinta, Talperu, Rihand (Ren), Kanhar, Gopad, Banas, etc.

The average annual rainfall in Chhattisgarh is 1418.2 mm (maximum average annual rainfall upto 1690.2 in Jashpur district).

Socio-economic profile

According to the Census of India 2001, the population of Chhattisgarh stands at 2,07,95,956, which is 2.02 % 0f India. There is a majority of the rural people as the 80 % population belongs to the villages. The district wise distribution of population is unequal in the state. Raipur is the largest district in population (14.47 %) and Kawardha district is the smallest (2.82 %).

The average population density is 154 per sq. km. Highest density (324 per sq. km) is observed in Janjgir-Champa district whereas the lowest density is found in Dantewara district (41 per sq. km).

The Gender Ratio (No. of females per thousand males) in the state is 990. Maximum Gender Ratio is found in Rajnandgaon district (1024) and minimum (947) in Koriya district.

The overall literacy is 65.18 % (77.86 % in males and 52.04 % in females) in Chhattisgarh. Maximum literacy is observed in Rajnandgaon district (77.85%) and minimum in Dantewara district (30.01%). The districts where the literacy is more than 70% are Rajnandgaon, Durg, Dhamtari, Kanker and Raigarh. The districts with the medium literacy (between 60-70%) are Raipur, Mahasamund, Janjgir-Champa, Jashpur Nagar, Korba, Bilaspur and Koriya.

According to the Census of India 1991, the religious communities residing in Chhattisgarh are Hindu (94.99%), Muslim (1.68%), Christian (2.15%), Bouddha (0.36%), Sikh (0.27%), Jain (0.25%) and others (0.30%).

Scheduled Castes

12.19% of the total population of Chhattisgarh belongs to the Scheduled Castes (SC) as defined in the Constitution of India in Art. 341. The main castes under this category are: Chamar, Satnami, Mochi, Dewar, Ganda, Ghasi, Ghasia, Kanjar, Khatik, Bhangi, Mahettar, Banchhada, Bedia, Mahar, Pasi, Chikwa, Bansod, etc. The 82.30% of the total population of scheduled castes belongs to the rural areas and rest (17.70%) to the urban areas. District wise distribution of SC's is the highest in Janjgir-Champa (22.00%) and lowest in Dantewara (4.00%). Gender Ratio in this community is 987, which is nearer to the Average Gender Ratio of the state (990).

The average literacy of the SC population of the state is 29.42%. District wise literacy of this community is maximum in Durg (39.57%) and minimum in Surguja (14.99%).

Scheduled Tribes

The castes under the scheduled tribes (ST) as defined by the Art. 342(1) comprises 32.46% (or 1/3) population of Chhattisgarh (Census of India 1991). There are 42 tribal groups which are further divided in to their sub groups / castes. Gond is the largest tribal group (55.05% of the tribal population of Chhattisgarh) in the state which is divided in to 13 sub groups / castes. Other tribal groups are Kanwar (11.84%), Halba (4.76%), Bhatra (2.52%), Urao (1.89%), Bijhwar (1.72%), Bhariya (1.58%), Sanwara (1.34%), Baiga (0.93%), Agariya (0.74%), etc. The names of the other tribal castes in Chhattisgarh are Andh, Bhaina, Bhumia, Bhuriya, Bhil, Bhilala, Barela, Pateliya, Mina, Birhul, Birhor, Domar, Domaria, Dhanwar, Gadba, Kamar, Korku, Khairwar, Kondhar, Khariya, Koundh, Kol, Kolam, Bhopchi, Korva, Kodaku, Majhi, Majhwar, Mawasi, Munda, Nagesia, Urao- Dhanka, Po, Pardhan, Pathari, Sarthi, Pardhi, Bahelia, Parja, Sonata, Sanata, Saur, Sahariya, Sonar, etc. The tribes of Abujhmar and Bastar, Hill Maria, Muria are the sub groups of the Gond tribal group. The "Gond" tribal group is in majority in all the districts except Raigarh and Jashpur Nagar where the "Kanwar" is the major tribal group and the "Gond" is the second largest group.

Generally the dense population of the tribes belongs to the rural areas other than the plains of Chhattisgarh. Their average population density in the state is 42 per sq. km. There is unequal distribution of the tribal population in the districts. The highest percentage population of the tribes is observed in Dantewara district, where 79.00% people are tribes. The districts with minimum tribal population (12.00%) are Janjgir-Champa, Raipur and Durg. Literacy in tribal castes is highest in Durg district (41.41%) and minimum in Dantewara district (7.12%).

Health

Outcome indicators in health are not available separately for Chhattisgarh for current years. Data for Chhattisgarh region is available from the regional estimates of the Sample Registration Scheme till the year 1992 . In 1990, 1991 and 1992 the Infant Mortality Rate for rural Chhattisgarh fluctuated from 82.7 to 111.8 and then to 76.5. In 1991, while the Life expectancy in Chhattisgarh is 61.4 years, it was 57.3 years for the entire Madhya Pradesh.

What is also very encouraging in Chhattisgarh is that female life expectancy in higher than that of males.

Basic primary health care, pre and postnatal care , nutritional status and preventive care are the essential requirements of the new State. It's long distances, large forest cover, a large number of forest village and remote villages make the issue of access and delivery of health care a crucial issue.

Health indicator of Chhattisgarh 1991.

	All	Male	Female	Rural	Urban
Mean Age of Marriage	52.4	25.5	25.3	25.4	25.2
Total Fertility Rate	4.3	-	-	4.3	4.2
Infant Mortality	85.0	88.0	83.0	92.0	52.0
Life Expectancy at Birth	61.4	60.9	62.0	60.0	69.6
Population expected to survive beyond 20 years	0.173	0.168	0.178	0.185	0.109
Child Mortality uptill 5 years	129.0	134.0	124.0	141.0	79.0

Source : Indicators calculated from Fertility Tables , Census of India 1991, Registrar General of India, New Delhi

Housing and basic amenities

The 1991 census provides detailed information on the types of houses occupied in Chhattisgarh as well as access to basic amenities of safe drinking water, electricity, and sanitation by households. More than three fourths of the households in Chhattisgarh resided in semi-pucca houses, and about 19 percent lived in pucca houses. Eleven precent rural houses in 1991 were Kutcha houses.

In term of access to amenities, the table below shows the situation as in 1991.

Basic Amenity	All	Rural	Urban
Access to Electricity	31.8%	25.4%	61.2%
Access to Sale Drinking Water	51.2%	45.1%	79.6%
Access to Toilet	10.3%	3.3%	42.4%
Access to all Three	7.6%	1.5%	35.6%
Access to None of the Three	36.1%	41.9%	09.6%

Source : Household tables ,Census of India 1991, Registrar General of India, New Delhi.

Employment

Information on Employment in Chhattisgarh is available on a comprehensive scale only from the Census of 1991.

The Worker Participation Rate in Chhattisgarh was 47.7 percen.!. 54.3 percent for males and 41 percent for females. The high Worker Participation Rate for females is commensurate with paddy being a major crop for the region. Paddy is sown in around 90 percent of the total sown area under cereals in *kharif,* and about 85 percent of all area sown under food grains in *kharif* in Chhattisgarh. The southern and eastern districts have the highest worker participation rates, all well above fifty percent. The same areas of Bastar, Dantewara, Kanker, Rajnandgaon, and Kawardha also have high female worker participation rates.

The Farm Sector dominates employment. The census of 1991 found that 82 percent of all workers and 90 percent of rural workers were involved in farm related activities including cultivation, and agriculture allied activities. After the primary sector, the services sector offers the highest employment. Eleven percent of the entire Chhattisgarh and fifty two percent of urban employment was in the services sector.

The total estimated head count ratio for poverty in 1993-94 was 28.6 percent, which was marginally lower at 25.74 percent for rural Chhattisgarh and much higher at 42.2 percent for urban Chhattisgarh.

Area	1987		1993/94	
	Official	Expert	Official	Expert
	PL	PL	PL	PL
All	55.35	45.27	38.91	28.64
Rural	58.47	46.72	38.21	25.74
Urban	35.38	35.99	42.21	42.21

Official PL : Poverty Line as per Planning Commission

Expert PL : Poverty Line as per recommendations of the Expert Group on Poverty

HUMAN DEVELOPMENT INDEX

The Human Development Index is a composite index of three main components of human development, knowledge (which is measured by literacy and children's enrolment in schools); longevity (measured by expectancy of life at birth); and access to resources to lead a reasonable quality of life (measured by per capita incomes and adjusted to reduce the impact of very high of very high per capita incomes and sensitized to levels of poverty in the districts.)

There is insufficient data available for fifteen of the six- teen districts of Chhattisgarh for developing Human Development Index based indicators directly associated with the districts. However, data is available for the seven original districts. Since Durg is the only district that was not divided, data is available for this district. Of all the other fif- teen districts, data is available for literacy for all of the fifteen, but on other indicators we have applied the indicators of the parent district to the divided districts for constructing the Human Development Index. District Durg comes out on top followed by Dhamtari, Raipur, Bilaspur and then Korba. At the bottom lies Kawardha district, which was carved out from Rajnandgaon. The other districts at the bottom come from the northern most and southern most districts of Surguja, Dantewara, Bastar, Raigarh, and Koriya.

Land Use

Land use is an important index of human, social, cultural, and economic developments. According to the land use classification accepted by Govt. of India the district wise land use of the state is described below.

Geographical Area

The total geographical area of the state is 93,52,236 hectares. Surguja is the largest district (10,72,740 hectares) and Dhamtari is the smallest (1,95,689 hectares) in area.

Forest Area

1850248 hectares of the state is covered with forests, which is 19.78% of the total geographical area. Dantewara district has the maximum percentage area (44.65%) of the total area of the district is covered with forests and the lowest percentage is found in Janjgir-Champa district.(2.62%).

Land under non-agricultural uses

About 10.96 % land area is being used for non-agricultural purposes. Sub-merged lands, roads, townships, settlements, factories, mining areas, industries, airports, marshy, red laterite soils, etc. fall in to this category. District wise maximum percentage of such land is found in Jashpur district (24.46%) and minimum in Bilaspur district (7.85%).

Cultivable wasteland

Such lands are suitable but not being utilized for agriculture. These lands can be improved for agricultural purposes. The area of such type of lands is 11,99,354 hectares in Chhattisgarh with a minimum in Surguja district (18.27%) and minimum in Korba district (7.64%).

Old and current fallow

The land that has been utilized previously for agriculture but nothing has been sown or planted in it temporarily for 1 to 5 years, are called fallow. There are 4,53,738 hectares of fallow land in the state, which is 4.85% of geographical area. Out of these 4.85%, 2.50% are the current fallow (left unsown for 1 to 2 years) and 2.35% are old fallow (left unsown for 2 to 5 years). Maximum percentage of fallow land is found in Koriya district (7.88%) and minimum in Dhamtari district (1.48%).

Net sown area

51.57% of the geographical area of the state (48,23,863 hectares) is net sown area. Janjgir-Champa district has the maximum percentage (71.17%) of net sown area while Dantewara district has the lowest percentage (29.15%).

Double crop area

In 8,20,050 hectares (16.99% land of net sown area) the crops are taken 2 or more times. Maximum double crops area is observed in Dhamtari district (49.90%) and the least in Dantewara (1.61%).

Crops

The main crops being grown in the state are described in the table.

Crop	Chhattisgarh	District wise distribution (area sown)			
	% of net sown area in the state.	Maximum		Minimum	
		District	%	District	%
Food Grains	**70.62**				
Paddy/Rice	65.54	Mahasamund	84.01	Kawardha	37.52
Makka (Maize)	1.63	Surguja	6.51	Durg	0.10
Wheat	1.53	Koriya	4.06	Dantewara	4 ha. Only
Kodo-Kutki	0.20	Bastar	1.58	Jashpur	0.39
Jwar	0.19	Surguja	3.50	Dantewara	1.56
Barley	0.10	Koriya	0.84	Surguja	0.78
Others					
Pulses	**15.05**	**Kawardha**	**32.89**	**Dantewara**	**3.87**
Gram	3.43	Kawardha	19.71	Dantewara	18 ha. Only
Arhar	0.72	Koriya	1.72	Kanker	0.16
Oil Seeds	**6.17**	**Surguja**	**13.09**	**Janjgir-Champa**	**1.25**
Alsi	1.95	Rajnandgaon	6.56	Dantewara	10 ha. Only
Mustard	0.91	Surguja	3.81	Mahasamund	0.06
Soya bean		Kawardha	5.37		
Groundnut	0.60	Mahasamund	2.90		
Sugarcane	0.09	Kawardha	0.89		

Soil

According to the records of All India Land and Soil Survey, the following types of soil are found in the state:

1. Red-yellow soil (or Matasi)
2. Red-sandy soil
3. Red-domat soil
4. Laterite soil
5. Black soil

The distribution and other description of the soil are mentioned in the following table:

Types of soil	Mother rocks	Distribution in the state		Main crops
		%	Districts / Region	
Red-yellow soil (or Matasi)	Gondwana	60-65	Surguja, Koriya, Jashpur, Raigarh, Korba, Bilaspur, Kawardha, Durg, Raipur, Dhamtari, & Mahasamund districts.	Paddy
Red-sandy soil	Archaean Granite	20-25	Bastar, Dantewara, Kanker, Durg, Rajnandgaon, & Dhamtari districts.	Kodo-Kutki, Jwar, Maize, Potato, Coarse grains, etc.
Red-domat soil	Archaean Granite	-	Dantewara and Konta tehsils.	Paddy
Laterite soil	Mixed	-	Bagicha, Samri, Sitapur, Ambikapur, Kawardha, Chhui-Khadan, Saja, Bemetara and Jagdalpur tehsils.	Pulses, Jwar, Kodo-Kutki, Oilseeds, Potato, Coarse grains, etc.
Black soil	Deccan Trap & Basalt	-	Mungeli, Pandariya, Raipur, Rajim, Mahasamund, Kurud and Kawardha tehsils	Paddy, Wheat, Cotton, Gram, Sugarcane and Rabi Crops.

Except all the above types of soils, the alluvial soils are found in the river valleys, of the state. The main crops grown in these soils are vegetables, sweet potato, sugarcane, Jute, Kharbooja, etc.

Soil Erosion

There is a problem of soil erosion due to the rainfall, deforestation, uncontrolled flood and cattle grazing, etc.

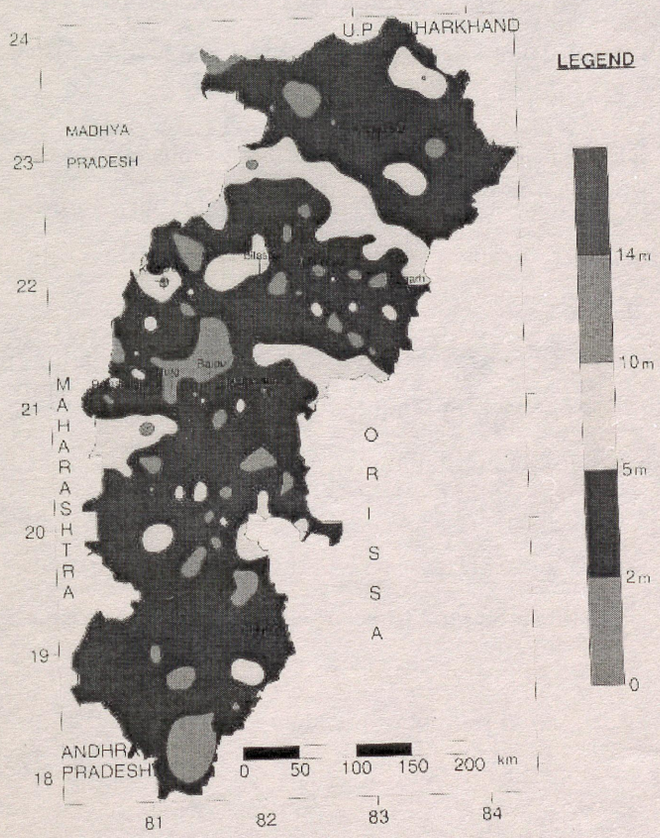
There is a need to make serious efforts for conservation of soil i.e. development of forests, watersheds, dams, public awareness and participation, improvement in traditional agricultural practices through introduction of suitable techniques, crop rotation, etc.

Ground Water

Due to rapid urbanization and industrialization the under ground water table is decreasing very fast and now people residing in the urban areas are facing problem of drinking water. Geological studies reveals that there are not good aquifers in the upper crust. Upper layer consists of hard impermeable rocks retaining percolation of pond's water. Pond's technology of water harvesting and utilization is very successful in the Chhattisagarh. Details of district wise ground water table is shown in the **annexure page no.----------**

DEPTH TO WATER TABLE (mbgl) MAP OF CHHATTISGARH

PERIOD : NOVEMBER 2001



Irrigation

In Chhattisgarh, 21.67% of the net sown area is irrigated with various sources i.e. Canals, Tube wells, Dug wells, Ponds, etc. The district wise distribution of the irrigated area is unequal. Dhamtari district has the maximum irrigated area i.e. 74.96%, and minimum in Bastar district (1.61%).

The following table describes the source wise irrigation in Chhattisgarh:

Source	Distribution in Chhattisgarh
Canal	21.67
Tube wells	9.15
Dug wells	4.22
Ponds	6.00
Others	8.60

* Agriculture Statistics of M.P. 1998-99.

River valleys irrigation projects of Chhattisgarh

The main irrigation projects of Chhattisgarh are:

1. Mini Mata Bango Multipurpose Project (Hasdo river, Korba district): - Established mainly for irrigation along with power production, fisheries, water supply, conservation of soil erosion, boating, plantation, etc.
2. Khudia Project (Maniyari river, Lormi tehsil):- for irrigation.
3. Khuntaghat Project (Kharang river, Ratanpur): - for irrigation.
4. Bodhghat Project (Indravati river, Jagdalpur district): - Multipurpose project (proposed).
5. Arpa Project (Arpa river, Kota tehsil): - for irrigation (proposed).
6. Kunwarpur Project (Chulhat Nallah, Lakhanpur, Ambikapur): - for irrigation.
7. Shyam Project (Ghunghutta river, Ambikapur): - for irrigation.
8. Banki Project (Banki river, Ambikapur):- for irrigation.
9. Barnai Project (Barnai river, Ambikapur):- for irrigation (proposed).
10. Ravishankar Sagar Project (Gangrel Dam) (Mahanadi river, Dhamtari district): - for irrigation along with power production, water supply, fisheries, boating, etc. It is the oldest irrigation project of the state (started on 1912-15).
11. Mooram Silli Project (Siliyari Nallah, Dhamtari district): - subsidiary of Ravishankar Sagar or Gangrel Dam.

12. Dudhawa Project (Mahanadi river, Kanker district): - for irrigation and subsidiary of Ravishankar Sagar Project.
13. Sondhur Project (Sondhur river, Dhamtari district): - for irrigation.
14. Pairi Project (Sika-Sar Dam) (Pairi river, Raipur district): - for irrigation.
15. Tandula Irrigation Project (Tandula river, Balod): - irrigation and water supply. Tandula, Gondali and Kharkhara Projects are called "Tandula Complex".
16. Gondali Project (Juhara river, Balod): - for irrigation.
17. Kharkhara Project (Kharkhara river, Durg-Rajnandgaon): -for irrigation.
18. Kodar Project (Kodar river, Mahasamund district): - irrigation project.
19. Jonk Project (Jonk river, Mahasamund district):- irrigation project.
20. Kinkari Project (Sarangarh tehsil):- irrigation project.

Minerals

Chhattisgarh contributes 13.64 % of the income generated through the minerals of our country. The state is heavily deposited with the minerals i.e. iron ore, coal, lime stone, bauxite, dolomite, tin ore, gold, etc. and also rich in the deposits of precious stones like diamond, corundum, alexandrite, garnet, etc.

In Chhattisgarh, Bilaspur division gives the major contribution (80%) of the total income through the minerals, while 11% and 9% is generated from Raipur and Bastar divisions, respectively. Among all the districts of the state, Korba district contribute 50% of the total income (of Chhattisgarh) generated through the minerals.

The minerals can be classified in three categories:

i. Metallic minerals - . iron ore, bauxite, tin ore, gold, copper, etc.
ii. Non-metallic minerals - lime stone, dolomite, diamond, corundum, alexandrite, garnet, etc.
iii. Power minerals - coal, radio active minerals, gasoline, etc.

Iron ore :

Chhattisgarh produces 25% of the total iron ore production of the country. The main iron ore producing areas are:

1. Bailadila (Dantewara district)
2. Raoghat (Narayanpur tehsil)
3. Dalli-Rajhara (Balod tehsil)

Bauxite :

The main bauxite producing areas in the state are:

1. Phutka Hills (Korba district)
2. Main Pat and Samri Pat (Surguja district)
3. Keshkal valley (Bastar district); and
4. Maikal ranges (Kawardha district).

Tin :

Mainly found in Dantewara and Konta tehsils of Dantewara district.

Gold :

There are limited deposits of gold in the state in the following areas:

1. Sonakhan (Bilaigarh tehsil, Raipur district)
2. Konta tehsil (Dantewara district)
3. Narayanpur tehsil (Bastar district)
4. Bagicha and Kukuri tehsils (Jashpur district)

Copper :

Konta, Narayanpur, Durg, Rajnandgaon, and Kunkuri tehsils.

Lime Stone :

Out of the total lime stone production of the country, 25% is produced in Chhattisgarh. There is a huge stock of lime stone in various districts of the state i.e. Raigarh, Janjgir-Champa, Bilaspur, Raipur, and Durg districts.

Dolomite :

20% of the total dolomite production of the country is produced in Chhattisgarh. The main dolomite producing districts are Bilaspur, Janjgir-Champa, Durg, Bastar and Dantewara.

