

Biodiversity Conservation Through Ecodevelopment:

An Indicative Plan for

*Buxa Tiger Reserve, Gir National Park,
Nagarahole National Park, Palamau Tiger
Reserve, Pench Tiger Reserve, Periyar Tiger
Reserve, Ranthambore Tiger Reserve, Simlipal
Tiger Reserve*

1994



Scripted in 1994, this is the second set of ecodevelopment proposals for protected areas, seeking financial support from international agencies, in this case the Global Environmental Facility (GEF). The first set was drafted in 1973 for the Great Himalayan National Park and Kalakad Mundanthurai Tiger Reserve.

Cover photograph of a Bonnet Monkey, at Nagarahole National Park, by Shekhar Singh.

**BIODIVERSITY CONSERVATION THROUGH
ECODEVELOPMENT
AN INDICATIVE PLAN
for**

Buxa Tiger Reserve, West Bengal
Gir National Park, Gujarat
Nagarahole National Park, Karnataka
Palamau Tiger Reserve, Bihar
Pench Tiger Reserve, Madhya Pradesh
Periyar Tiger Reserve, Kerala
Ranthambhore Tiger Reserve, Rajasthan
Similipal Tiger Reserve, Orissa

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UNITED NATIONS DEVELOPMENT PROGRAMME

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Ministry of Environment and Forests
and the concerned state governments

by

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INTRODUCTION

This indicative plan has been prepared over the last year and a half, based on the work of Field/ Park Directors and their colleagues in the eight protected areas, and of various non-governmental organisations involved in carrying out PRA in the proposed project area. The final output has benefitted greatly from the inputs of the various national consultants and consulting institutions, and from the critical comments and support of various State and Central Government officials. This document has also benefitted greatly from extensive discussions with members of the advisory committee and Project Tiger Steering Committee, and from World Bank and UNDP experts.

The Chief Wildlife Wardens of the concerned States have given much of their time in nurturing this process along and in responding quickly and positively to the many demands made on them. But finally, much of the legitimacy of the indicative plan comes from the communities living in and around the selected protected areas who have participated in the rural appraisal exercises and have shaped the thinking of those involved in preparing this indicative plan.

Perhaps it is worth reiterating here that the indicative plan is supposed to be just that: indicative. It is supposed to:

1. give **basic information** about the project area;
2. broadly identify the **major management and ecodevelopment issues** in terms of the pressures on the PA, the pressures of the PA on the local population, and the management constraints;
3. broadly identify the **strategies** available for tackling the various management and ecodevelopment issues;
4. indicate some of the **types of biomass and income generating activities** feasible in the area, given the local ecological and socio-economic characteristics and the availability of natural, human and social resources;
5. indicate the **infrastructural inputs and support** that might be required to implement the management and ecodevelopment plans, especially in terms of human resources development education and awareness, and research;
6. indicate, broadly, the **levels of financial support** that might be required, more on the basis of the nature of problems and the populations involved, rather than on the detailed costing of specific activities, as the final selection of these activities would be made only in the micro-planning stage;

7. indicate the **biodiversity value of the PA** and the feasibility of taking up an ecodevelopment project, in terms of the need for ecodevelopment and the possibility of it succeeding and thereby helping protect the PA;
8. indicating the **processes and methodology** that would be followed in detailed planning and implementation of the project, including the financial, legal, policy and institutional mechanisms required or, where these have to be determined through micro level planning, indicating the relevant process.

It is hoped that, based on this indicative plan, the financial support required for the project would be committed. This would allow the second phase to start, where micro-level planning will be done for each village, through planning teams who would help the villagers to plan for themselves.

Shekhar Singh
Project Director

**A. PROJECT BRIEF FOR FREESTANDING
INVESTMENT PROJECT OF THE GLOBAL
ENVIRONMENTAL FACILITY**

1. **COUNTRY OR REGION:** India
2. **PROJECT TITLE:** Biodiversity Conservation Through Ecodevelopment
3. **LEAD AGENCY:** World Bank
4. **EXECUTING AGENCY:** Government of India, Ministry of Environment and Forests
5. **IMPLEMENTING AGENCY:** State Governments of Karnataka, Kerala, Orissa, Rajasthan, West Bengal, Madhya Pradesh, Gujarat, and Bihar
6. **GLOBAL ENVIRONMENTAL FACILITY PRIORITY AREA:** Biodiversity
7. **DURATION:** Five years
8. **PROPOSED GEF FINANCING:** US \$32 million

9. **BACKGROUND:**

- 9.1 India is one of the twelve "megadiversity" countries in the world, which collectively account for 60-70% of the world's biodiversity. The country has a broad range of ecosystems and species within its ten recognised biogeographic zones. Its flora comprises 15,000 flowering plants, representing 6% of the world total, some 33% of which are endemic. India's faunal diversity is also high. Its 1,178 bird species represent 14% of the world total. As many as 3,000 to 4,000 