Precious Stones :

Diamond : This precious stone is found in Payalikhand and Behradih villages of Devbhog area of Raipur; and Tokapal village of Bastar district in the form of its mother-rock Kimberlite.

Alexndrite : Villages Latapara and Sendmura of Devbhog tehsil.

Garnet : Village Latapara of Devbhog tehsil.

Corundum : Chhattisgarh produces 65% corundum of the country. It is found in Bhopalpatnam tehsil of Dantewara district.

Energy Resources

Chhattisgarh is rich in energy resources. The main resources are:

Coal: The state produces 15% coal of the country. The main coal producing areas are:

1. Korba Colliery - Produces 75% coal of the state and 11% of the country.
2. Hasdo-Rampur Colliery.
3. Mand-Raigarh Colliery
4. Vishrampur Colliery
5. Lakhanpur Colliery
6. Tatapani-Ramkola Colliery
7. Jhilmili Colliery
8. Sonhat Colliery
9. Jhagrakhand Colliery
10. Chirmiri-Kurasiya Colliery

Electricity

Thermal electricity and hydroelectricity are produced in Chhattisgarh. But maximum power produced in the state is thermal power.

Thermal Power - Korba is the largest centre for production of thermal power in Asia. Another super thermal power production centre is under construction in Seepat, Bilaspur. Some plants have also been established under private sector in Korba, Raigarh, and Bhilai.

Hydel Power – In Chhattisgarh, the hydro-electricity is produced in the following centers:

i: Mini Mata Bango Multipurpose Project (Hasdo river, Korba district)

ii. Ravishankar Sagar Project / Gangrel Dam (Mahanadi river, Dhamtari district)

Industries

Chhattisgarh is rich in agriculture, forests, electricity and mineral resources but the industrial development is very slow in the state. Only 9% of the total working population is employed in the industries while the national average is 24%. Various industries of the state are steel, cement, aluminium, tin, mining, thermal power production plants, cotton clothes, rice mills, flour mills, oil mills, chemical industries, silk, jute, lac, bidi, foods, plastics industries, and other large, medium or small scale industries.

Durg, Raipur, Korba and Bilaspur are the leading districts in the field of industrial development in the state. Bhilai Steel Plant (BSP) in Durg district happens to be the largest integrated steel plant of the country. Establishment of BSP in 1950's led to development of a wide range of industries at Raipur and Bhilai. Raipur district has got the rare distinction of having the largest number of big and small-scale cement plants. Bilaspur and Durg districts too are home to a number of large-scale cement plants korba, with a number of power generating units established by NTPC and MPEB, is among the leading power generation centers of the country. Aluminium and explosive plants are also located in Korba district. There are a number of industrial growth centers in the state which host hundreds of industrial units. The principal growth centers in the state are : Urla and Siltara (Raipur); Borai (Durg) and Sirgitti (Bilaspur).

Cultural Diversity

In contemporary history evidence of ancient people has been found in the hills or Raigarh, Singhanpur, Kabra, Basnajhar, Boslade and Ongana Mountains at "Chitwandongri" in Rajnandgaon district. The stone equipments made and used by ancient people have been found from the coasts of Mahanadi, mand, Kanhar, Manihari, and Kelo River. The rock-Paintings of Singhanpur and Kabra Mountains are quite famous among contemporary paintings due to variety and style. Among remains of historical age, traces of bone, animal burial has been found in abundance in Raipur and Durg districts.

Along with archaeology, the culture of Chhattisgarh is also quite famous. The tribal Kanwars, Kamar, Baiga, Halba, Korea, Pando, Birhai, Biniwar make the atmosphere cheerful by their dance and song, on the accasion of marriage and other festivals. The rice-bow Chhattisgarh land has unique eroticism and sweetness. Apart from the mesmerizing dances songs of Dadra, Pandwani, Karma, Panthi and Suva the region has National Parks/Sanctuaries and has places of archeological and religions importance such as Sirpur, Rajim, Malhar, Sita

Bengra, Jogibhatta, Deepadih, Dantewada and Dongargarh where tourists come automatically. The ancient deposits of Chhattisgarh and Jain religion memorials are found at Malhar, Sirpur, Mahespur and Arang.

Innumerable monuments, finely carved temples, vihars, forts and palaces raise in the visitors ,and visions of dynasties and kingdoms of great warriors and builders, of Buddhism, Jainism, Christianity, and Islam. Saint Guru Ghasidas of Satnami Samaj, Mahaprabhu Vallabhachary of Vaishnav Samaj and the great poet and saint Kabirdas also hails from this state. The celebrated Chinese traveler Huein tsang visited the state in the middle of 7th century A. D.

Nearly half (44%) of the state is forested and offers a unique panorama of flora and fauna. The national parks of the State are Kanger Valley and Indravati & Garu Ghasi das The sanctuaries of Udanti, Sitanadi, Barnawapara, Achanakmar, Gomardah, Tamorpingla etc. Offer the rare opportunity to see the wild buffalo, gaur, tiger, leopard, singing maina and wide variety of antelopes in sylvan surroundings. A variety of tradition in each of three geographical and cultural regions of Baghelkhand Plateau, the Plains of Mahanadi basin, and the Dandkarnaya plateau of Bastar have added color to the states rich cultural tapestry, making it a many splendor land.

Places of Archaeological & Cultural Importance

Sirpur, Rajim, Arang, Sirkatti (Village-Pandula), Bhoramdev Temple, Ratanpur, Malhar, Khaod, Pujaripali, Ramgarh, Deepadih, Barsur, Dantewada, Ramgarh etc.

Principal Places of Tourist Interest

Rajim, Champaranya, Sirpur, Ratanpur, Amarkantak, Bhilai, Dongargarh, Arang, Mainpat, Sheorianarayan, Malhar, Tala, Bhoramdeo, Bheemkhoj (Khallari), water falls at Chotrakoot, Teerathgarh, Mandra, Chitradhara, Tamda, Dhoomar; caves at kotamsar, kailash, Aranyak, Sakal Narayan, Tular, Rani, Makar, Kanak & Dongare, Dantewada, Keshkal Valley, Charama Valley.

The list of Protected Areas (PA's) in the state along with the areas are tabulated below:

S.No.	Name of the PA	District Location	Area (in sq. km.)*
	National Parks		
1.	Indravati	Dantewara	1258
2	Kanger Ghati	Bastar	200
3	Guru Ghasidas	Sarguja / Korea	1441
	Wildlife Sancturies		(*All figures rounded.)
1	Achanakmar	Bilaspur	552
2	Badalkhol	Jashpur	105
3	Bhairamgarh	Dantewara	139
4	Barnawapara	Raipur	245
5	Gomarda	Raigarh	278
6	Pamed	Dantewara	262
7	Semarsot	Sarguja	430
8	Sitanadi	Dhantari	559
9	Tomarpingla	Sarguja	608
10	Udanti	Raipur	231
11	Bhoramdeo	Kawardha	164

As per the protected area network document of Wildlife Institute of India (2000) extensions/ new PA creation is proposed in the following areas :

S.No.	Name	Proposal	Area (in sq.km.)
1	Bahiramgarh	Extn.	61
2	Kawardha	New PA	200
3	Badalkhol	Extn.	50
4	Gollapalli	New PA	300
5	Sitanadi	Extn.	100
6	Hasdeo basin	New PA	200

Political profile

Chhattisgarh state has 5 Rajya Sabha, 90 Vidhan Sabha seats of democratic pattern. There are two main political parties viz Indian National Congress (I) and Bhartiya Jnanata Party. It is divided in the 16 district for better administration It has 1,35,153 Sq. Km. Area bearing more than 1.761 crores of the human population.

It comprises of sixteen districts of Koriya, Surguja and Jashpurnagar to the north, Korba, Bilaspur, Janjgir Chhampa and Raigarh in the North central, Kawardah, Rajnandgaon, Durg, Raipur, Dhamtari and Mahasamnd in the centre and Kanker, Bastar and Dantewara in the South. According to the 1991 Census, the total population residing in the Chhattisgarh was 1.761 crores, which was 2.1 percent of the population of India. The state of Chhattisgarh is carved out of 30.49 percent of the land area and 26.6 percent of the population of the undivided Madhya Pradesh. It has 20378 villages of which 19,720 are inhabited villages. The state has a total of 96 tehsils, and 146 janpad panchayats or blocks. It has 95 cities and town including 6 class I towns.

Ecological Profile

Forest Cover

Chhattisgarh is rich in forest resources. About 44% of the total area of the state is under forest cover. Chhattisgarh is famous in the entire country for its sal forests. In addition, teak, bamboo, saja, sarai, haldu etc. are also found in large numbers. Tendu leaf, which is used in beedi-making, is a principal forest produce of the state. Chhattisgarh produces a large number of minor forest products as well.

As per Udvardy (1975) state is placed under Indo-malayam relam. Sal and mixed forests are the main forest types of Chhattisgarh. Biogeographically the state is placed in Deccan Plateau zone with three provinces namely 6D Chota Nagpur plateau, 6C Eastern Highlands and 6E Central high land (Rodgers and Panwar 1988). Chhattisgarh is possibly last home of genetically un-swamped and critically endangered wild buffalo (*Bubalus bubalis*) and Bastar myna (*Gracula religiosa*) and aptly the state had declared them as state animal and bird respectively. At present they are three national parks and eleven wild life sanctuaries in the state. Chhattisgarh is a tribal dominated state in the country with extensive areas bearing the

prints of traditional use. Large forest tracks of the state have been under scientific management over a century. The landform, the soil and the rainfall attributes of state allow for large biodiversity of crop cultivar and land races. These unique features cause Chhattisgarh to have extremely rich biodiversity within the old growth forest systems, the traditionally influence forest systems, the managed forest systems and the agro- pastoral systems.

On all these considerations Chhattisgarh encompasses highly rich biodiversity of crucial significance at the national level. With its two major most forested water basins State is strong contributor to soil and water securities of neighboring states also.

Agriculture

Agricultural systems

Chhattisgarh is an agrarian state. About 80.5% working population of the state is employed in agriculture. Rice is the main crop, which is grown in maximum area of the agricultural land of Chhattisgarh. The state is called the "Rice Bowl of India" due to the large number of varieties of rice and their production. Agricultural systems in the state are generally traditional and monsoon based.

The salient features of the agricultural systems of the state are:

1. Food grains are produced in about 93.68% agricultural land.
1. Crops taken in the state can be divided in to:

   Kharif Crops in the rainy season (Paddy, Kodo-Kutki, Arhar, Makka, Til, Sugarcane, etc.);

   Rabi Crops in the cold season (Gram, Wheat, Mustard, Rai, etc.) ; and

   Summer Crops (Paddy, Gram, Urad, Groundnut, etc.)
2. Crops are sown by Broadcasting, Lei system, Onari system, Ropai (Transplanting).
3. About 98% farmers use bullock-plough in their traditional farming.
4. There is a trend of taking mixed crops of Kodo-Kutki, Makka (Maize), Til, Arhar (Pigeon Pea), Groundnut, etc.
5. Shifting cultivation is adopted in some pockets of the state i.e. Maikal range, Pat regions and Abujhmar hills.
6. About 65% land of the total geographical area of Chhattisgarh can be used for agriculture but only 51.57% is being used for the same.
7. Irrigation is mainly based on rainfall.
8. Improper power supplies for the electrical agricultural techniques and pump sets.

9. Lower breed of cattle.
10. Lack of transportation facilities to transport the agro-products to the market and for market.
11. Only 21.67% of the total sown area is irrigated.
12. Poor economy of farmers.

Land utilization pattern of the state is as below: -

(a)	**Land Non-Agricultural uses**	-	**6.73 Lacs Hect.**
(b)	**Barren and uncultivable land**	-	**3.52 Lacs Hect.**
(c)	**Permanent pastures and Grazing land**	-	**8.70 Lacs Hect.**
(d)	**Land under miscellaneous trees and groves**	-	**0.01 Lacs Hect.**
(e)	**Cultivable waste land**	-	**3.29 Lacs Hect.**
(f)	**Fallow land (current)**	-	**2.34 Lacs Hect.**
(g)	**Old fallow land**	-	**2.19 Lacs Hect.**
(h)	**Gross cropped area**	-	**56.44 Lacs Hect.**
(i)	**Net Cropped area (sown)**	-	**48.24 Lacs Hect.**
(j)	**Area sown more than once**	-	**8.20 Lacs Hect.**

The main crop of the State is Rice, Wheat & Jowar. Total food grain production in the year 1999-2000, is Rice 470 lacs tonnes, Wheat 8.8 lacs tonnes, Jowar 0.9 lacs tonnes, total Cereals 503.3 lacs tonnes & Pulses 50.6 lacs tonnes. Commercial crops production like Sugar Cane 11 lacs tonnes, Soyabean 19 lacs tonnes & total Oil Seats 13.4 lacs tonnes is reported.

Total fertilizer (NPK) used in the year 1999-2000 on 2.57 lacs hect. of land @ 40 kg. per hect.

Chhattisgarh plains :

This plain is in the east of Satpura spreading over Bilaspur ,Raigarh ,Raipur, Rajnandgaon ,Sarguja districts . This plain is made by the fertile alluvial soil brought by Mahanadi and its tributaries Shivanath , Hasdo , Kharoo etc . Rice is the main crop here .

Chhattisgarh is known as the "rice bowl". Chhattisgarh used to produce over seventy percent of the total paddy production in the state. Apart from paddy, cereals like maize, kodo-kutki and other small millets, , pulses like kulthi and oilseeds like groundnut, soybean, niger and sunflower are also grown. Chhattisgarh produced nearly half of all food grains, and one third of all major crops grown in the undivided Madhya Pradesh during the kharif season.

The main rabi crops of Chhattisgarh are jowar, gram, urad, moong and moth. Chhatisgarh produces 45 percent of the jowar and over eighty percent of the gram produced in undivided Madhya Pradesh. Chhattisgarh produces very little wheat. In pulses, a quarter of all produce in Madhya Pradesh during the rabi season comes from Chhattisgarh.

In the mid nineties, most of Chhattisgarh was still a mono-crop belt. Only one fourth to one fifth of the sown area was double cropped. When a very substantial portion of the population is dependent on agriculture, a situation where nearly 80 percent of a states area is covered only by mono cropping needs immediate attention to turn them into double crop areas. Also there are very few cash crops grown in Chhattisgarh, and there is a need to diversify the agriculture produce towards oilseeds and other cash crops.

The total agriculture production taken from two years can give some idea of the general share between Chhattisgarh and Madhya Pradesh. In 1995-96, out of a total agricultural production of 180.73 lakh metric tonnes, Chhattisgarh produced 54.09 lakh tonnes or 29.9 percent. The total gross value of agricultural output of undivided Madhya Pradesh was Rs. 18023 crores, of which Chhattisgarh produced R.s 4, 102 crores or 22.8 percent. In 1997-98, out of the total agricultural production of undivided Madhya Pradesh of 252.19 lakh tonnes, valued at Rs 28,362 crores, Chhattisgarh produced 60.53 lakhs tonnes or 24 percent, valued at Rs 6,854 crores or 24.2 percent. The land under cultivation in Chhattisgarh is around 5800-6000 hectares, which is around 23-24 per- cent of the total area cultivated in undivided Madhya Pradesh.

Horticulture

Chhattisgarh State is rich in diversity of biotic, abiotic as well as socio-economic condition, which favour the cultivation of various horticultural crops like vegetables, temperate, tropical and subtropical fruits.

It is well established that bio-diversity is well maintained in areas where the cultural invasion is least. The tribal areas are therefore, considered as rich sources of native land races and bio-diversity. Especially the bio-diversity of horticultural crops like fruit trees and tuber crops is very rich in tribal areas. It will be highly rewarding to comb the Chhattisgarh state for selection of superior types of horticultural crops. Identification, cataloguing, preservation and utilization will go a. long way in sound horticulture development of the state. Unlike the field crop species, preservation of the genetic resources of fruit tree species is a difficult task. It is necessary to establish bio-diversity park of fruit tree species in the state.

Animal Husbandry

The average density of domestic animals in the state is 95 per sq. km. Maximum density of 118 per sq. km is found in Raipur division and the minimum in Bastar division (64 per sq. km.). According to the estimate of Agriculture Statistics of M.P. 1998-99, the total number of cattle is 1,28,92,001 in the state. Out of which the maximum number belong to the Bilaspur division (54,67,548) and minimum in Bastar division (25,05,959).

CHAPTER – III

BIODIVERSITY IN CHHATTISGARH – A OVERVIEW

Current Status

Chhattisgarh supports an array of ecosystems. Natural ecological zones must be qualified in scientific terms, however, they have been widely affected by human activity and very few natural habitats remained intact. Till date no systematic classification of ecological zones have been defined except for one or two sub-state zones.

Man-made political boundaries on the earth does not comprise an individual entity in bio-geographic terms. Endemism of some species as plants, mammals, reptiles, freshwater fishes and many more are yet to be defined in Chhattisgarh. Inspite of this, available range of endemic species occurring here is much higher.

This document records the floral and faunal diversity into two major parts:

(i) Wild biodiversity: comprising the forest and aquatic ecosystems.

(ii) Domesticated biodiversity: covering agricultural ecosystem.

WILD BIODIVERSITY

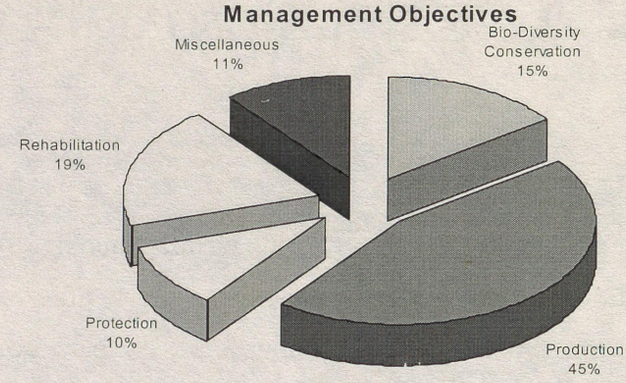
Forest Ecosystem

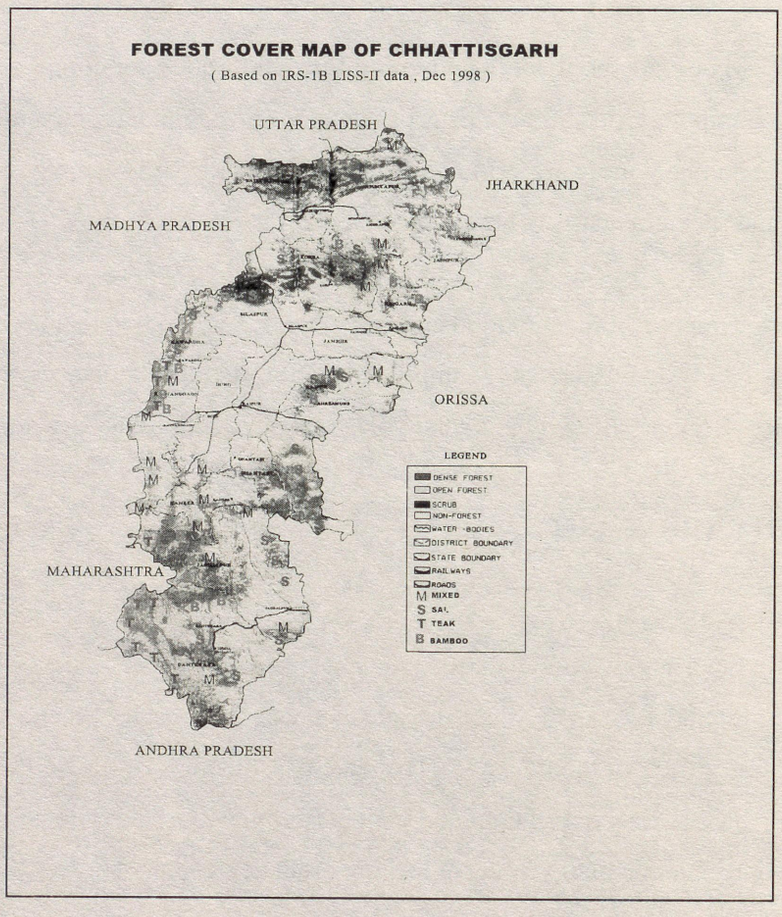
India is situated at the tri-junction of Afro-tropical, Indo-malayan and Palaeo-arctic realms and hence, has the characteristic elements from each of them. This assemblage makes the country rich in biodiversity. The state of Chhattisgarh lies in the Deccan biogeographic area, which houses rich and unique biological diversity. The state is conspicuously significant with rich endemic plants of medicinal importance.

The forest cover in the state is placed at 56,693 sq. km (SI, 1999). Out of this, 39,557 sq. km is dense forest and 17,136 sq. km open forest. However, as per the legal definition the state has 59,772 sq. km of forest area, which accounts for 44% of geographical area of the state.

Forests according to the management objectives are as under:

Fig - Allocation of Managed Forests on the basis of Management Objectives



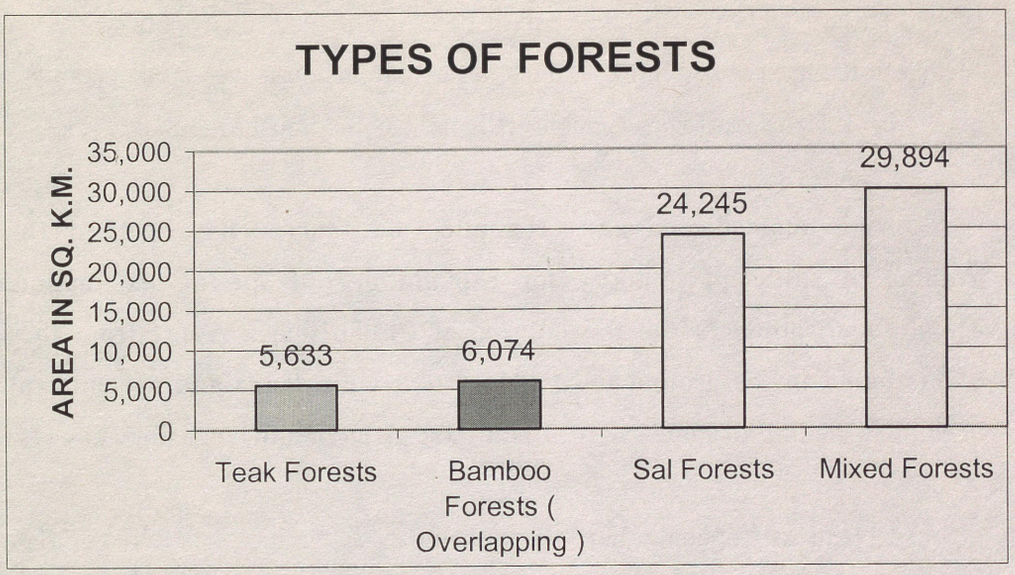


Floral diversity

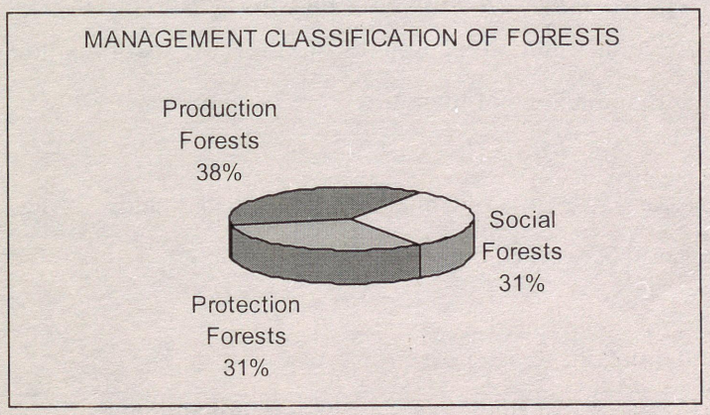
The forest of the state fall under two major types :

1. Tropical Moist Deciduous forest and
2. Tropical Dry Deciduous

Both these forest make up twenty two varied forest types existing in the state **annexure page no----------**



Major floral components of these forests are Sal (*Shorea robusta*) and Teak (*Tectona grandis*) are two major tree species in the state. Other notable overwood species are Bija *(Pterocarpus marsupium*), Saja (*Terminalia tomentosa*), Dhawra (*Anogeissus latifolia*), Mahua (*Madhuca india*), and Tendu (*Diospyros melanoxylon*) etc. Aonla (*Embilica officnalis*), Karra (*Cleistanthus collinus*) and Bamboo (*Dendrocalamus strictus*) constitute a significant chunk of middle canopy of state's forests.



Diversity of Non Timber Forest Produces (NTFP)

Approximately 65 species of natural tree forest produces have been listed in the state (Table 13). The important ones in common terminology are sal seed, karanj seed, chhaar, chakoda, Dhawada-gond, Sal-Raal, Babool-gond, Saloi gond, Mahul-leaves, Khair, Koilar

leaves, Kusum lakh, palash lakh, palash bel, kusum seed, dhawai flowers, Mahua flowers, Mahua fruits, harra, saja, chirol, Bahera, sisar fibre, tendu leaves, , tubers, amla, korya leaves mango in all forms, various vegetables (Bhajis) Chhind, mushroomS etc.

An ethnomedicianl and economic value survey has revealed 18 species are availble in sufficient quantity for exploitation, 38 species are inadquate for the exploitation/trading in the Baster area of Chhattisgarh. Apart from these medicinal plants found in the ground flora of forests, barren lands and agricultural fields have been identified up to some extent. Details are given in annexure page no----------

Chhattisgarh people have been using vast varities of flora in their traditional medicines. Documentation of these have been started, 10 varities of rice have been identified for the medicinal use. Apart from it enlisting of medicinal flora under different land situaions, traditional uses, district wise potential, Industrial uses, and their market rate has been done, details can be observed in **annexure page no----------**

Rare and Endangered flora

Floristic study of the erstwhile seven districts of Chhattisgarh was made by National Botanical Research Institute, Lucknow and identified 44 species as endangered taxa of the state. They have been listed in **annexure page no----------**This conclusion was made on the basis of survey, distribution pattern of the species, over exploitation of medicinal and economic plants and review of literature.

Some endemic and rare flora of Chhattisgarh area listed below through their functional ecology has yet to be worked out

Table : Endemic and Rare flora

S.No.	Name of the Flora	Location/Remarks
1	*Saphora bakeri*	Restricted to the cooler parts of Jashpur
2	*Crotalaria trifoliastrum*	Recorded from Raigarh
3	*Uraria prunellaefolia*	Collected from bastar forests in 1952 and believed to be extinct

4	*Mucuna imbricata, Vigna pisosa*	Rare species collected from marshes of Bhudeopur (Raigarh)
5	*Nogra and Lespideza sps.,*	Recorded from Jashpur division
6	*Hoya wrighitii*	Large perennial climber, totally epiphytic, Found in Bailadilla hills

Some plants have been disturbed, due to human internee to an extent that common tree population is also decreasing rapidly. One such example is *Butea monosperma,* a common plant (Parsa) elsewhere, is in the list of endangered species of Chhattisgarh. This tree is important for the production of lac and there is a dire need to protect and propagate very vigorously, so that the lac industry revives to a sustainable state.

Wild Fauna

Biogeographically, the state is under deccan bioregion comprising of the representative fauna of central India. ("As per Rodgens and Panwars planning").

Mammals

Out of 15 nonhuman primates in India, 8 species are recorded, out of which one is in the endangered list. The mammals found in the state are tiger (*Panthera tigris*), leopard (*Panthera pardus*), gaur (*Bos gaurus*), sambhar (*Cervus unicolor)*, chital (*Axis axis)*, nilgai (*Boselaphus tragocamelus)* and wild boar (*Sus scorfa).* The state also has considerable primate species which need a scrupulous survey.

The state possesses a rare wild animal: Wild buffalow, *Bubalus bubalus*

Extinct and threatned mammals

Ignorance, human collonsons and faulty planning over a period of time, has drawn some animals in the treatened list

1. Asiatic cheetah :

Once very widely available all over India, is now extinct in wild. The last cheetah in India was killed in 1946 in the then Koriya state, which is now a part of the Chhattisgarh state.

2. Elephant and Bara Singha

There were once commonly available in the state. Now they are locally extinct in the state. However, elephants do come into the state from adjacent states and return back, but they are not the permannent residents. This is probably due to, following their migratory routes to and fro from the state.

3. Wild buffalo

Wild buffaloes are highly threatened and are on the verge of extinction due to habitat shrinkage and poaching. It is also facing problem of genetic swamping in Indravati Tiger Reserve.

4. Birds

Chhattisgarh has a number of varied bird species, however, documentary evidence in this respect needs study of literature and field survey. Hill Mynaa (*Gracula religiosa*), a bird from the ist of endangered species, has been declared as the state bird and every effort is being made to protect it. Overall, a thorough survey for the bird fauna is desired.

5. Reptiles and Ambhibians

The State is endowed with a rich diversity of reptiles and amphibians. Documentation of reptiles & amphibians has been done to some extent, but still more has to be explored.

In reptiles, largest population of snakes are found in Farsabahar area of Jashpur district and this region is know as "Nag lok". The rainfall vegetation and the forest canopy suits the snake habitat, which has become the breeding ground of many of the common as well as the rare species of snakes.

The Indian python, Sand Boa, The rat snake, water snake and tree snake are the common non poisonous snakes. While the poisonous snakes of the state are common Cobra, King cobra, Krait, Banded krait and Russels viper.

6. Subterranean Fauna

Kotumsar cave is on the bank of river kanger in kanger valley National park. The floor of the cave spans 1.0 km and is the biggest among all known caves in India. It is a true lime-stone cave.

Many animals inhabiting this cave are pale and blind. Probably the eyes and pigments do not provide any slelective advantage to them the different animals of various groups found are bats (*Hipposideros speoris,* loch (*Nemacheilus evezardi*) and cricket (*kempiola shankari).* Alos Arthropods as cricket, crab, preying manits moth, millipede, centipede, ants and spideus are inlcuded. Nematodes and snails are also prominent. Among vertebrates are the but rodents, froga and loches **annexure page no----------**

MEDICINAL INSECTS: Chhattisgarh state has varieties of insects used in traditional medicines such as 1. Red velvet mite (Trombidium grandisssimum) 2. Pod Borer (Lepidoptera noctuidae) 3. Green Leaf Hopper (Nephotettix nigropictus & N. virescens) 4. Bed Bug (Cimex lectularius) 5. Lightening Beetles or Fire Flies. These are used in the treatment of different diseases by the local traditional practitioners.

The insect Dragon fly are the friends of the farmers and indicator of ecological degradation. Different types of dragon flies found in Baster district are enlisted in the **annexure page no----------**

DOMESTICATED BIO-DIVERSITY

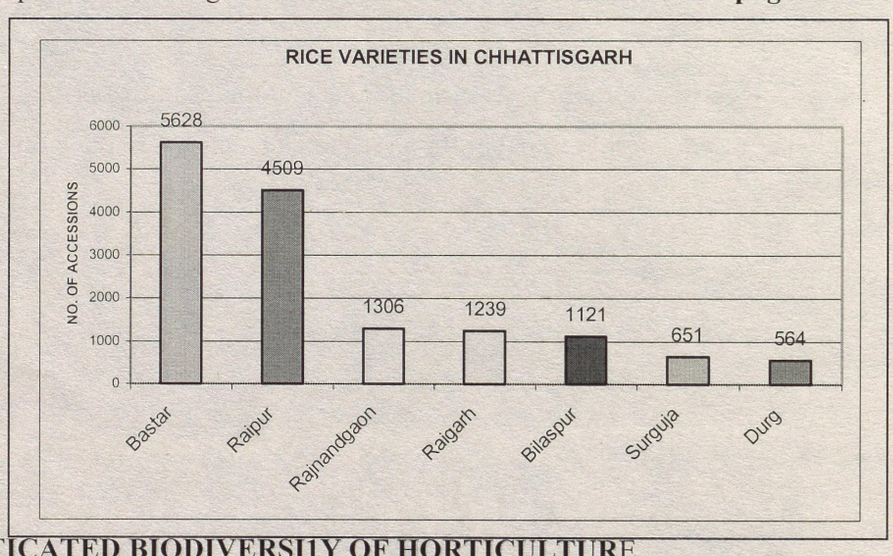
AGRICULTURAL DIVERSITY:

Chhattisgarh state is divided in 3 agroclimatic zones namely Bastar Plateau, Northern Hills, and Chhattisgarh Plains. Zonal Diversity of domesticated crops have been studied and details are given in **annexure page no----------**including map indicating the crops. In Chhattisgarh a large area of agriculture is under rain fed conditions and crops like rice, lathyrus, kodo, kutki, kulthi, sorghum, cotton, chickpea, pigeonpea, etc. have good land races with diverse genetic variability.

Rice varieties identified in Chhattisgarh state.

There are total 15047 enlisted varieties of rice in Chhattisgarh. Some of the varieties are: Agiya sal (A:367), Lali Ajanh (L:1265), Bareg (B:1164 II), Badshah Bhog (B:411)Kantha Bako (K:1839), Bedro (B:2404), Benta (B:1925), Assamchudi (AC:77), Dongri (D:898), Jalpa (J: 347), Atma Shital (A:283) Ajan (A:193), Lali Ajanh (A: 1265), Thakur Bhog((T: 232), Chudi (C: 376II) Atma Shital, Agan Kalimali Ajan (A:4), Jalpa (J:34), Atma Shital (A: 283), Kariya Beni Kath (K:1866) Jalpa (J: 347), Atma Shital (A:283), Jodara (J:475), Jondari (J:4087), Anjan (A:631), Bargi (B:2179)Barhi (B:7071), Bewara (B:771), Boilam (B:1012), Gajai Kali (G:165), Kalam Gurmatia (K:2021), Jalle (J:2887), Banspati (B:1037I)Bheda Kabar (B:2037), Badi Barik (B:698), Bansghati (B:2411), Chandi (C:374II)Bhata Bajrat, Jegane, Kanak Phool Koliya, Kohikari, Budati, Nawa, Sukul Pora, Sungo

The undivided Madhya Pradesh districts incorporated in Chhattisgarh have rice varieties as per the following bar chart. Details can be seen in **annexure page no----------**



DOMESTICATED BIODIVERSIIY OF HORTICULTURE

In case of fruit crops variability occurs in guava, seedling mango, custard apple, aonla, ber, Kagzi lime, jamun, bael, woodapple, chiraunji, khirni, kamrakh, lasoda, marking nut, gular, karonda. As regard vegetables, spong gourd, ridge gourd, bitter gourd, pointed gourd,

Amaranthus, Drumstick, Curry leaves, Bathua, Tinpatti (*Desmodium trifolium*) maesta (*Hibiscus sabderiffa*), Chilli, cluster- bean, sem, agathi are being grown in the region on large scale. There is a wide variability in almost all vegetables in the region. In case of spices wide variability occur for coriander, fenugreek and ginger. Variability in sweet potato, colocasia, elephant foot yam (suran) has been noted in this region. As regards flowers, variability had been seen in Nlarigold, Kaner, China rose, Jasmine, Tula rose, Chrysanthemum, Rose, Champa, Sesbania spp., Chandani, Gultura (*Poinciana pukherrema*), Kachnar, Sawni *(Logrestro emiaindia)* Harshringar *(Nyctumthus artabortistis)* Night queen, Madhu kamini, Mehandi, Canna, Kewada, Zinia, Ba1.sum, Sunflower, Lotus in this region.

As regards fruit crops, tamarind, banana, tadi tree, sulfi, cashew nut show great variability in this region. However, in case of vegetables; brinjal, cucumber, bottle-gourd, snakegourd, Ivygourd show wide variability under these area. Wide variability occurs in case of species such as turmeric, coriander, fenugreek noted in this region. Almost all the tuber crops like sweet-potato,colocasia, elephant foot yam (suran), dioscorea, tikhur *(Curcuma anustifolia)*, yam-*bean (Pachyrrhizus erosus, kochia/giant taro (Alocasia Indica).*

TRADITIONAL LAND USE PATTERN OF TRIBALS OF BASTAR.

Forest dwelling poulation of Bastar have their own traditional way of cultivation of agricultural crops, vegetables and tubers. Ther are 3 type of land avialble with them for vegetables and tubers cultivation i.e. 1. Badi or Courtyard. 2. Marhan or Fallow or Barren land. 3. Farm bunds, apart from these good fertile land is used for paddy cultivation. Details of relation between land and vegetalbes and tubers can be seen in **annexure page no----------**

BIODIVERSITY OF INSECTS, MITES, SPIDERS AND ARTHROPODS IN CHHATTISGARH (including honey bee)

Ecological Profile :

I. Natural Ecosystem :

Since the state is having 44 to 46% area under natural forests, natural ponds a variety of insects are could proforma to forest, aqua system veterinary medical, forensic both useful and harmful. All this needs a detailed survey and through document.

II. Agro-ecosystem :

Under agro-ecosystems various agronomical, horticultural and agro-forestry plants are being cultivated with different densities. The insects associated with various crops and which have assumed the status of pest have been documented in all the 3 zones . **annexure page no----------**

III. Other Arthropods:

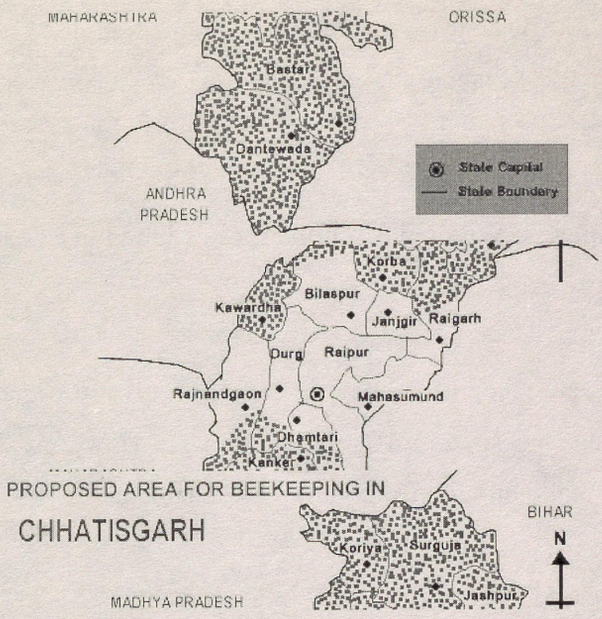
Besides insects, other arthropods like arachnids (spiders) etc. both general and of economic importance, associated with various ecosystem are to be properly documented though some have been depicted in **annexure page no----------**

All wild species of honey bee are available for apiculture except *A. mellifera ligustica.*

Future Status Prediction:

If the same tradition of honey collection is continued most of the bee colonies will disappear. In order to protect and use them for human welfare and income generation from this NFP resource the efforts on war footing should be done by way of massive apiculture, both routine traditional methods as well as modern biotechnology of bee-keeping . In India the latter method is yet to be introduced. However, this technology can not only give more honey, but also the other bee-products like herb honey (from medicinal herbs), propolis, bee-pollen of medicinal value, wax, venom, protein-rich bee bread and royal jelly etc. By way of increase in colonies, pollination efficiency of orchards, agricultural crops, timber trees, medicinal herbs, etc biodiversity will automatically increased which may step up increase in live stock and wildlife. More income will bring economic stability specially to those tribal people, who live below poverty line.

Northern hills and southern plateau of Chhattisgarh is suitable for the bee keeping as shown in the following map.



DRAGONFLY: These are one of the best indicators of ecological degradations and pollution in the water bodies. It's lavae feed on larvae of mosquitoes and various dipteran flyies. Details of Dragonfly diversity can be explored in the **annexure page no----------**

ANIMAL DIVERSITY

Domestication of animals reveals the status of development of a society. The people of Chhattisgarh state mostly have local species/variety of domesticated cattle in large numbers. They are dependent on the forests for grazing. The main enlisted species are Sahiwal Cattle, Nagpuri Murrah & Nilli-Ravi Buffalo & Bengal Goat. Details are given in **annexure page no----------.**

Different species of Livestock and poultry found in Chhattisgarh

The following species of livestock and poultry are found in Chhattisgarh-

A: Livestock:

1. Cattle 2. Buffalo 3. Sheep 4. Goat
5. Pig 6.Horse and 7. Donkey

B. Poultry: 1. Fowl 2. Duck 3. Quail and 4.Guiny Fowl

C. Pet Animals:

1. Dog 2. Cat 3. Rabbit
4.Pigeon and 5. Parrot

Breeds within Species: Within most of the species found in Chhattisgarh different breeds are available. These are being listed species-wise.

Cattle Breeds: No recognized breed of cattle is native to Chhattisgarh. More than 90% of the animals of this species are of non-descript type. However, the farmers are maintaining many breeds originally brought from other states/ habitats.

1. Non-Descript (local) 2. Sahiwal 3. Gir
4. Tharparkar 5. Gaolao 6. Ongole
7. Jersey Crossbreds 8. Holstein-Freisian Crossbreds.

Details of live stock mentioned above is given in **annexure page no----------**

Status of Aquatic Eco-system:

Aquatic systems are very dynamic ecosystems and the diverse life systems have acclimated accordingly. Either lotic or lentic systems, the micro – organism life cycle is small and succession of species takes place depending on the physico - chemical and other biological parameters. Animal populations include many phyla of the invertebrate and vertebrate world. Among the notable ones are the algae, weeds, protozoans, arthropods, pisces, amphibian, reptiles, aves and mammals.

Phytoplankton

Phytoplanktons are minute not visible to naked eye and occur in large numbers and varieties. Depending on the species colour is imparted to the water they contribute towards the primary productivity in aquatic systems and are important in the food chain and food web, which reflects the ultimate productivity of higher order like fishes etc. All the four major groups; chlorophyceae, cyanophyceae, Euglenaceae and Bacillariophyceae are encountered in the water here but a systematic inventory is yet to be made.

Aquatic weeds

As the name suggests, when its volume goes up it is a menace. Fish production is effected and the aquatic system is not efficiently utilized from production point of view.

Plants as surface floating submerged, emergent and marginal are seen in and around the tanks here. The most common ones are Eichornia, Lemna, Azolla, hydrilla, ceratophyllum, Ipomea, wild rice, comelli, Lilies, Lotus, Trepa etc. are present in the waters here. However, their systematic classification, ecological impacts, production losses and aesthetic value loss have yet to be accounted.

Zooplankton

Zooplanktons, from protozoa to higer classes contribute a lot, to the food web of fishes. Protozoans, Rotifees, cladoceran and copepod groups are commonly present. Again their systematic and other fish production aspects need to studied.

Fish Biodiversity

In the year 1974 and 1978-79, inventory of fishes was made, by the Directorate of Fisheries, Govt. of Madhya Pradesh. During that period the fish fauna of Rivers Mahanadi and Hasdeo were listed and the total number of fish species recorded were 60 (listed below). Later 1987 Sehgal while surveying the sport Fisheries in India recorded Mahasheer in the Rivers Hasdeo, Mahanadi, Maniari, Seonath and Indravati in the Chhattisgarh region. In the River Indravati Vardia (1991) made a survey of fish fauna and recorded 49 species also listed below. Not the least even hypogean fishes are found in this region. At present most water bodies are being used for stocking and harvesting of culturable fishes hence much attention has not been paid to the biodiversity of fishes or other organisms in waters.

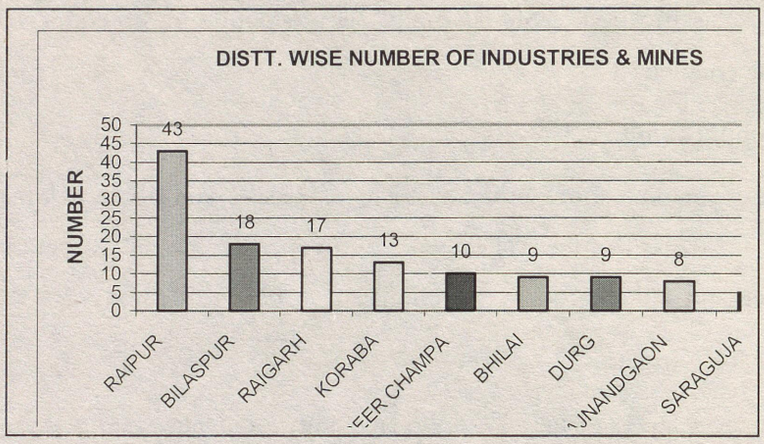
Some considerable study has been done on fishes ,specially with regard to inventory production . The inventory studies are also more than ten years old and we do not know what charges in fish fauna have taken place or how their production trends are being affected. Recently it has been seen that ***Clarias batrachus*** and ***Heteropneustes fossilis*** are exhibiting a population decline. The reason for their decline is not known. So it is highly desired that all fauna of higher orders along with invertebrates is also highly desirable.

Details of Aquatic fauna is given in **annexure page no----------**

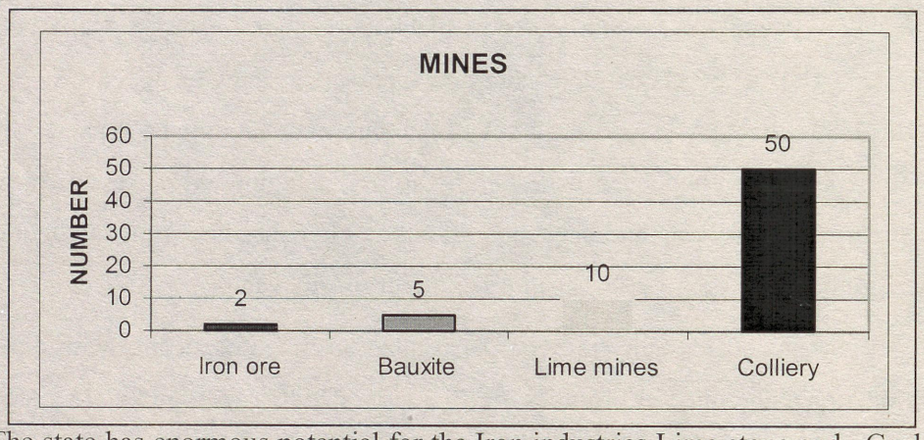
DIVERSITY OF MINES & INDUSTRIES

Chhattisgarh State is very rich in Coal, Lime and Iron ore, thus the industries based on these are in large number. At present, state have 50 collieries, 10 Lime, 5 Bauxite and 2 Iron ore mines, There are 20 industries using iron ore or mid product of it forming various types of

steel. Due to abundance of coal 11 power plants are there in the state. Cement manufacturing units are 12 in the state and almost all units have their own lime stone mines to fulfill their requirement.



The Raipur district is the largest industrial zone in the state, but the towns developed mainly due to industries in the state and Bhilai & Korba.



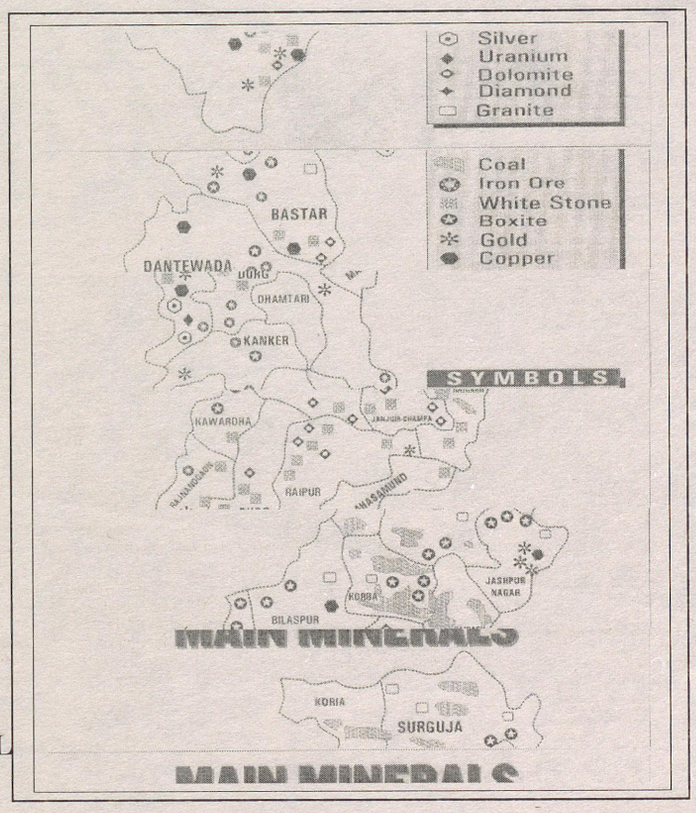
The state has enormous potential for the Iron industries Lime stone and , Coal mines. A new deposit of Diamond has been found in the Raipur district. The state has the capacity to feed coal to more thermal power plants.

Mining Potential in the State

1. Deobhog in Raipur & Tokpal area within the Bastar District has been identified for the exploration of Diamond.
2. Bijapur in Bastar district has potential for Corrandum.
3. Incidences of Gold and Tin (Cassiterite)are recorded in Saraipali area of Mahasamund district.
4. There are huge deposits of iron ore in Bailadeela, Raoghat & Rajnandgaon district.

5. Indication of Gold in Jhanjhar, Meru, Durg, Bhaupratapur, Kondal area of Kanker district and tin occurrence in Renger, Markanar, Vasanpur area of Dantewarda District.
6. New localities of cement grade limestone have been identified in Chhirahi-Newari, Saradih, Garrabhata and patharkundi village of Raipur district and Sakti area of Janjgir district.
7. 500 lakh tonnes of high grade dolomite has been in Lagra-Madanpur area of Champa-Janjgir district.
8. 5 lakh tonnes of metal grade of bauxite has been proved in Dorima or barima area of Surguja district. Beside this District Durg also have potential in bauxite.
9. 220 lakh tonnes of coal has been identified proved in Hardi Bazar-Kertali area of district. Korba.
10. 170.4 lakh cubic mtrs. of flagstone having different shades and colours has been demarcated in revenue land of Chitrakot and Matkot area of Bastar district.
11. Occurrence of clay and Banded hematite quartzite(BHQ) are reported Balod area, district Durg.

Chhattisgarh has abundant natural mineral resources. District wise occurrence of Coal, Iron, White Stone, Bauxite, Gold, Copper, Silver, Uranium, Dolomite, Diamond and Granite are shown in the following map.

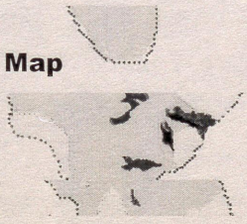


GEOLOGICAL

Chhattisgarh state is situated on the Alluvium, Deccan trap, Upper Gondawana, Lower Gondwana, Ryolites, Felsite, Cuddpah, Granites, Gneis & Crystaline geological formations, which are distributed as per the following map.

Generalized Geological Map

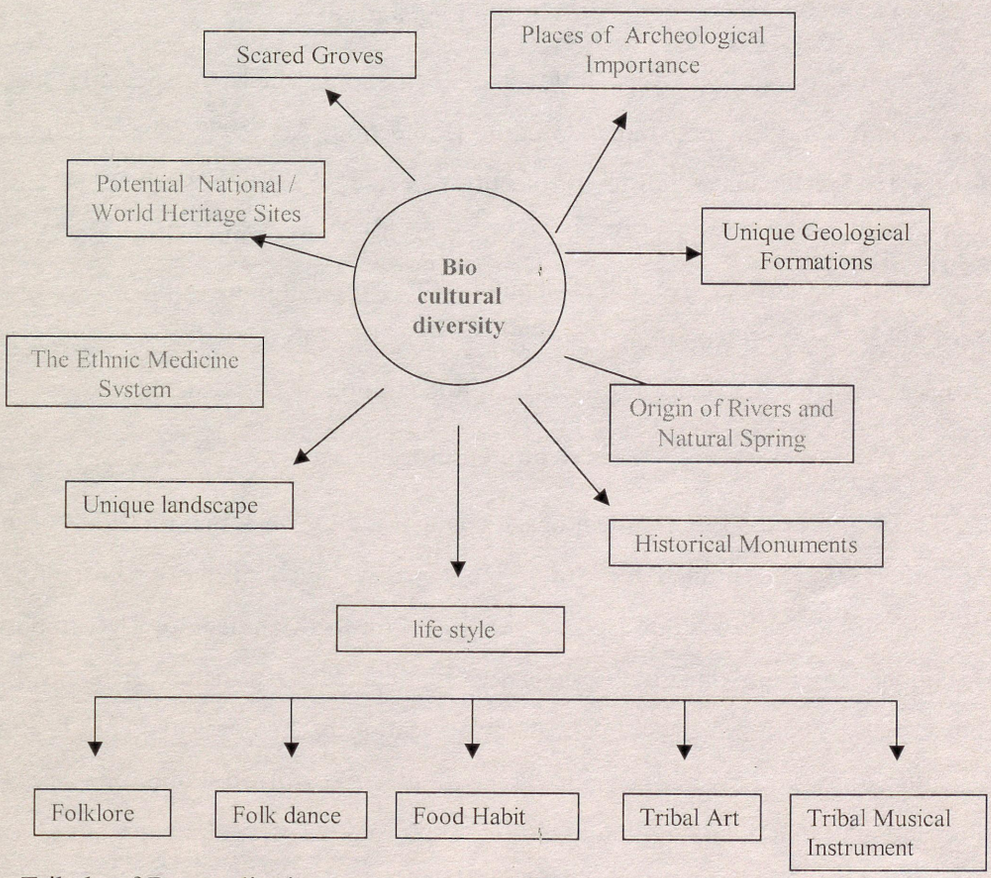
(Not to Scale)



CULTURAL BIODIVERSITY:

Along with archaeology, the culture of Chhattisgarh is also quite famous. The tribal Kanwars, Kamar, Baiga, Halba, Korea, Pando, Birhai, Biniwar make the atmosphere cheerful by their dance and song, on the accasion of marriage and other festivals. The rice-bow Chhattisgarh land has unique eroticism and sweetness. Apart from the mesmerizing dances songs of Dadra, Pandwani, Karma, Panthi and Suva the region has National Parks/Sanctuaries and has places of archeological and religions importance such as Sirpur, Rajim, Malhar, Sita Bengra, Jogibhatta, Deepadih, Dantewada and Dongargarh where tourists come automatically. The ancient deposits of Chhattisgarh and Jain religion memorials are found at Malhar, Sirpur, Mahespur and Arang.It is abundant in Chhattisgarh, with a large variety of flora and fauna, cultural support system, sacred spot, pasture land, lithic habitals, caves, cliffs, den sites and water bodies. **DEOGUDI** is a place of worship, site slected by **Mati Pujari** on the basis of water source, trees, isolation from villae, etc. These also acts as bio-diversity conservation spots.

THE CONTOURS OF BIO-CULTUTRAL DIVERSITY



Tribals of Bastar district are omnivorous. They eat everything which could be edible. A list of thie food is enclosed in the annexure part as **annexure page no----------**

Details of their customs religion political system organization food habits & bio-culturally rich important sites/places of Chhattisgarh can be explored in the **annexures from page no. -------to ----hindi too.**

DIVERSITY OFBIO-DIVERSITY RELATED POLICIES, LAWS AND INSTITUTIONS

At present following policies, laws and institutions directly or indirectly affects the bio-diversity of Chhattisgarh.

Central Legislations, Acts and Rules

The central acts which directly governs mainly the forest land and flora are, National Forest Policy, 1988. Indian Forest Act, 1927. Forest Conservation Act, 1980. Forest Conservation Rules, 1981.

Wildlife Legislations –

The Central Govt. Acts, Rules and Regulations which are specially enacted for the protection of wild life are, Indian Wildlife (Protection) Act, 1972.,The Wildlife (Protection) Rules, 1995., Indian Wildlife (Protection) Act, 1972.,The Wildlife (Transaction and Taxidermy) Rules, 1973.,The Wildlife (Stock Declaration) Central Rules, 1973.,The Wildlife (Protection) Licensing (Additional matters for consideration) Rules, 1983.,The Wildlife (Specified Plants – conditions for possession by Licence) Rules, 1995.,The Wildlife (Transactions and Taxidermy) Rules, 1973.,Recognition of Zoo Rules, 1992.

Environmental Legislations –

To protect the Environment of the country and to check the ill effects of industries on the biodiversity Central Govt. of India has enacted ,Environment Protection Act, 1986.,Environment Protection Rules, 1988.,Rules for the Manufacture, Use, Import, Export of Hazardous Micro-organisms, Genetically Engineered Organisms or Cells.,Environment Impact Assessment Notification , 1994.,Notification of Ecologically Fragile Zones (so far Chhattisgarh is not covered).,Water (Prevention & Control of Pollution) Act, 1974.,Water (Prevention & Control of Pollution) Rules, 1975.,Water (Prevention & Control of Pollution) Cess Act, 1977.,Water (Prevention & Control of Pollution) Cess Rules, 1978.,Air (Prevention & Control of Pollution) Act, 1981.,Air (Prevention & Control of Pollution) Rules,

1982.,National Environment Tribunal Act, 1995.,National Environment Appellate Authority Act, 1997.,National Environment Appellate Authority Rules, 1997.

Mining Legislations –

To regulate the mining activities in India central govt. has forced ,National Mineral Policy, 1993.,Mines Act, 1952.,Mines & Minerals (Development & Regulation) Act, 1957.,Minerals Conservation & Development Rules, 1988.,Mineral Concession Rules, 1960.,Coal Bearing Areas (Acquisition & Development) Act, 1957.

Other Miscellaneous Legislations –

Apart from above legislations some more acts are in force which indirectly regulate the environment and bio-diversity. These are, Central Electricity Act.,The Ancient Archaeological Monuments, Sites and Remains Act, 1958.,Cattle Trespass Act, 1871.,Petroleum Act, 1934.,Atomic Energy Act, 1968.,Radiation Protection Rules, 1971.,Code of Criminal Procedure, 1973.,Trade Related Aspects of Intellectual Property Rights (TRIPS).,The Indian National Ecosystems (Draft) Bills, 1995.,The Protection of Plant Varieties and Farmer's Rights Bill, 1999.,The Biological Diversity Bill, 2000.

States Legislations, Acts and Rules

Chhattisgarh State Government has adopted and enforced several rules and regulations formulated under different acts through the law adoption order 2000, which are,M.P. Protected Forest Rules, 1980.,M.P. Forest (Form of Appeal) Rules, 1988.,M.P. Transit (Forest Produce) Rules, 1961.,M.P. Vanopaj (Vyapar Viniyaman) Adhiniyam, 1969.,M.P. Vanopaj (Vyapar Viniyaman) Niyam, 1969.,M.P. Land Revenue Code, 1959.,M.P. Schedule Tribe (Interest in Trees) Protection Rules, 1987.,M.P. Establishing Forest Villages in RF and PF Rules, 1997.,M.P. Grazing Rules, 1986.,M.P Timber and Other Major produce Rate Regulation – Extension Rules, 1974.,Forest Constract Rules, 1927 (of M.P.),M.P. Kastha Chiran (Viniyaman) Act, 1984.,M.P. Kashtha Chiran (Viniyaman) Niyam, 1984.,M.P. Vanopaj (Vyapar Viniyaman) Kashtha Niyam, 1960.,M.P. Vanopaj (Vyapar Viniyaman) Paramarshdatri (Mantrana) Samiti tatha Mulya Prakashan Niyam, 1969.,M.P. Vanopaj Ke Kararo Ka Punirishan Adhiniyam, 1987.,M.P. Vanopaj Ke Kararo Ka Punirishan Niyam, 1987.,M.P. Tendu Patta (Vyapar Viniyaman) Adhiniyam, 1964.,M.P. Tendu Patta (Vyapar Viniyaman) Niyam, 1966.,M.P. Van Bhumi Shaswat Patta Pratisahan Adhiniyam, 1973.,M.P. van Bhumi Shaswat Patta Pratisahan Niyam, 1974.,M.P. Vanya Prani (Sanrakshan) Niyam, 1974.,M.P. Karadhan (Sanshodhan) Adhiniyam, 2000.

Other Statutes –

Apart from above Acts, Rules and Regulations which indirectly affects the biodiversity are, M.P. Minor Mineral Rules, 1996.,M.P. Krishi Upaj Mandi Adhiniyam, 1972.,M.Pl Panchayati Raj Adhiniyam, 1996.,M.P. Commercial Tax Act, 1994.,M.P. Entry Tax Act, 1995.

It is abundantly clear from above mentioned Central and State statutes that development and sustainable harvesting of biodiversity is governed by a complicated intricate network of statutes. Thus a deep understanding of various environment, forest, mining, taxation and miscellaneous statutes are sine-quo-non of the strategy to avoid legal complications in future.

CHAPTER – IV
PROBLEMS RELTING TO BIODIVERSITY

Biodiversity is a natural entity, which is based on geological formation, geographical locations, altitude and climate etc. This is influenced by anthropogenic factors to a large extent more in tropical conditions than others. The ecological trend is a matter of concern for Chhattisgarh today, as is basseted by the gradual loss, fragmentation and degradation of natural and modified habitats. With this particular concern, problems in various sectors are being addressed.

Loss of Natural Habitat

Though the degradation, fragmentation and total loss of habitat is age-old phenomenon, but the state of Chhattisgarh is witnessing a sharp increase in the intensity, since last two decades approximately.

Wild Biodiversity

Major Threats to Forest Biodiversity

The biodiversity in the forests, grasslands, wetland and mountains, and river ecosystem of Chhattisgarh, has been under pressur. **One of the major causes for the loss of biological diversity in the state has been the depletion of vegetative cover in order to expand agriculture.** The other major region is the degradation of forests on account of over-dependence of poor people on forests. Most of the biodiversity rich forests of the state contain the maximum mineral wealth potential for development projects . Some of the initiatives in such areas in the past have often led to destruction of habitats. Poaching and illegal trade of wildlife products too have adversely affected biological diversity.

Woody biomass of the state, is declining at an alarming high rate. Consumption (mostly for firewood) is exceeding production in all places, except for some sparsely populated areas. If this trend is not addressed seriously, consumption is excepted to increase in time with human population increase, and over a period of time, if unchecked, woody biomass could be totally consumed in the next 30-40 years.

Threats to forest ecosystem

Due to various anthropogenic factors, rate of deforestation is increasing. This destruction is leading to overall disappearance of trees, shrubs and ground flora together with the vertebrate and invertebrate fauna they support. Loss of forest habitat is having a serious impact on biodiversity and it can have serious implications on other natural and agro-ecosystems also.

Mountain and hill ecosystems constitute the base for the forest biodiversity in the state. They constitute the catchments of all the rivers in the state. Such ecosystems are harmed due to major negative impact of unplanned development, opening of roads, degradation of catchments areas and erosion. The major threats faced by the forest ecosystem in the state are: felling without ensuring natural regeneration and converting miscellaneous forests into mono culture plantation, diversion of forests for agriculture, settlements, roads; deforestation for development projects like multipurpose river valley projects; shifting cultivation; grazing; mining firewood collection; introduction of exotics; fire and pollution. Grasslands are one of the most threatened ecosystems in the state. Apart from commercial pressures, they are forced to face pressure from grazing, fire, pollution, development projects, and conversion for agriculture, tree plantation, and introduction and spread of exotics. A number of wetlands in the state found inside forests are reported to be seriously threatened. this apart , land degradation also poses potential threat to biodiversity.

Threats to species and genetic diversity:

The major factors threatening the species and genetic diversity found in the state are similar to those elsewhere in the country. Threats to species and genetic diversity are diversity linked to threats to the ecosystem. In addition, habitat destruction, over exploitation, poisoning by pollutants, introduction of exotics, imbalances in community structure, epidemics, floods, and droughts affect species and genetic diversity. The diversity of indigenous varieties of forest species face many threats from introduction of exotic varieties.

Proximate Causes:

The proximate causes are felling without ensuring natural regeneration and converting miscellaneous forests into mono culture plantation, diversion of forests for agriculture, settlements, roads; deforestation , for development projects like multipurpose river valley projects; shifting cultivation; grazing; mining firewood collection; introduction of exotics; fire and pollution. The proximate causes of species loss and ecosystem erosion are habitat destruction, over exploitation, poisoning by pollutants, introduction of exotics, imbalances in

community structure, epidemics, floods, and droughts. The diversity of indigenous varieties of forest species face many threats from introduction of exotic varieties also .

Root causes:

The root causes of biodiversity in managed forests are population increase, poverty, over dependence on forests, increasing standard of consumption in urban areas, social inequality, gender biases, weakness in governance system, lack of enabling environment, corruption in government organization.

Proximate causes of loss

a. Indiscriminate use of bio-resource.
b. Wild forest fires.
c. Illicit felling.
d. Mining
e. Lack of appropriate forestation of mine dumps.

Root causes of loss

1. Difference in perceptions regarding bio-resources.
2. Lack of awareness in ladies and children.
3. Poaching
4. Excessive utilization coupled with wrongful way of use.
5. Insufficient rehabilitation of degraded forests.
6. Weak enforcement of preventive laws.
7. Weak preventive laws regarding Kochias (Middlemen)
8. Gap in vision and communication of public with forest department
9. Grazers, Forest fire, Vaidyas, middlemen, mining agents, Encroachers and Local tribes play major role for causing threat to Bio-Diversity

Major threats to forest eco-system

1. Lack of political will to attend to problems of the forests

2. Inadequate and inappropriate investments in to the forestry sector
3. No comprehensive land use policy
4. Ever increasing biotic (human and livestock) pressure on the forests
5. Unregulated grazing by livestock
6. The unsustainable exploitation of fuel wood in the guise of head loads
7. Forest produce collection through destructive practices
8. Lack of commitment from personnel and adequate infrastructure support
9. Extremist activities
10. Epidemics affecting forest strands and fauna
11. Repeated man made fires and
12. Problems with natural regeneration of Sal forests.

Proximate and Root causes of loss of biodiversity in Protected Areas (PA's):

Proximate and Root causes detailed for managed forests will hold good for Protected Areas also. Some causes that need special mention with respect to PAs are listed below:

1. Pressure of local people and their livestock on the PA's
2. Impending settlement of rights and rationalization of boundaries.
3. Small size of PA's and degradation and fragmentation of corridors in between them.
4. Increasing ecological isolation of PA's, leading to genetic separation and loss of biodiversity and genetic vigour.
5. Adhoc management of PA's without duly approved scientific management plants in place.
6. Poaching and illegal trade in wildlife and wildlife products and lack of systematic intelligence set-up to prevent the same.
7. Insurgency and related law and order problem.
8. Misplaced activism by human rights NGOs and political pressures.
9. Inappropriate land use outside the boundaries of Protected Areas.

Other causes of loss of bio-diversity in Chhattisgarh

- Unregulated harvesting, without *in-situ* and *ex-situ* conservation of biodiversity.

- Increasing biotic pressure on forest areas.
- Prevailing mis-notion that agriculture has got maximum biodiversity; the fact is that sum total of gene pool may be more in agriculture but about 90% of biodiversity is confined to forests (mainly in sanctuaries, national parks, bio-sphere reserves etc.)
- The concept of "Criteria Indicators" for monitoring and evaluation of biodiversity is not fully developed till yet and bench mark data is not available in this respect.
- Certain working plan/management plan prescriptions are detrimental to the biodiversity conservation.
- Fire, grazing, encroachments, are serious threat to biodiversity.
- Increasing incidence of grazing, closure periods are not observed, heavy un-regulated grazing without rotation, little availability of grazing land outside forests.
- Shrinking forest cover in "orange areas" – which act as buffer between forest and habitations.
- Absolutely no emphasis on soil and moisture conservation – a prime requirement to boost development of biodiversity.
- MFP societies are being encouraged to harvest NTFP and biodiversity without any sustainable development / harvesting in mind.
- Certain administrative decisions like exempting Aonla from transit pass, are causing depletion of resource.
- Panchayati Raj institutions have been empowered with exclusive rights for NTFP harvesting, but unfortunately these bodies are technically not competent to do so.
- Bastar, Dantewada, Kanker, Korba, Kawardha, Bilaspur, Jashpur, Raigarh, Surguja and Manendragarh districts are rich repository of biodiversity and incidentally rich in minerals also. With the development of "mining sector", mining activity would be a serious threat to biodiversity.

- Manendragarh Surguja, Korba, Bilaspur and Raigarh district shall witness installation of thermal power plants in near future. The thermal emissions and fly-ash would pose a serious threat to biodiversity.
- Rapid industrialization (toxic and non-toxic both) without safeguards of EIA and EMP would be detrimental for biodiversity.
- All these activities are likely to pollute water bodies in the State.
- Improper/delayed reclamation of over-burden dumps, spill-over of tailing ponds and waste of coal washings are likely to affect biodiversity adversely.

Domesticated biodiversity

Agro-ecosystems are experiencing a number of trends damaging to biodiversity. These include soil loss intensification of production, increased use of pesticides and fertilizers and climate. Soil degradation reduces the productivity of agricultural lands, reducing the capacity of there lands to sustain micro-organisms and invertebrates of higher trophic levels and indirectly placing greater human demand on natural biodiversity resources. Intensification reduces floral and faunal diversity in crops and field margins.

World the genetic diversity of many crops is eroding. This is due to development of uniform cultivars, grown in uniform environments. The spread of these cultivars is leading to an erosion of primitive crop genetic variety.

In Chhattisgarh many such primitive varieties have disappeared from cultivation and new ones area taking their place. Many old cultivars are now being maintained *in-situ* condition at Indira Gandhi Agricultural University, Raipur

Proximate causes for loss of domesticated biodiversity

Some of the major causes responsible for loss of domesticated agro biodiversity are :

- Unawareness of local farmers regarding availability and importance of indigenous material

- Bringing of imported materials and technology
- Pressures for chemical farming
- Over exploitation of natural resources
- Soil erosion
- Small land holdings

All there ultimately results into loss of biodiversity, loss of traditional systems, conversion of fertile land to barren land and thereby becoming a threat to indigenous crop cultivation and *in-situ* conservation of large number of cultivars, destruction of habitats and replacement or traditional cultivars with high yielding cultivars and cultivation systems for their economic viability.

Horticulture

Fruits

Seedling Mango :

This region was dominated by mango in case of which large plantations were made by seedling mangoes. With the increase in population the demand fr timber as well as fule wood was also increased. With the result, trees of seedling mangoes were cut to fulfill the demand of growing population. It is interesting to note that rare species which possess good qualities were not only known in particular village but in near by locality as well. Such important species are also available today in the region but most of rare trees are vanished.

Seedling guava :

There were huge orchards of guava in this region, but 1980 onwards new orchards were seldom developed. On other hand incidence of guava wilt also occurred after 1980, which had been spread in almost all the region. With the results rare plants of guava possessing a character of heavy bearing quality fruits were come to an end.

Citrus species :

In case of citrus species orchards were not available in the region but people were planting different citrus species either in home garden or in the field nearby source of water. As attention was paid to produce cereals in large quality the citrus species already available in the field was ignored and ultimately most of the citrus species are absent today in this region except lime or lemon.

Jamun :

Wide variability was available in case of this tree species under the region. As jamun trees were mostly developed by natural re-generation along the side of streams or on the bank of rivers. There is an understanding in this region that river banks and sides or edges of streams are made for whole society of particular village. Thus, jamun trees grown naturally were considered no man's property. Therefore, the trees of this fruit crops were cut as and when required by the villagers. On other hand Shepherds and Cowboys *(Rawat)* were mainly responsible to destroy rare species of this important fruit plant as well as medicinal plant.

Wood apple (Kaith) Gular, Lasoda, Chiroungi, Marking Ber and Aonla.

All the fruit trees mentioned in this items are mostly available in the forest of this region. There is wide variability in all the fruit crops but most of the rare species of all this fruit crops were destroyed by the local people who are making the livelihood by collecting and selling forest produce.

Vegetables and other crops

Similar to the fate of rice, as new cultivars and varieties (hybrids) made their may into economic viability many old primitive varieties of vegetable and plants have been or in the process of being lost. Some of them are listed.

1. *Solanum melongema* (Brinjal)
2. *Capsicum annum; capsicum fruitescens* (Chillies)
3. *Cyamopis tetragonoliba* (Clusterbean)
4. *Lablab purpurcons* (Sem)
5. *Momordica dioica* (Kheksi)
6. *Tricosanthus dioica* (Pointed gourd)
7. *Cringiber officinale* (Ginger)
8. *Amorphophllus* sp. (*Elephant Foot yam)*
9. Sweet potato
10. *Colocasia* sp
11. Tamarind
12. Sulfi
13. Tandi and
14. Cashew

Insects

With the advent of hybrid crop varieties which require high fertilizer and other time demanding intense agricultural operations opened up the gates for advent of many insect pests out of control. This led to extreme use of pesticides for their control which also kill many natural enemies of these pests (non-target organisms). Moreover, repeated use of pesticides is creating resistance in insect pests, so over a period of time the insect prey balance many break down leading to a disaster. All activities directly or indirectly leading to a loss in biodiversity. The fate of pesticide accumulation in the ecosystem at different trophic levels is unknown

Useful Insects

Honey bee:

Proximate causes of the loss :

Main culprit is humans (honey collectors) who destroy bee colonies by burning hives or squeezing hives for honey as well as eating bee-bread. Habitat destruction such as massive harvesting of medicinal plants, clearing forest by felling, grazing, poisoning by insecticides/fumigants etc., use of pesticides on agricultural crops etc and massive digging of earth for mining activities etc. Monoculture of bee does not destroy bee species.

Root causes of loss of biodiversity of bees

There is no sustainable model developed for bees. Some people are afraid of bee-stings, so they prefer to destroy colonies, especially those of Rock-bee. There is no consideration for social and political equity, neither there is any policy of government to protect biodiversity of bees. There is no thought given by the government to consider economic value of bees' product. There are no laws to protect biodiversity of bees. There is lack of administration 's coordination between forest, agricultural and social departments to protect bees.

Medicinal plants

Chhattisgarh state possesses as many as 327 medicinal plants and many more are yet to be identified as depicted by Bishal Bharat, 2002. Many useful herbs are being exploited

commercially width proper replacement in their natural ecosystems. Many medicinal plants are declining at rapid rate. Their causes for loss acre presented below :

Proximate causes of loss medicinal plants

1. Continuously increasing human population.
2. Destruction of forest & wild life due to human population pressure resulting in illicit felling of trees, encroachment upon forest land and illegal mining etc.
3. Introduction of exotics and monoculture.
4. Poisoning and poaching of wild animals.
5. Over -exploitation of herbal medicinal plants by local population for trade.
6. Uncontrolled and unscientific harvesting of medicinal plants resulting in their non-sustainable root destruction

Root cause of loss medicinal plant

i. Earlier the biodiversity was managed and controlled by village communities . The utilization and management of forest resources fell under two broad social systems, tribal and agrarian. Under the tribal system , which was the older of the two, individual tribes or clans formed homogeneous social groups and were confined to a particular territory, within which the flow of the resources was largely restricted . The tribal groups had working rules for sustainable utilization of forest resources and associated biological diversities . In the agrarian system, each villages was partly autonomous within its own geographical boundaries to administer and control the forest and other biotic resources which were under the community management system, through religious sanctions . Under both the systems, the local societies had very rich knowledge of biological resources used for traditional medicinal systems. During the colonial period , through successive policy formulations, forest resources were controlled firmly under the state property rights regime. The reservation and demarcation of forest gradually brought an end to the tradition of common property regime or community rights and control.

ii. When the major emphasis was on development of timber species during the colonial period , minor forest produces including medicinal and aromatic plant resources became irrelevant and occupied a back seat . Owing to the conflict - ridden relationship

created between local communities and forest officials during the colonial period , the forest resources management regime was reduced to an open access property regime.

iii. The post independence period also saw unfortunate shift in the role of Panchayats from development to grass-root politicisation . This led to the inter-community conflicts in villages leading to further accentuation in depletion of natural resources including medicinal and aromatic plant through intensified open access system. Most of the common pool medicinal and aromatic plant resources in India have degraded in to open access due to the weak property relations or resource use ownership, institutional arrangements and break -down of local authority system.

iv. Improper conservation, faulty policies, failure to account for the value of biodiversity contribute to biodiversity issues. Clearance of forest for agriculture and other development programs, poor transformation of knowledge, dissemination against traditional medicinal system, encroachment, privatisation and government appropriation of forest resources have resulted in severe depletion of medicinal and aromatic plant resources.

Industry, Mines and biodiversity

Problems, threats & pressures

It is clear from the following chart that more than 50 % of industries falls in the red category on the basis of norms issued by the Central Pollution Control Board. It is a major threat to biodiversity of the Chhattisgarh. We have to monitor closely, to the emissions, and the raw material used in industries, for the of biodiversity conservation.

Proximate causes of loss

Impact on Physical Structures:

The physical alteration is more conspicuous in surface and strip mining. Solid wastes and mine dumps, mill tailings, slag cinders, and ash accumulates in huge piles around large mines forming man made hills. These artificial hills being unconsolidated and loose are subject to slumps and slides and are easily erodable choking surface drainage and deposits on fertile land down slope. This scene is visible about in all the open cast mines of Chhattisgarh e.g. Gevera colliery Bailadila Iron ore mines etc.

Chemical Impact:

The toxicity of the resultant water and air can create hazards to the people and biome.

Biological Impact:

The inherent susceptibly of living organism to change in water and air quality results in metabolic and mutational changes. In certain species it can create concentration of toxic elements, which can move up to food chain. The increased, noise level causes death of some of the Bacteria, Protozoa and more than 80 db of noise increases tension in a human being.

Root causes of loss

1. Lack of Education and Awareness about the Biodiversity
2. Lack of baseline information and sharing of information
3. Lack of financial instruments to address biodiversity conservation/env. Issues
4. Lack of environmental programmes within the industry
5. Outdated technology
6. Lack of interaction between industry and regulatory and research organisations
7. Outdated regulations and legislation
8. Problem of dust due to drilling, blasting and transportation of coal.
9. Pollution of subsurface and underground water in the region.
10. Underground fire in mining areas,
11. Emission of CO_2, hydrocarbon gases like methane and other noxious gases in the atmosphere,
12. Vibration due to blasting,
13. Human diseases like asthma, Silicosis, Pneucokoniosis, dermatitis, anemia and stomach abnormalities due to pollution,
14. Land degradation due to land subsidence, Soil erosion, and change in drainage pattern,

Major threats due to mining activity in this area are:

1. Lowering of permanent water table ,
2. Water pollution due to addition of dissolved substances, toxic substances and enrichment of different salts like gypsum etc. in underground water (Ex. Gypsum crustification in agriculture land around Kawardha district.),

3. Vibration due to blasting, heavy machineries and heavy transporting vehicles,
4. Deforestation,
5. Air pollution through suspended and /or different gases,
6. Soil erosion, land subsidence and changes in drainage pattern,
7. Other factors like disposal of overburden.

Major threat in biodiversity of this region is effected by following ways :

1. Deforestation,
2. Contamination of subsurface and underground water with soluble and suspended elements / particles,
3. Land subsidence, Soil erosion,
4. Geomorphological changes in topography,
5. Change in drainage pattern,
6. Transportation of excess heavy sediments in rivers and tributaries,
7. Rate of siltation in water bodies / water reservoirs is increased,
8. Vibration due to heavy blasting, heavy machineries and transportation equipments.
9. Air pollution due to suspended and toxic gases,
10. Migration of wild birds/animals due to sound pollution and less availability of food chain,
11. Various factors effecting the socio-economical and cultural heritages / habitats of local tribes,
12. Other factors like disposal of overburden.

Threats to Bio Cultural Diversity

Rapid change in land use, population pressure, mining, urbanization, industrialization, changing value system, occupational mobility, migration and scarcity of water resources.Alienation of local communities in general and the indigenous people in particular from the natural resources, traditional occupations, displacement and rehabilitation, decaying of ethical and moral values, inappropriate land tenure system, flaws in policies and laws, centralized authority and lack of inter-departmental, co-ordination especially between rural development, tribal development, health service providers, animal husbandry, eco-development and forest Department. Though there has been considerable loss due to developmental projects and mining activities but it is not too late to recoup. Central part of Chhattisgarh has last in 80% of cultural bio-diversity, north Chhattisgarh has also suffered due to industrialization and urbanization but certain areas (about 1/3 rd) has been retained, especially in Jashpur and Surguja Districts

CHAPTER – V

ACTORS

(WHOSE ACTIVITIES EFFECT BIO-DIVERSITY)

There are acts, which directly influence the diversity of a bio-resource, eg. over exploitation of a particular bio resource from its habit or afforestation works done to improve the productivity are few. Existence of an actor in form of an individual or community or agency to perform these actions is necessary. To enhance or to control the activity, we can analyze the actors responsible for it and then can control the pace.

Actors are of two types : first one-who are responsible for BD degradation, and second type is the list of the actors, which any how conserve the BD of an area. First can be called Negative Actor and the other one Positive. We are obviously more concerned about negative ones. Irrespective of quantum of BD loss, negative actors can create loss almost immediately, after short lapse of time or can take a long time. Again their impact can be direct or through other object/resources. The actors must be dealt in the tone they exist. We can subdivide them into

A) **Primary** first grade actors whose acts degrade BD directly and immediately.

B) **Secondary** are those, whose acts,s if continue uncontrolled for a long time, would show definite ill-effects and

C) **Tertiary** whose acts though seem to be totally harmless but are definitely going to create threat to the concerned bio-resource can be listed as under

A) Primary

- Headloaders of fuel wood.
- Grazers
- Forest Land Encroachers
- Low-Cost labourers involved in illicit timber fellings.

B) Secondary

- Local healers if uncontrolled (Regeneration of herbs not guaranteed)
- P.A. Based rural population (Dependent on P.A. for its bio-resource demand)

- Forest based rural population .
- Tuber/other non-agriculture natural produce based rural.
- Forest department initiated committees.
- NTFP collectors (For Fire hazards especially)

C) Tertiary

- Kochias (Middle-men). Catalyze the tendency of excessive exploitation.
- Small shopkeepers working in deep rural areas. (Link daily household in exchange of NTFP)
- Snake catchers.

SWOT Analysis of Primary Actors

Strength

- Nearness to bio-resource.
- The first stakeholder.
- Can be most of link effective as as agency any task being performed in the area.
- Protection of the linked bio-resource can be addressed best
- Can be the best judge for the fluctuations of quality/quantity of bio-resource of the area.

Weakness

- So much dependent on the bio-resource, that even over-exploitation of BD seems to be perceived as a survival need.
- Non-access to the various welfare programmes being performed by local government.
- In general lack of awareness.
- Economic status of the category is subsistence; thus are very prone to small incentives given by local smugglers.

Opportunity

- If these stakeholders become vehicles for implementation, task can be completed early. Awareness can be very useful for protection of BD of the area.

Threats

- Head loader fell the pole crop and the established regeneration.
- Grazers become the agency for trampling of unstablished ones forest land encroachers (Inclusive of shifting cultivation) accelerate the pace of soil loss pushing the area to be barren .
- If not properly attended to, they can be serious threat to BD

Probable Solutions Which May Resist Further Degradation

a) Head loaders

i) By creating alternative source of employment by raising decentralized nurseries in the area, run by them selves, or at least engaging them as laborers in these nurseries (so as to engage them)

ii) Providing non-conventional energy source to them.

iii) Awareness regarding bio-resource, with remuneration of the day of the training.

iv) Training them for CBO, singling in forest area and technical knowledge of unimportant species which can be exploited at will.

b) Grazier

i) Go for live stock, improvement programs - reducing the non-descript and producing healthy off-springs suiting to area.

ii) Introductions of habit of stall feeding through cattle camps.

iii) Raising Silvipasture areas in charnoi lands and orange areas, so as to reduce entry intensity into forests when unstablished regeneration needs time.

iv) Awareness campaign for them, on the spot (with remuneration if possible)

c) Forest Encroachers

i) Awareness for encroacher as well as JFM committees.

ii) Strict compliance of the existing laws.

iii) Amendments be made in the existing laws to make for forest encroachment as non bailable on

d) Other Misc. actors *(Like agents for hazards which are not regular)*

i) Awareness and capacity building programs at village level.

ii) Listing of fire prone sites and cultural habits responsible for fire hazards.

iii) Listing the occasional agents for it.

iv) Counting of mahua trees and introducing departmental controlled burning.

Renewable sources of Energy (R.E.)

1.) Remote rural areas can't be connected to natural grid, will need non-conventional only to electrify them

2.) Thus the State must have a police on renewable source of energy.

3.) Biomass; would based solar power generation - Potential in the State.

4.) State's Power generation distribution

5.) Solar lanterns lights; Solar thermal water heaters - in industry, Hotel and Hospitals a must.

6.) Coordination funds from National Project on Biogas development (NPBD), - (NBGP) KVIC modal - Deen Babdhu model (Rs. 8000/- to 10000/- with 2 cmt. of gas per day)

7.) Energy plantations + crop residues Bio-mass gassifire (Bio-mass co-generation)

8.) Introduction of decentralized , Hydro power projects in rural area even if forest areas are in submergence.

9.) Huge private investment with tax benefits be permitted in renewable energy ??? in the C.G. . In the initial stage, being a relatively new technology; it would head support from state Govt. in terms of subsided. High cost of RE can be nullified against it social and environmental benefits.

State should take initiative for integration of renewable energy source institution be made mandatory to improve energy efficiency.

CHAPTER – VI

ON-GOING BIO-DIVERSITY RELATED INITIATIVES

It would be imperative to bring the various initiatives by different organizations to pen for a better understanding of the programmes. The on-going initiatives have been put under various levels who are operating them.

1. Governmental

The convention on biological diversity passed in the year 1992 provides a basic framework for the policy at the national level. The state of Chhattisgarh, though received its statehood in 1st of November 2000, enunciated a series of policy measures.

State Government has prepared a document **VISION 2010** compiling over all priorities of all the departments in it and it would lead to progress of the state on impementation. It has mentioned targets like 75 % increase in per capita income, 100 % literacy and primary education, bringing down poverty level by 50 %, 200 % increase in irrigation facility and availability of 100 & pure drinking water.

In the State Forest Policy Resolution , October 2001. The State Forest policy opens a new vista for sustainable management of forest resources, including bio-diversity in the new state. The forest policy, inter alia, focuses on bio-cultural diversity of the state. Certain policy directives pertaining to biodiversity conservation are as under:

1.0 Departmental initiative

1.1 Forest Department:

- .Forest Policy of Chhattisgarh State has been issued.
- .Management of forests through duly approved Working Plans. .
- Resolution on Joint Forest Management has been issued and 6,412 JFM committees constituted covering 33,924 sq km of forests.
- State Steering Committee for State Biodiversity and Action Plan established.
- In-situ conservation efforts in 3 National Parks and 11 Wildlife Sanctuaries in an area of 6,500 sq. km
- Indravati National Park under Project Tiger umbrella.

- Peoples Protected Area work started in nine forest divisions. .Forest Development Authorities established in Jagdalpur, Mahasamund and Sa rguja districts to coordinate all forest development activities.
- Rehabilitation of degraded forests through various forest development projects.

Formulation of Biodiversity conservation strategy and action plan for C.G. State is a good example of governmental initiative to conserve BD. This proposed strategy intends to conserve BD. through the systematic sustainable utilization of resource ensuring proper sharing of benefits. For the purpose, the State Steering Committee has been formed, which meets time to time so to monitor the whole process.

There are awards for BD conservation like Vrikash-Mitra.

1.2 Joint Forest Management in Chhattisgarh

Joint Forest Management (JFM) can be defined as the sharing of products responsibilities, control, and decision-making authority over forestlands between forest department and local groups, based on a formal agreement.

The Forest Policy of the State underlines the importance of JFM and has laid further emphasis that Joint forest management (JFM) should form the basis of forest management . There are 6412 JFM committees in the state. (Annexure). The abundant potential of people living in rural and forest areas should be tapped for sound participatory forest management. Efforts should be made to facilitate assistance from financial institutions to the forest dwellers engaged in forest based economic activity for furthering participatory forest management in the state.

1.3 To translate the policy in to action, the Govt. of Chhattisgarh has passed a Resolution October 2001 on JFM which has following important features-

1. Two types of JFM Committees (village forest committee & Forest Protection Committee) will be formed after consultation with the people living in /near forests.
2. Executive committee will be constituted giving proper representation to SC/ST & OBC. 33% of the members will be female.

3. Microplan will be prepared for forest management & village resource development. State Govt. shall arrange funds for implementing the microplan Committee shall contribute at least 25% of the labour component as "Shramdan ".
4. There will be sharing of benefits accruing from the forest on the principles of care and share.
5. Though the JFM movement began in early nineties, but after the formation of the state it has received well desired momentum. By the end of Dec. 2001, 3190 Village Forest Committees and 3222 Forest Protection Committees have been constituted covering 33.91 lakh ha. forest area. The JFM has so far involved more than 1.05 lakh families spread over 7115 villages across the state. It is the endeavor of Forest Department to cover all the 9000 villages situated within 5 km. radius of forests under JFM.
6. The multi – dimensional activities being carried out through active involvement of JFM committees can be broadly classified into:
7. Protection of biodiversity.
8. Enrichment of degraded forest ecosystem.
9. Income generation activities.
10. Strengthening participatory socio-economic institutions.

The result of Joint Forest Management now has come forward as a **EXEMPLARY MANAGED FOREST** area 5979.07 ha in Dhorpur & Rajpur forest ranges of the Sarguja Forest Division. VFC and FPC have taken responsibilities of protection & management of forests in the guidance of forest department resulting increased regeneration, decrease in forest fire, expanding area of Acorous calamus (Bach) and other medicinal species.

1.4 Forest Department, Nodal Agency for all development works:

Keeping in view the success of the JFM movement in the State, recently the Hon'ble Chief Minister of Chhattisgarh has also announced that the Forest Department will be the **Nodal Agency for all the developmental works to be taken up in the villages located within 5 km.** from the boundary of the forest and a pilot project will soon be started in Dhamtari District.

1.5 Constitution of FDA.

Similarly, keeping in view the relevance of JFM, the Govt. of India has issued

directions to all States to constitute Forest Development Authority (FDA) on the line of DRDA, in every forest division.

1.6 People's Protected Area (PPA)

People's Protected Area (PPA) is a an important forestry program being implemented in Chhattisgarh. It targets on broad range of goods and services in terms of physical, material, human, social and environmental assets in conjunction with appropriate entitlement regime. People's Protected Area (PPA) envisions a proactive and people's friendly framework so that it becomes Poor People's Pool of Assets (PPA) for meaningful poverty alleviation and their enhanced well being.

In India, the PA network has been largely targeted on faunal aspects, envisaging exclusion of anthropogenic pressure from the forests. However poor people may not conserve biodiversity if the process of conservation competes with their survival needs. Protected Areas (PAs), divorced from livelihood security of the people has no future. The organic link between the conservation and sustainable utilization by the dependent people will require a resilient and adaptive management which can reconcile the dichotomy of threat perceptions arising out of conservation-development orthodoxy by taking into account the human sensitivities in terms of the felt needs of the people, their social norms, beliefs and systems borne out of history, culture and traditions.

To conjugate the above premise with developmental process, the concept of People's Protected Area which may also be termed as the Poor People's Pool of Assets, has emerged, which aims at facilitating poor people's access to physical, material, human, social and environmental assets.

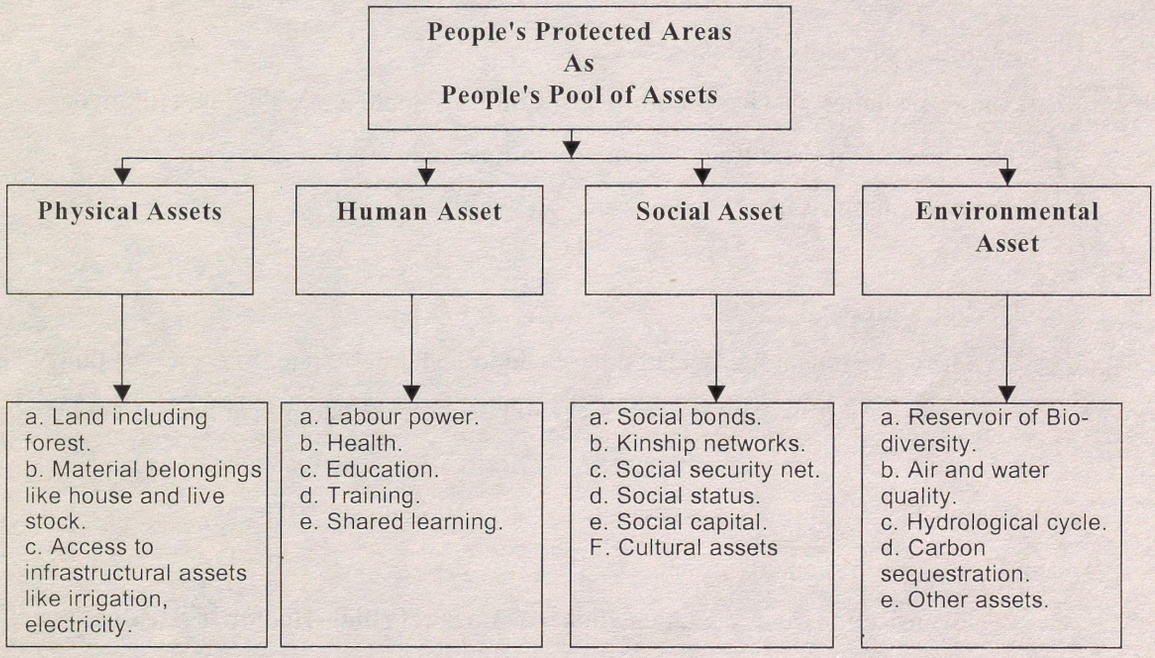
The People's Protected Areas are in consonance with the IUCN Category VI which delineate sites containing predominantly unmodified natural systems, under management to ensure the long term protection and maintenance of biological diversity, whilst providing at the same time a sustainable flow of natural products and services to meet local community needs.

To translate the concept of People's Protected Area on the ground and to make the conservation efforts proactive and people's friendly, it has been logically decided to bring the

local communities into the forefront by meaningfully involving them in the management of the natural resources. Accordingly, steps have been initiated in Dhamtari, Jagdalpur, East .Bhanupratapur, Bilaspur, Marwahi, Dharamjayagarh Raigarh, East Sarguja, Korea and Durg Forest Divisions of Chhattisgarh, to institutionalize the People' Protected Area. (Fig)

The people of the area would be stewards of the forest resources and manage their pool of assets to fight against the gaping jaws of hunger, poverty, unemployment, resource backwardness and health problems coupled with social evils persisting within the villages.

Capital base of PPAs is depicted below:



Livelihood securities: Moving away from income or consumption criteria, many a times poverty has been equated with the lack of livelihood security. Stated briefly livelihood security comprises of multidisciplinary safety nets for furtherance of physiological and psychological well being of the people. Accordingly, sustainable livelihood approach permeates the entire concept of **People's Protected Area**.

1.7 Wild Life

1.7.1 Special efforts for wildlife conservation

1. Anti-poaching squads : Constituted at Raipur, Bilaspur, Jagdalpur and Surguja

2. Tiger Cell : Police and Forest Department work in coordination

3. State Level Committee

4. Vikas Nidhi : Created in all PA's, Gate revenue be recycled to improve tourist facility.

5. The State Government has recommended 3 sanctuaries i.e. Udanti, Sitanadi & Achanakmar, for the Project Tiger.

1.8 Research & Monitoring

1. Monitoring of wildlife habitat
2. Ecological studies on Tiger, Sloth Bear, Wild Buffalo, Gaur, Wild dog, Hill myna
3. Application of GIS and Radio Telemetry in Research Works
4. Interpretation / Informative programme on wildlife

1.9 Herbal State

The Government has declared the State to be herbal State, forest development agency is to be created shortly. State is on the way to be a herbal State. Local healers are being given priority and the herbs are documented. Rajiv Gandhi Watershed Area Development Programme is also a good task, which helps in BD conservation, by assurance of people's decision for people and environment welfare.

Identification and documentation of **Local Tribal Doctor (Healer)** and their specialisation on a particular disease has been started by the Directorate of Indian System of Medicine and Homeopathy, Chhattisgarh. Up till now 355 persons have been identified and further documentation is going on.

State Government has decided to take **MASSIVE PLANTATION OF NEEM** saplings due to it's medicinal properties and demand.

Survey of distribution of **ethnomedicinal plants** have been done partially in Bastar area of Chhattisgarh. Their availability in the forests has been accessed and traders have been identified.

1.10 World Bank's Chhattisgarh Community Forest Management Project

World Bank has agreed in principle to start a Community Forest Management Project with a objective to strengthen participatory system of natural resource management and

marketing to improve and sustain the livelihoods of forest dependence people. It is a transition from J.F.M. to C.F.M.

2. Agriculture:

2.1 Changing of Crop Pattern in C.G.: The agriculture department has started a major project for changing of crop pattern to harvest full capacity of land with the consultation of Agricultural University Raipur. This project has been launched on 8-4-2002 and emphasises on at least two crops in a year.

This will check labour migration and exploitation from the state.

2. Tourism: Govt of CG is its resolution of cultural policy dt. 22nd Oct 2001 envisages as follows :-

Tourism will be developed as non-invasive instrument of biological ecological and cultural conservation, and not as a bread and circus affair.

3. Panchayati Raj: Rural Development Department

Govt. of Chhattisgarh has given vast powers to the panchayats and other BD related agents, which are in vicinity to forests. Gram-Sabhas can very well resist or accelerate any activity going on in their area. Sabha can also initiate for a new activity.

Watershed area development programme which was initiated by the centre has been accepted by the State Govt. also. Integrated Watershed Area development programme (in forest area) has also been started from year 2001-2002.

4. Revenue Department:

Chhattisgarh Govt. has launched a programme named Indira Hareli-Saheli, which has added a lot to the greenery of the State.

5. Rural Department & CHIPS:

On first of November, 2001 villages in Chhattisgarh, numbering over eighteen thousand, have embarked on Campaign to prepare their own Jan-Rapats (People's Reports) People's would not only documents the human development status of each village- and, in that

sense would serve as a human Development Report for each village – but would also use the inventory on resident natural, physical and human resources leading to community action in development. The preparation of people's Reports would be an elaborate exercise in participatory study, analysis and documentation. In one sense, it marries the concepts of people's planning and human development reports.

The village level people's report would then be amalgamated to form District and State level Jan Rapats. The aggregated State Report would serve as the State Human Development Report. Another area of exploration is the potential of these reports as documents that would lead to community action in development and as inputs into district planning. People's Reports in Chhattisgarh are intended to address these broad concerns, reflection both the status as well as the local vision for developing the State's villages. The Chhattisgarh ki Jan Rapat or the People's Report for Chhattisgarh is based on the convictions that every citizen of this state has the right to articulate his or her self and it is this articulation that can form the best resource to information, planning and enhancement of a democratic civil society.

The jan rapats will not only document the village resources, they will also provide a framework for future community action to utilise available resources in the best possible manner for overall development of the village. The jan rapat will specifically address issues of gender, equity, livelihoods poverty, food security etc.

There are many investigation/Research centres for various BD related items. All the germ plasm of paddy, found in Chhattisgarh, sown in IGNU Raipur, to maintain local gram plasm gene intact.

6. Culture Department:

Culture policy of the State envisages on intact relationship of tribals to forests. Sarna concept is being taken very seriously which has characterised the tribal/forest relationship in North Chhattisgarh. In Dandakarnya plateau, Salfi tree is the main item of tribal life. Bio-diversity action plan being conceptualised not taken care of them.

The policy of the department directs for the mapping of bio-cultural habitat and documentation of skilled and technical resource persons.

Two days seminar on inter state relations was organised by the department of culture in the month of March 2002, revealing inter cultural linkages among the Orrissa, Uttar Pradesh, Maharastra & Andhra Pradesh. The fact was disclosed that 40 % of five tribes from adjoining state Orrissa are diminishing either due to migration or death.

7. Industry & Mining:

As the Chhattisgarh state is a new formed state, the government has not taken any significant, new and innovative imitative related to the Mines, Industry and Biodiversity, apart from adopting legislations already enforced in the old Madhya Pradesh and the Laws formed by the Central Government such as :

- The Environment Protection Act, 1986.
- The Water (Prevention & Control of Pollution) Act, 1974.
- The Forest Conservation Act 1980
- The Air (Prevention & Control of Pollution) Act, 1981.
- Indian Forest Act 1927 and Laws framed within the act.

8. Law & Legislation:

Customary law and biodiversity –

The customary law of certain primitive / aboriginal tribes are protected under the provisions of the Schedule-VI of the Constitution. In a cursory view following tribes enjoy customs/ customary privileges as given below.

Korba, Pohari Korba	—	None
Gond	—	Use Salai (Boswellia serrata poles in marriage "Madwa".
Maria and Muria	—	Enjoy a wide range of exclusive customary privileges in the "Abujmar". Sal tress for "Rath".

Korku	—	None
Baiga	—	Sal leaves, honey, "Dhop" for rituals.

All tribes enjoy customary privileges of collection of small timber, firewood, Dev-sthan (place of worship), NTFP's (Mahua, Tendupatta, Sal seed, Ashwagandha, Aonla, Safed Musli, Baibidang, Baichand, Tikhur etc.)

Water Resources & Public Health Department:

The department of water resources and public health has taken initiation for the preparation of **thematic map of ground water level** for proper exploitation of ground water with the help of Regional Remote Sensing Services Centre Nagpur.

The second **major irrigation project on Kelo river** in Raigarh district capable of irrigating 30,000 hectares of land at the cost of 825 hectares of forest land has been cleared off by the state government to Central Water Authority for final approval.

Government of Chhattisgarh has decided to provide **free water from canals and dams** for the non-paddy , horticulture, vegetables & fruit crops till May 31, 2002.

Chhattisgarh State Electricity Board:

The **TWO NEW HYDAL PROJECTS** in Bastar and Dhamtari district is set to open. In Dhamatari on the banks of Mahanadi river near Gangrel dam is being installed. Another power project is likely to come up on the banks of the river Indravati in Baster district.

CREDA

CREDA has decided to construct an **ENERGY EDUCATION PARK** at the Rajeev Smriti Van on the VIP road Raipur. To create the awareness among the prople about the renewable energy models based on Non-conventional energy sources would be installed in the park.

2. Other institutions: -

2.1 Indira Gandhi Agriculture University has taken up as lot of projects on horticulture, fisheries crop diversity, economic valuation of Bio-diversity, livestock and other related issues. Symposium are held time to time and the knowledge data is updated. This knowledge bank would find momentum, in the process of formation of Strategy & action plan for Chhattisgarh.

Research work regarding collection and evaluation of local germ-plasm of tuber crops as well as plantation crops has already been taken up at college of Agriculture, Research Station, Jagdalpur. Besides, activities regarding extension of improved technology in agriculture in tribal area was also undertaken by Ramkrishna Mission Ashram at Narayanpur. Thus conservation of biodiversity is initiated at Narayanpur under orchard development programme on the farm of Ram Krishna Mission.

2.2 Ravishankar University, Raipur has fund through U.G.C. and a lot of projects are on funded by many other agencies. University has initiated and has mediated for many projects in the field of Botany, Zoology, Herpatofauna, fisheries and other related disciplines.

A lot of students with masters degree have been registered for doctorate in their concerned disciplines. That will create yet another data base bank.

2.3 Chhattisgarh Renewable Energy Development Agency: It has launched a major project of electrification by solar panel, of rural villages specially within the sanctuaries and forests for the domestic use only in March 2002.

3. NGO/NGI :-

There are Several NGOs working in the field of Socio-economic development of rural population as well as for WL and also in the field of environmental education

In certain parts of Chhattisgarh (like ambagarh chowki, Rajnandgaron) religion bodies like **Gayatri Parivar** use to take schemes of Biodiversity conservation floated by EPCO and MPCOST. They go for schemes for water conservation/Soil Conservation and trainings etc.

Recently **CEE (Centre for Environment & Education**) has started it's branch office at capital Raipur to extend their activity in the state.

An organisation **Ajadi Bachao Andolan** has suggested the state government to chalk out a People's Draft for the development of state, It is to be prepared by intellectuals living in the state and should fix the priorities for the development of Chhattisgarh.

CHHATTISGARH JAL BIRADARI has launched a programme Jal bjeevan yatra to encourage people to contribute voluntary labour for creating a new water source or extend & conserve the existing water sources in villages.

Action for food production and Surguja Gramin Vikas Sansthan jointally started watershed development programme in the Rajkheta village of the Sarguja district. From the

beginning of the project, women were involved in planning and implementation. Now the villagers are producing lush green crops in their fields and biodiversity is also increasing.

SRISTI HERBAL ACADEMY AND RESEARCH INSTITUTE has documented about the MEDICINAL INSECTS, MITES AND SPIDERS in Chhattisgarh. They have identified 6 species used by the local healers in different diseases & work is on progress. Apart from this they have started enlisting of medicinal flora & fauna, and their potential in the state. Details are given in **annexure page no----------**

DEOGUDI OF MATI PUJARI IN BASTAR: Deogudi of Bastar in Chhattisgarh state are centre of biodiversity conservation. The place is selected by Mati Pujari of the village on the certain criteria, some of them are:

1. Water Source near the site.
2. Isolated but near to village.
3. Area 2 to 3 acres.

Taboos:

1. No trees shall be cut or destroyed.
2. No wind fallen shall be removed.
3. No unnecessary trespassing.
4. Protected from fire, grazing etc.

CHAPTER-VII

GAP ANALYSIS

GAPS:

I. *IN INFORMATION*

State of Chhattisgarh is bestowed with a wide variety of valuable tropical forests, with a versatile nature of species, trees, bushes, grasses, tubers, bryophytes, ptridophytes, fungi and Algae fruits in sets, reptiles? fishes and other games. In agricultural field we have 51 species of cereals and millets, 104 species of fruits, 27 of spices, 24 of fibre plants, 12 species of oil seeds, besides several wild strains of coffee, tobacco and sugarcane. Besides these, a host of micro-organism is yet to be described.

In course of stewing for priority are on gaps in various directions were properly dissected. Based on secondary data available, number of unidentified species of plants and animals (and of course micro-organism) gist of the workshops held at six forest circle headquarter, the fact surfaced that there is a vast area yet to be explored. Viruses, archaea, eubacteria, cynobacteria, various fungi, Algae, lichens along with trees, bushes herbs, reptiles and insects, human foods are main hotspot where there is hiatus between peoples knowledge and secondary data. This hiatus is to be filled. Documentation and erecting BD Parks con be one answer to it.

II. IN VISION

It was clear that besides, use of BD for the want of thatching roofs, fuel, food, medicines, fodder and the such genuine reasons. BD was fragmented for human greed also (eq. mines, stone quarry, unjust commerce of endemic plants/herbs etc.) This greed coupled with very weak legal actions has created havoc ecologically but in a clandestine manner. We are not serious with this regard up to the requisite limit.

Second stage gap in vision is difference in perceptions pertaining to use of BD in the name of development. Debate still goes an whether to save BD strictly on the cost of so called human needs of to develop sacrificing BD to certain permissible limit of destruction. But then again the gap of information comes in way.

Forests of Chhattisgarh face forest fires thrice. First, at the time of pruning, to get fresh flush of Tendu leaves, second instance is for mahua and lastly for sal seeds. Any amount of .advise from FD to the villagers does not work . Sense of ownership of forest land to the people residing in vicinity to forests has not taken the proper placement. Forest fires not only burn herbs and important ecological links but also regeneration which are coming up (and also established ones) are sacrificed. Soil is loosened owing to washing away of ash of humus. This initiates for erosion of soil. Many hardy species which are primary sere vegetation, come up in the area, which suppress the desired species.

Political parties, NGOs and lobbies, in the name of disprivilaged people, advocate for settlement of encroacher residing on the forestland. This vision can increase incidences of encroachment. Another gap is tendency among lower forest functionaries to hide the encroachment incidences, to avoid administrative action against them.

Without resolving certain conflicts in Bio-diversity areas, we can not achieve sustainable conservation. Some of them are:

1. Human Vs. Nature.
2. Life Vs. Profit.
3. Surplus Vs. Survival.
4. Nistar rights Vs. Conservation.
5. Consumption Vs. Regeneration.
6. Subsistance economy Vs. Market economy.
7. Global resources Vs. Local resources.

III. GAP IN INSTITUTIONAL AND HUMAN CAPACITY

Till today there is no single Govt. or non Govt. body which can be held responsible to collect all relevant information regarding BD. Every Govt. department has its own priority norms which are monitored separately. This causes a gap in horizontal linkage on the spot where it is boldly needed.

NGO are also working in isolation. Except for funds or for approaches they lack any link with government agencies. This some times causes problems or at least lack of proper exploitation of energy is evident.

IV. GAP IN POLICY, LEGAL STRUCTURE AND IMPLEMENTATION

District collector (DM) has been given immense power, with heavy responsibility. The two result in shrinking the time given to a problem to be solved. This causes hurried decisions with lack of full information.

In 1956 at the time of state of M.P, it had same what less than 100 Sq.Km. of un-demarcated PF. (91.291) In order to regulate forest properly, section 20A was inserted in IFA 1927 MP Rajpatra dated 2oth March 1965, which brought all the forests (having legal status of undemarcated PF, any area declared PF /RF by any authority / princely state in pre independence period, any land recorded in area register of working plan) under the ambit of IFA. Unfortunately the correction of revenue/forest records were not carried out, which resulted in very complicated scenario.

Likewise., M.P. State government took conscientious decision in 1968 to transfer large forest areas where refugees were settled to Revenue Deptt. for settlement of land-less. But due to resentment of public it was postponed temporarily. In 1971, delineation of forest boundaries in permanent revenue records was decided by State Govt, but could never be implemented in intention & spirit. Later, on the name of delayed process of denotification , in 1972, Collectors were given powers to issue Bhoomi-Swami patta is orange areas. Similarly in 1970 & 80, 20 point programme committee also issued a lot of pattas to village blocks.

Over all these acts gave a impression that encroachment in forest land was easier than any where else. Which has ultimately resulted in tendency to fragment the forest ecosystem at will. This is also a gap, to be filled.

V. EXCLUSIVE GAPS IN CHHATTISGARH

1. Deficiency in database : Managed Forest Ecosystem

The baseline data on species and genetic diversity, particularly intra specific diversity, and their macro and micro -habitats is inadequate. . There are many areas in the state which are supposedly rich in repositories of endemic and other species and their survey may add species far more than the number recorded in past. These areas need to be surveyed in order to develop a complete state database, which would include listing of all species, with their location, distribution, description, status, and their local uses, if any. For this purpose, the survey organisations could network with other agencies, particularly forest department, universities and colleges, with a substantial support from national funding agencies in terms of policy planning and funding.

2. PRESENT STATUS OF INSECT AND ARTHROPODS AND GAP TO BE FILLED AT A GLANCE

A. Natural Ecosystem	Status	Gap to be filled
1. Forest		
a. Trees	Major harmful insects have been documented	Systematic documentation of minor as well as NE's , is to be done
b. Shrubs	-------do ------	-------do ------
c. Medicinal plant with ground flora	No proper documentation	Total insect scenario & their status and NE's is to documented
II. Aqua Entomology	Major aquatic arthropods have been documented for Chhattisgarh plain	The associated insects particularly in Bastar & Northern hill are to be documented.
III. Veterinary Entomology		
a. Domestic	Insect has been document	NE's are to be documented
b. Wild	No documentation has been	Total virgin field; needs

	done so for	initiation of documentation
IV Medical Entomology	Major arthropods have been recorded	NE's are to be documented
V. Forensic Entomology	Total virgin field	Needs initiation of documentation
VI. Insects of industrial importance	Major insects like silk honey & lac production insects have been documented	NE's are to be studied in detail The distribution of honey bees needs proper documentation
VII. Insects as helpers a. Predators & parasites b. Pollinators	Their association & density have not been documented so far	Status and their role need to be documented systematically

3. INTER STATE LINKAGES AND THEIR APPRAISAL

Chhattisgarh touches the boundaries of six states. (U.P., Jharkhand, Orissa, Maharastra, M.P.,A.P.) of which A.P. boundary is very important, where to & fro visits of naxalites is evident. Because of them, movement of local people who are mainly tribals. These tribes have a good knowledge bank, treasure of folklore competing with that of NE, a Good knowledge of Bio-resource which is being used today itself. Then exploitation of them is also there. People from thickly populated states like A.P. and Maharastra try to establish here with a result Sulfi trees are sacrificed, for want of land to build houses.

There are cultural and historical linkages with Orissa. There are many temples on either state boundaries, which show a direct archeologica1/historical/cultural link between the two states. This is quite evident from the ruins and burials of some unknown unnamed temples. Chhattisgarh has some negative linkages with Jharkhand and Orissa. Interstate smuggling of timber is the foremost, which is headache for the two states. There are kochias (middlemen) who purchase NTFP at through away prices from hamlets of state boundary , earning a big margin of profit ant of this. Exploitation of local rural is the result.

Elephants tress pan is most recent link between Jharkhand-C.G. and Orissa-C.G. This is become of habitat distraction is neighbouring states.

There is a need for the States to address the linkages and to reach a policy consensus.

4. GAPS IN PROTECTED AREA

ISSUE
• Theft of timber and other forest produce. • Unsustainable exploitation for fuel-wood under the guise of head loads.
• Lack of commitment from personnel and adequate infrastructure support.
• Threats of encroachments on forestlands.
• Ban on recruitment of forest personnel.
• Epidemics affecting forest strands and fauna.
• Status of NTFP (levels of exploitation, exploitation practices, regeneration levels, sustainability factor) that are both legally and illegally harvested is wanting.
• Small size of protected areas & degradation and fragmentation of habitats in managed forests.
• Increasing ecological isolation of P.A.s, leading to genetic separation and loss of biodiversity and genetic vigour.
• Impending settlement of rights and rationalization of PA boundaries.
Management Planning : Adhoc management in majority of Protected Areas of the state without duly approved scientific manage-ment plans in place. Most protected areas, except for a few important National Parks, do not have management plans or have only namesake 'plans'.
• Poaching and illegal trade in wildlife and wildlife products. Lack of systematic intelligence set-up to prevent the same. This aspect of protection also requires special skills at field level, which is rarely available at present.
• Man animal conflicts. Crop depredations.
• Ploughing back Tourism revenues into to the local economy to win over the local support.
• Insurgency, Law and Order Problem.
• Misplaced activism by human rights, NGO's and political pressures.
• The State does not have any real climatic climax type of grasslands. Grasslands further can be divided into grasslands in forest areas and grasslands outside forest areas. But unfortunately the acreage data with respect to these categories is wanting.

5. **Gaps at Legislative level:** Several of the acts that affect the biodiversity of the state/nation such as Fisheries Act 1987, Seeds Act 1966, Species Board Act 1986 and several other acts pertain mainly to use/exploitation of biological resources than their conservation. On the other hand acts such as Wildlife (Protection) Act 1972 have focus on protection rather than conservation. Conservation includes protection, but also preservation, development, regeneration, propagation and sustainable use. Changes in these acts need to be done at the national level. But it is important to point out the same in the SBAP. In all probability proposed biodiversity Bill is presumed to take care of some of the legislative anomalies.

   Lack of comprehensive land use policy at the state level is another gap in the legislation to reduce the land hunger attitudes. This will help in reducing the tendencies in diversion of forest area for non-forest purposes.

6. **Ex-situ Conservation**: To complement in-situ conservation ex-situ conservation of wild flora and fauna is a must. Not a singly Botanical Garden or Zoo is present for ex-situ conservation of important endangered wild flora and fauna of the state.

7. **Sustainable use of Biological diversity**: At present much of the NTFP including medicinal plants are harvested from the wild without much consideration to the conservation aspects. We do not have any scientific data about levels of sustainable harvesting of these NTFP's.

8. **Indigenous knowledge systems, Practices, Innovations and benefit sharing**: Indigenous knowledge systems are both coded and non-coded and are formal and informal. Coded systems include Ayurveda, Unani and Sidha systems and a wealth of information is non-coded which is in the form of local knowledge systems and practices. Documentation of knowledge systems and practices and innovations are lacking. While documenting the same IPR's (Intellectual property rights) of these people need to be safe guarded.

9. **Institutional Frame Work**: Biodiversity conservation is a multidisciplinary in nature and involves various governmental and nongovernmental agencies. Thus it requires a nodal agency to coordinate all the wings related to biodiversity conservation. Incorporation of biodiversity concerns in development projects is another important

aspect that needs to be looked into. Considering the limited public investments in the biodiversity conservation sector there is a need to attract private and external sources of financing, which is lacking at present.

PEOPLE'S PROTECTED AREA:

PA network has been targeted on faunal aspects alone, envisaging exclusion of anthropogenic pressure from the forests. However poor people may not conserve biodiversity it the process of conservation competes with their survival needs. The ground reality is that the ecological security of the PAs, divorced from livelihood security of the people has no future. The organic link between the conservation and sustainable utilization by the dependent people will require a resilient and adaptive management which can reconcile the dichotomy of threat perceptions arising out of conservation-development orthodoxy. This will necessitate taking into account the human sensitivities in terms of the felt needs of the people. Their social norms, beliefs and systems borne out of history, culture and traditions.

Detail discussion is enclosed in **annexure page no----------**

BIODIVERSITY CONSERVATION:

- Biodiversity has been viewed as common heritage of mankind but now there is a paradigm shift towards considering it as national patrimony of the indigenous groups and consequently, the issue of property rights access and benefit sharing among the local people gains importance.
- Since most of the World's Biodiversity is found in inverse proportion to the technological and industrial wealth (Macilwain. 1996) the conflict between biodiversity rich and poor nations is aggravated.
- The arrangement of benefit sharing arising out of Bio prospecting are yet to fined tune.
- Material Transfer Agreements (MTA) envisaging items like recognition of the origin or provenance of the material etc. are in the initial stages only.
- Indiscriminate use of biotechnology and issue of Bio-safety needs detailed scrutiny and surveillance.

- ❖ Protected Areas (IUCN Category II) contemplate exclusion of benefit sharing. Some modalities have to be developed to rectify this aberration.
- ❖ Methodologies of obtaining informed consents of the concerned parties are to be elaborated.
- ❖ Mountain ecosystem are highly fragile. These areas need therefore new special attention.

10. HORTICULTURAL :

(i) Commercial orchard / blocks are not being planted in the region for Leechi fruits in Ambikapur.

(ii) Plants of local types are not being multiplied as per demand by the farmers.

(iii) There are no organization to take up the Challenging task of conservation of bio-diversity in the State.

(iv) For want of marketing, the farmers are not coming forward to collect and take up regular plantation programme or block plantation.

(v) Germplasm regarding elite trees of tamarind are yet to collected from both the district of the region.

(vi) No legal bindings are imposed on tribals towards use of forest spp. and merchants of timber are cutting tamarind, sulfi, tadi trees illegally.

(vii) Suckers of local type of banana is neither maintained nor multiplied and they are replaced by improved variety of Banana.

(viii) Distinct types of trees of sulfi and tadi, jackfruit, mango, chirounji may be identified and collection of germplasm of these trees is urgently required within 2 years as several important trees of above mentioned crops are being vanished.

(ix) In case of Ivy-gourd distinct types were collected under IGAU from an area of Abuzmad upto Orchha. Beyond that orchha distinct plant types are yet to be collected. Amongst germplasm collected by IGAU Ac.5,Ac.6,Ac.48 and Ac.52 were found promising, but these lines need massive extension programme.

(x) Substantial number of tuber crops are being grown in both the districts of Bastar plateau. Few of them are popular in entire region but some of them are yet to be identified for their economic value.

(xi) At present there is no organization which will take care of conservation of distinct plant material available in the region.

11. Areas that require proper investigation.

1.Grasslands

2. Herbs, climbers and epiphytes of forests

3. Lichens, Bryophytes and Pteridophytes including the ferns

4. Gymnosperms

5. Biodiversity of the Urban Area

6. Biodiversity of Dragonfly

7. Rice field bunds

8. Hot Spots: There is, so far no any identified area as HOT SPOT, for Chhattisgarh region. Chhota Nagpur, adjoining to Jaspur Nagar district, is the only area to be considered as a mini hot spot. However, it is expected that detailed investigation of the state may reveal one or more HOT SPOTS for the state, with respect to plant and animal biodiversity.

9. Microbial Biodiversity

12. Honey Bee:

1. Gap in information, policy and legal structure: Lack of formal beekeeping policy and law; Lack of trained personnel in planning and policy issues; Lack of formal cross-sectoral coordination with other related sectors such as forestry, agriculture and wildlife; Lack of feedback mechanisms between beekeeping extension workers and beekeepers/traders/processors and other stakeholders involved in beekeeping development. Lack of adequate statistical information to guide plans and operations for the development of the beekeeping sector; and Lack of facilities and equipment for collection, storage and management of beekeeping data.

2. Gaps in Vision:

- Management aspects of bee's biodiversity.
- Case Studies of management regimes under various central and state schemes.
- In depth analysis of the eco-development and JFM initiatives.
- Animal conflicts and over exploitation of honey combs
- Gaps in knowledge and research
- Institutional strengths and availability of expertise in various sectors.

- Effectiveness of initiatives such as the Peoples Biodiversity Register and Teachers Network
- Impact of plantations especially those under private ownership and impact on biodiversity
- Involving industries and industrial bodies in conservation efforts
- Key players in conservation efforts especially those hitherto not included
- Socio-economic factors including gender, tribal identity.

13. INSECTS

A . Need of proper documentation.

(i) Forest Entomology
(ii) Aqua Entomology
(iii) Veterinary Entomology
(iv) Medical Entomology
(v) Insects as helper
(vi) Insects of Industrial
(vii) Forensic insects
(viii) Other Arthropods

14. LIVESTOCK

1. **Conservation of Aseel**
2. **Identification and characterization of local cattle and buffalo**
3. **Lack of animal genetics laboratory**

15. AQUATIC BIODIVERSITY :-

The pressure on freshwater ecosystem in Chhattisgarh are not very well known. So the study on the following aspects in desired :

- Management of Surface and ground water for environmental benefits.
- Fragmentation of previously connected systems.
- Pollution and contamination.
- Drainage and infilling of wetlands.

- Protection of riparian zones.
- Impacts of invasive species.
- Changes in natural plants and animals life cycles.

16. MEDICINAL PLANT BIODIVERSITY :-

i. Gap is to be bridged in by bringing the use of these herbs into existing framework of rational scientific use of the medicines.

ii. There is a gap in regulatory and legislative control for sustainable harvesting.

iii. Gap exists in quality control both of raw material and finished product .

iv. In standardization of herbal medicines.

v. In Study of clinical - efficacy of every herbal remedy used to determine whether they are really and actually effective and useful or not.

17. CROP BIODIVERSITY:-

i) On the ongoing biodiversity conservation activities the thrust was mainly given to the crops of economic importance only, the others were neglected.

ii) The utility if natural resources is to be quantified in terms of money.

iii) The gap exist in the documentation of already available existing biodiversity and its information dissemination there off.

iv) The importance of biodiversity conservation awareness at the grass root level. i.e. local communities.

Agro-ecosystem	Status	Gap to be filled
I. Agronomical crops		
Cereals, pulses, oilseeds, major & minor millets, sugar crops, fibre crops	The scenario of major & minor insects with their present status have been documented	Proper documentation of natural enemies associated with all major & minor pests needs proper identification, documentation & conservation.
II. Agro-forestry		
Including major agro-forestry plants	Major insects have been documented only in Chhattisgarh plain.	Major and Minor insects are to be documented with their natural enemies.
III. Horticultural crops vegetables, species, plantation crops & medicinal plants	The scenario of major & minor insects has been documented except to medicinal plants	The status of natural enemies of all major & minor insects needs proper documentation. The insect scenario of medicinal plants needs proper documentation along with the status of natural enemies of insects.

18. LIVELIHOOD & LIFESTYLE :-

i) Life style :-

Myopic practices like Vishu- Shikar setting fire for small target.

ii) Poverty lined to BD and Livelihood :-

Low cost labour (compelled)

iii) Benefit Sharing :-

Lack of access to proper stage.

iv) Projection in IPR and other such provisions:-

Lack of Knowledge, Govt. initiatives absent.

v) Monitoring at village level for asset creation:-

Gap in vision and perception regarding BD sustainance.

19. INDUSTRY & MINING

GAPS IN:

- Estimates of the health damages.
- Developing a new model : The new model stresses participatory regulation, with community representatives taking their place at the negotiating table along with government regulators and factory managers.
- Financial incentives by charging polluters for every unit of their emissions.
- Public disclosure works through many channels, including "informal regulation" by communities, investor preference for clean firms, and consumer preference for green products. Public information about the sources and impacts of pollution has particular benefits for poor communities.
- Economic incentives for private investment in conservation.
- Incentive for commercial forestry.
- By sharing benefits from biodiversity prospecting and commercial forestry.
- Institutional arrangements for mobilising private industry's input in the. implementation of the CBD.
- The latest benchmark, ISO 14001, should be mandatory to all the Industries of the red list.
- in determining "Path of Balance" : Through:-

    i. **Determining environmental quality goals.**
    ii. **Estimating the pollution reduction required by these goals.**
    iii. **Estimating the marginal cost of abatement at the desired level of pollution.**
    iv. **Setting the pollution charge equal to the estimated marginal cost.**
    v. **If the estimate is right, pollution should fall to the desired level. If it is wrong, the charge can be raised if there is too little abatement and reduced if there is too much.**

11. **Lack of environmental programmes** within the industry.

12. **Modern Technology** : Most of industries are using outdated technology.

13. Lack of interaction among industry , regulatory and research organizations.

14. HRD

Human resource development for scientific management of biodiversity has suffered because of inadequate infrastructure for research and development the shortage of

organizations capable of imparting technical skills at the local and regional levels, the limitations of education and public awareness through formal and non formal means. And insufficient training for policy makers. Administrators, trainers, educator's students, local self-government authorities and grassroot level workers.

CULTURAL BIO-DIVERSITY

(a) Loss and drainage of plants with medicinal values are becoming extinct. Grazing in the forest area provides impetus.

(b) Wood carving, terracotta art and Basketry the mainstay of economy for many communities is loosing its foothold.

CHAPTER-VIII

STRATEGY & ACTION PLAN

1.

Strategy :- **Documentation of available bio-resource and creation of database. Baseline information on biodiversity should be improved and expanded.**

Action - 1 Creation of people's biodiversity register at village level and to establish it as authentic record.

Agency :- Chief Executive office Zila Panchayats, all department and the District level BD conservation Committee. (University personnel, NGO may also be added if necessary)

Time :- Medium term (5-10 Years.)

Text :- Residing well in the core of a bio-resource rich Mega BD area (4th in world after Indonesia, Brazil and China) we are prone to bio-piracy. Chhattisgarh is particular rich in herbs of medicinal importance, and has a wealth of over 30000 kinds of paddy only. We need to have knowledge and documentation of what we have, in order to fetch the needed information once the BD bill is finally passed. Documentation will be done on two levels - in labs for secondary data, in village level for primary data.

Specific action proposed: -

A. For Secondary Data

1. Create data list of threatened flora and fauna.
2. Enhance knowledge on indigenous micro flora.
3. Computerized database to be maintained by custodian agency for above tasks orient and strengthen the already existing bodies.

B. For primary data

1. DM (District Magistrate) be made nodal officer for it.
2. Concerned department should make all the record and compare there with people knowledge.
3. At local level Panchayat secretary, teacher, patwari or kotwar be the informer.
4. D.F.O. be appointed as technical adviser for filling in the register.
5. Monitoring to be done by SDM/Tahsildar and other department officials.
6. A date be fixed every 6^{th} month (and interim date of 3 month) to fill and update the records. Date on every 3 months will mean only for village officers, while on dates of 6 months there will be one Gram Sabha for BD. Entries made by village officer will be approved in Gram Sabha with new entries be made on the spot.
7. Sample check of 10% registers by class I officer/Department District head will be mandatory. Roster will be prepared by D.F.O.

2.

Strategy :- **Bring in to force an effective legal framework for conservation and sustainable use of bio resources .**

Agency :- State government through Collector and D.F.O.

Time :- Medium term.

Action :- 1. Owing to delayed regulation of land status land disputes between Forest and Revenue departments have been on rise. Due to tack of demarcation; In 1986 onwards many instances of issuing pattas in forest-land came in existence. Ultimate end of every instance was unfortunately fragmentation of Bio-resource. So, the task must be taken in big priority, so that intact bio-resource tract can be ensured. Hon'ble Supreme Court has directed the state to complete the task of setting revenue forestland disputes in a fixed time frame. Most Important :- Need of political will - NOT TO REGULATE DIVERSION OF FOREST LAND FOR NON-FOREST PURPOSES, AND DO SO IN THE MOST ESSENTIAL CASES ONLY AND WITHIN THE CENTRAL LEGAL FARME WORK.

2. Induct into legistance constitution of the Chhattisgarh / India that biodiversity is the concern of every critizen of the State or Nation.
3. Review all existing laws and acts to make amendments in them or bring about a new legislation to meet the biodiveristy strategy actions. The identification of the deficiencies and shortcommings in the existing laws should also define the inrisdiction limits of law enforcement agencies. State level laws also should be microporated for greater participation of local communities for supporting biodiversity activities. Also communal ownership and occurs to bio-resources laws should be reviewed to protect and coverage the Natural Resource Management Systems.
4. After a systematic survey identify the endangered flora and fauna and introduce appropriate legislation for their conservation appropriate

legislation for their conservation penalties for validation and rewards for compliance should be introduced.

2. Develop access legislation on priority for genetic resources, technology, handling biotechnology and distribution of its benefits.
3. Develop holistic plan for integration of PA's and other land use planning.
4. Review existing laws and rectify the gaps. Define jurisdictions of all the parties involved Incentives are a device, which follow, reward who comply and punish who disobeys. Incentives may be direct like giving subsidies or indirect like tax exemptions etc. Disincentive may be in the form of fines or pollution charges, suspension of licenses for a certain period (till improvement takes place). Such measures will definitely promote the conservation and sustainable use of biodiversity. However, in agriculture such incentives for introduction of high yielding varieties for higher yields of grain may deplete the local germplasm leading to a loss of biodiversity over a period of time. Similarly the irrigation facilities are practices leading to degradation of aquatic system through wastage of water. Such practices also need to be looked into from a holistic approach.

3.

Strategy :- **Ensuring cultural bio-resource linkage intact.**

Action :- Identify the link with history and culture, link it to bio - resource under threat / excessive exploitation.

Time :- Short term.

Agency :- Tribal development / culture development at district level.

Text :- Tribals have an excellent link of their constants / folk lore with bio-resources on which they are dependent. Fluctuations of they folk lore indicates difference in bio - resource status either Quantity or Quality wise. So, keen observation (and photo documentation) of folk lore is essential.

Specific Action :-

1. Intensification of surveys and inventorization of bio - cultural resources in different parts of the state. The surveys should include information on the distribution pattern of various species / population / communities and the status of ethnobiologically important groups.
2. Identify Resource person.
3. Documentation of folk lore along with full details.
4. Tribals and other indigenous people of the state, residing in and around forest areas, with rich cultural traditions and practices, should be encouraged to maintain their unique relationship with the forests for mutual benefit. Unique geographical and cultural landscapes, existing protected areas should be managed keeping in view the conservation of bio - cultural diversity of the state.
5. Bio-cultural Fairs

Financial Forecast :- Rs. 10 lacs.

4.

Strategy :- **Policies and laws need to be developed or improved to regulate the access of genetic resources (including bio technologies) and promote justifiable sharing of benefits among resource owners and users.**

Action :- Identify the local bio - resource with economic significance, cultural linkages and support them wherever necessary

Time :- Medium term.

Text :- At present there are several facts which about the rural economy. Through, these work are not officially fabricated but in a haphazard leads to exploitation of either the bio - resource and the rural. So, there is a scope of rating models of trade and commence (which may be environmentally feasible also) to support people for livelihood strategies.

Agency :- State Government

Specific Actions :-

1. Inventarisation of base line data pertaining to genetic resources and made accessible to academic and commercial uses.
2. Identification of bio - resource (and the people connected to it) eg. Herbal, cottage industry etc.
3. Work study of their practice as on date.
4. Develop a market for there material.
5. Marketing / Technical know and awareness programme fo people engaged in these activities.
6. **Involving these articles in the state list of subsidies and if possible adding it to PDS. (So as to create vacuum for these materials on govt. level so that items can be purchased by govt.)**
7. Promote formations of laws that support indigenous and traditional people's concepts of property rights, tenure etc.

8. Oppose adverse laws claiming government ownership and control over indigenous and traditional people's land's and territories.
9. Promote global policy debated on equitable access and benefit sharing.
10. Help develop ***sui generis*** (new) collective systems that protect traditional resource, cultural and spiritual values.
11. Strengthening JFM base.
12. To Create clubs of snake catchers.
13. Implement the project integrating PPA/healer and the directorate of Indian System of medicines.
14. Strange than forest committees financially / technically.
15. Develop decentralized nursery for primary stake holders.

Financial Forecast :-

- For Snake catcher club at Jashpur Rs.....
- Project of PPA / Directorate Rs.....
- Decentralized nursery Rs.....

5.

Strategy :- **Ensuring of local Germ plasm to be intact.**

Action :- Creation of local Germ plasm banks of all domestic / wild endangered spices and build strategy and action, which resist local germ plasm isolation from main stream.

Time :- Continuous process.

Agency :- State Govt's all concerned departments specially Forest, Agriculture, horticulture, Animal husbandry etc.. .

Text :- State has a mandate for economic development of disprivilaged class. In course of time, we give up all germ plasm which are not economically viable and replace them by Seeds of economic value. This process, with lapse of time, creates a vaccum for local germ plasm, which is then scarified. Many a time we have lost a lot of local genes, which had either to resistance to a particular or set disease. So that need of the time is to keep these genes in main stream. As a matter of practice prevailing today only the listed crops are purchased by the state government at support price and is distributed to the less privileged class on subsidies rates. This is a mandate for the government. Purchase being on at support price and distribution at subsides rates, results in increment to deficit of state budget. If staple corps are added into PDS, (which are comparatively cheaper than the corps being purchases today) deficit will be lower down, local people will be fed by the crops of their taste, also a market (which the need of the day) will be opened for their crops.

Specific Action :-

1. Elucidation of economic significance of local herbs / herpatfaunas.
2. Agro-climate specific Bio-diversity Parks depicting their (of bio - resource) importance
3. NGO/NGI be involved in collecting local bio-diversity information through awareness.

4. To collect information of local herbs and medicinal system and establish library of medicinal and aromatic plants at village onwards level by organizing workshops and training camps at village level.
5. Listing of local staple crops into PDS so, as to create a vaccum to initiate rotation of local crops into main stream.

Specific task for Ex - Situ and In - Situ Conservation

i.) Ex-Situ Conservation :-

- Establish and strengthen the strengthen the network of ex - Situ centers / sites like arboretum, zoos, botanic gardens, harbaris etc.
- Accord priority to on - farm tree conservation programmes.
- Establishment of private zoological parks, botanic gardens and other ex - situ facilities / centers in important cities of the state.
- Develop ex - situ gene banks at field level as well as laboratory level.
- Encourage cultivation of plants of economic value and promote development of elite varieties of such plants.
- Create a State data for ex - situ conservation centers.

ii.) In - Situ Conservation :-

- Strengthening JFM, PPA and provide manpower, essential equipment, infrastructural facilities and requisite funds to the forest department for sustainable management.
- Eliminate activities leading to loss of bio - diversity, through enforcement of preventiv existing laws and through pre-active amendment.
- Intensify silvicultural measures through introduction of new technologies for improving the fallen productivity of 25 % of the state forests i.e. degraded forests.
- Ensure that survey, collection and bioprospecting of biological resource is undertaken with minimal damage to the habitat.

- Identification of wild fruits - Answer to energy / nutrition requirement of rural .
- Production by cultivating them in waste land (Bhata Lands); adoption in agro-forestry.
- Cultivation of non-traditional fruits is neither cost - intensive nor labour intensive

Research & Development

1. Identify a coordinated agency for R&D work pertaining to forestt biodiversity.
2. Devise mechanisms to fully gear up the participation of private sector in R&D activities especially in agro-forestry and processing of medicinal plant products.
3. Accord priority to research in preservation plots and seed stands on the basis of the ecological principles for conserving the endmic species.
4. Promote basic and applied research for different types of ecosystems and species, with special emphasis on hitherto unexplored/under explored areas and lesser-know groups of plants and animals, e.g. lower groups.
5. Promote and strengthen infrastructure leading to development of techniques for sustainable use, including harvest or economically important components of forest biodiversity.
6. Enhance research efforts on modified habitats such as ago ecosystems, organic farming, use of biofertilisers and biopesticides and integrated pest management.
7. Promote research on evalution of impacts of development activities on components of forest bio-diversity, and ecosystems as a whole.

Specific Action

Tree Improvement

i.) Improved seed

ii.) Maintenance of existing seed stands in natural forests and clonal seed orchards.

iii.) Identification of new seeds and CPT's for dominant species in each forest type.

iv.) Establishment of new clonal seed orchards.

Introduction of biotechnology

i.) Affiliation of each E7R centre with a research institute of repute for applied research.

ii.) Co-ordinating institute's of excellence like indo american hybrid seed banglore, TERI New Delhi, for developing tissue culture protocols for species having problem in regeneration and nursery techniques such as lagerstromia parviflora, clistanthees collinus, shorea robusta etc.

iii.) Production of plants on mass scale for the above species by

- Propagating species at Research institute.
- Hardening the plants at nursery of E&R centre.

6.

Strategy :- **Untapping the local traditional knowledge base present amongst people so as to equilibrate relations of stake holder / bio - resources.**

Action :- Village sensitization inviting perceptions of user group and disprivileged class regarding reading available bio - resource in vicinity and finding a consensus which is environmentally feasible too.

Time :- Continuous process (Pilot phase short term)

Agency :- NGO/NGI/SHG/Bio - diversity work group

Text :- Mainly problems regarding bio - resource have roots deep down in different visions towards bio - resource. Excess exploitations can only be checked if on a common platform custodian and stake holders can share views and can reach to a consensus. As soon as sustainable utilization practice starts, further fragmentation is checked automatically.

Specific Actions :-

1. Adoption of ideal practices in agriculture, fisheries and forestry that will enhance the conservation of biodiversity. This with then necessaciate.
   - Following IPM approach
   - Give incentives for traditional cultivators including crop diversification
   - Establishing more diverse forests width indigenous species
2. Village level meeting / Jan panchayat or work shop to be hosted.
3. All groups of residents and user groups be invited.
4. Every group must be given time to talk.
5. Open discussion will be appreciated.
6. MOU between village in question and the concerned department, action of which influence the whole or any component of BD in any way - be established for the village.
7. Recording be done.

8. People BD register be updated
9. Strengthening committees at village level to institutionalize them.

Above mentioned tasks will be done with a sole objective to untap the knowledge base of locals. Trust needs to be built in first, so as to open them.

10. Strengthen participatory rural appraisal techniques and encourage formation of JFM / CFM for planning and managing forest resources with peoples participations including women.
11. Strengthening the already existing forest extension network for expending the logistic base to villagers interested in agro- forestry / Farm Forestry, and link it with forest based industries potential.
12. Preserve and Strengthen traditional, religious, ethical and cultural methods of bio - resource conservation (e.g. sacred groves, worshipping plants and animals)

7.

Strategy:- Strengthen ex-situ conservation comprehensively.

Actions :-

1. Develop a national policy with flexibility for changes in acts as per states requirement.
2. The existing ex-situ programmes should be evaluated for their scope and effectiveness.
3. An inventory of all collections under ex-situ programme has to made and stream hired.
4. Priorities the species and genetic resource for ex-situ conservation.
5. Funding, strengthening of human capacity, equipment and training are important aspects for ex-situ conservation. All organizational units should co-ordinate for effective ex-situ programme execution.
6. Over exploitation of genetic material in the guise of collection should not endanger other wild populations.

Sustainable use:

Before the 1992 CBD convention, conservation was the priority. But over a period time due to the pressure of increasing population and their needs it was felt that conservation along would not do rather a sustainable use without destroying the biosphere is the answerer. The CBD recognizes that for Socio-economic development, countries may use their biological resources (agriculture, forestry and fisheries) and the respective countries should see that the biological diversity is not depleted. In the process one should respect, preserve knowledge, practices of local communities for the conservation and sustainable use of biological diversity. Factors which can promote sustainable use of ecosystems may be put as below:

1. Economic factors:
   - Reasonable income to stakeholders and communities.
   - Reinvestment of income earned by the implementing agencies.
   - Setting objectives for the size of target population.

2. Policy factors:

- Definition of ownership to land and resources.
- Exchange of information between users, public and decision makers.

3. Management:

- Training of personnel
- Monitoring and feed back by a cell other than implementing agency.

8.

Strategy:- Introduce integrated approach to incentives and disincentives to encourage] sustainable use of bio resources.

Actions :-

1. Incorporate methods for direct incentives like
   - Providing subsidies to encourage farmers to maintain local cultivars, adopt IPM practices, agro-forestry and multi species cropping.
   - Subsidies to land owners who manage their lands sensitive to biodiversity conservation measures.
   - Provide grants to restore threatened species and degraded ecosystems.
   - Encourage ex-situ propagation and breeding of tradable species to reduce drainage from natural habitats.
   - Field staff and others involved in biodiversity activities should be given incentives in the form of pay increments, training opportunities, public recognition etc.
2. Indirect incentives should be introduced in the system for conservation of biodiversity.
   - Fiscal measure like tax exemption for conserving a particular habitat or species, tax savings for imported equipment used in conservation programmes, deductions for donations to NGO's etc.
   - Service incentives can be given to communities living in and around PA's. These could be according priority to public education and technical assistance in forestry, agriculture and allied subjects.
3. Unsustainable use should be discouraged through disincentives:
   - Heavy fines for violation of conservation laws.
   - Tax penalization for undesirable practices.
   - Polluters pay policy.
   - Encourage traditional customs promoting disincentives tonus sustainable users.
   - Cancellation of licenses and imprisonment etc.

3. Extensive polluting unit:
   - Green belts ground industries worth by industry Govt. total funding by enterprises. FD the Nodal
   - Common effluent treatment plant (CETP)
   - IBM paper.
   - Waster water recycling / garbage disposal plants must.

Institutional capacity:

Although quite many organizations are doing research on biodiversity or related aspects yet much remains to be done. So to begin with the institutional capacity in research and training should be accorded some degree of priority in strengthening and funding. This would facilitate in first identifying the issues in promoting education and public awareness.

Identifying issues:

Attention should be targeted on the following issues:

1. Ecosystems and habitats: having high diversity large numbers of endemic or threatened species, social, cultural, economic and scientific importance.
2. Species communities : threatened; medicinal, agricultural; social, cultural or scientific importance as indicator species, umbrella species etc.
3. Genes and genomes of social, economic and scientific importance.

Monitoring these issues should form the highest priority for which under mentioned strategies and actions may ameliorate the situation as mentioned earlier.

Public Awareness and Education

Literacy levels in the state is not very high and informal education will go a long way in understanding biodiversity. Majority live in the rural areas and ways need to be found out to send the message to them. One of the better methods is to take the help of their traditional knowledge on biodiversity; local uses and management practices if fostered can be effective. This knowledge can be documented by the local communities for which help can be given to them. This will create all the more awareness and generate the importance and values of biodiversity.

9.

Strategy :- Education to enhance awareness and conserve biodiversity.

Actions:

1. Emphasis on biodiversity concerning ecological, economic and social themes can be incorporated into the curricula at the primary and secondary levels.
2. In service training may be incorporated to the administrators, managers, police personnel and so on including private sector executives.
3. Orientation courser as summer schools for teachers to create awareness of biodiversity is another method.
4. Focused campaigning among local communities in and around PA's.
5. Media is an important knowledge importing.
6. Integrate biodiversity programmes with other social programmes.
7. Promote NGO's, formation of ecological clubs and groups involved in biodiversity conservation.
8. Develop simple tool guides for identification of animals, birds and flora etc.
9. Private and public entrepreneurs may be encouraged to become partners in various biodiversity educational programmes.

10.

Strategy :- **Equilibrating intact local gene insurance with increasing productivity per unit area.**

Action :- State agriculture department alongwith IGAU and district admonition

Time :- Long term.

Agency :- State level

Text :- Chhattisgarh state is nicknamed as rice-bowl of India. State is now on the way of increasing sown area and productivity of all crops for this crop diversity programme is being started. There are always apprehensions of local gave being lose forever. so, there can be crossing of local geves with their closet wild relative, so that in case of emergency, reversal way be easier and practical. deviation of genetic transfer will be less and reversal will be easier.

Specific Actions :-

1. Identifying local crops which add to economy of rural as well State's revenue.
2. Identifying sets of local crop-wild relative crops.
3. Studying the would be ill-effects.
4. Consultation with all concerned department / Stake holders.
5. Experimentally on pilot phase.
6. Appraising the results
7. If crossing is viable go for long scale hybridization

11.

Strategy :- **Managing livestock on sustainable and environmentally feasible way.**

Agency :- State Government through animal husbandry department.

Time :- Long term.

Text :- Scenario of rural India is incomplete without livestock. This item is not only very deeply interacted with their livelihood but is also a status symbol . Unfortunately, health and vigor of there is not up to the mark as for on feasibility in terms of bio-diversity is concerned. They are weak, loosely fed which is insufficient. Feed is under quality and obviously the animal is torched in the field.

Task :- Solution to livestock can be in two ways

i) Reduction of non-discript animal and;

ii) Introducing healthy vigorous breed which can perform well is the field, also are good in milk production. Animal husbandry department can put forth some practical projects for it.

Another solution can be that the Government purchases useless livestock and can an subsidised rates or fully free of cost.

Specific Action :-

i) Identification of numba & breed of livestock which need to be replaced.

ii) Way of change [Mechanical ploughs/ Reducing numba directly / cattle comps/ developing silviparstre to be listed for area in question.

iii) Suggestions and mapping for grazing grinds village wise (eg. Orange areas, village grazing lands etc.)

Note : Precaution must be taken that site of cattle comp and silviparstre be same preferably.

Financial Forecast :- As per animal husbandry department.

Specific Actions :-

8. Identifying local crops which add to economy of rural as well State's revenue.
9. Identifying sets of local crop-wild relative crops.
10. Studying the would be ill-effects.
11. Consultation with all concerned department / Stake holders.
12. Experimentally on pilot phase.
13. Appraising the results
14. If crossing is viable go for long scale hybridization

12.

Strategy :- Rain water harvesting and ground water recharge.

Agency :- State Government departments like GAD, PHE, Panchayats, FD.

Time :- Long term.

Text :- India is not in a water scarcity zone, but Chhattisgarh has started facing problem of drinking water along with the water for irrigation. This is due to mismanagement of water. Thus we have to switch-over two way management 1. Better management of existing water resources and 2. Tapping non-conventional source of water i.e. Rain.

Specific action :-

1. Approximately 5% area of every village be marked for development of rain water harvesting water bodies. This area can also be a part of land identifies as Charnoi.
2. Converting rain fed and marginalised lands of the state to more productive lands so that village commons, have resources to buy food. In this challenge, water can turn a large part of the state's currently parched lands into productive lands, reduce poverty and immense income. This is possible only through localized cost effective community based rain water harvesting management. Whose foundation is already in place in the state through water bodies i.e. ponds in the villages. Water management needs to become the biggest cooperative enterprise in the state.
3. Identifying and using traditional & innovative ground water recharge designs for rain water harvesting in forest areas for enhancing agricultural yield of forest proximity rain fed lands.
4. Developing institutional and legal framework for participatory watershed development (Since rain fed lands support one of the poorest tribal population of the state.)
5. Diesel/Electricity subsidies for the over extraction of ground-water during season, should be Withdrawn in a phased manner.
6. Separate manual , laws for rural, semi-urban, urban, forest and industries rain water harvesting measures.

6. Facilitating urban water harvesting ; social mobilization, enabling law for community based water harvesting, runoff capture & waste water treatment leading to development of eco-township in the state.

Financial Forecast :- As per the Estimate given by the concerned departments.

13.

Strategy :- **Exploitable of renewable sources of energy.**

Action :- State level

Time :- Long term.

Agency :- State Government, CREDA , Private sector.

Text :- The state already is a power surplus state, but it is predominantly thermal based, which is environmentally hazardous. The state has invited huge power sector investments in thermal based power generation. Which could prove over a long run threat to the BD. Also the remote rural areas can not be connected to national grid, and thus will need power generation from non-conventional energy resources, for this following action plan would be essential.

Specific Actions :-

1. State must have policy on the exploitation of renewable resources of energy. This policy should be pro-active, specially in the solar, micro-hydal, and bio-gass based (being a rice bowl).
2. The state should encourage private sector investments, in power generation from Renewable Energy Resources.
3. Co-ordination with the national project on bio-gas development (N.P.B.D.) for installing KVIC bio-gas model ie. Deenbandhu, model should be encouraged.
4. Forest Department should raise large scale energy plantations to supply raw material .
5. In the initial state being the relatively new and costly technology, it would need support from state government in terms of awareness and subsidies. High cost of Renewable Energy can be nullifies against the social & environmental benefits.
6. Solar lanterns, solar lights, solar thermal water heaters in government building, hospitals hotels and industries be made mandatory.

14.

Strategy :- **Acquiring knowledge of local herbs & traditional system of medicine.**

Action :- State level

Time :- Long term.

Agency :- Health Department and Ayrvedic Medical College.

Text :- Chhattisgarh is rich in flora, tribes and their traditional system of medicine, but it is not accepted world-wide due to non-scientific documentation and lab tested medicine formulae. It is need of hour to explore the local healers & their formulae of traditional system of medicine. Services of Local healers would be taken in the nearest existing Ayurvedic dispensaries and gradually their knowledge of traditional medicine would be discovered..

Specific Actions :-

1. Conservation through cultivation of medicinal plants.
2. Study of Demand & Supply.
3. Research
4. Patents.

15.

Strategy :- **Define the sustainability of individual medicinal plant/unite area.**

Action :- State level

Time :- Long term.

Agency :- **FD,** Health Department and Ayurvedic Medical College.

Text :- Sustainable availability of individual medicinal plant, herbs, shrubs etc. / unit area could only be basis of non-destructive harvesting. It is to be introduced which definitely would need a gestation period in the in-situ conservation areas for say 4 to 5 years. Harvesting should be done of only those species and in those areas where sustainable quantum is availabl, then it also needs to be started how much quantity; number of plants/ unit area should be harvested to make it sustainable. Quantum of medicinal plant/unit area; the gestation period for the in-situ conservation should be used to create a favourable physical environment in the forest areas, specially soil environment. Such creation of physical environment would need technical input like soil working, moisture conservation seed broadcasting or vegetative cutting planting, fire & grazing control. Length of gestation period would depend upon the time taken to create conducive environment for the exploitable quantum of the individual , site specific herbal plants/unit area.

Specific Actions :-

1. Conservation through cultivation of medicinal plants.
2. Study of Demand & Supply.
3. Research
4. Patents.

16.

Strategy :- **Identifying & using traditional and innovative Ground Water Recharge Designs.**

Action :- State level

Time :- Long term.

Agency :- Forest Department & Rural Development Department.

Text :- Sustainable availability of individual medicinal plant, herbs, shrubs etc. / unit area could only be basis of non-destructive harvesting. It is to be introduced which definitely would need a gestation period in the in-situ conservation areas for say 4 to 5 years. Harvesting should be done of only those species and in those areas where sustainable quantum is available.

Specific Actions :-

5. Conservation through cultivation of medicinal plants.
6. Study of Demand & Supply.
7. Research
8. Patents.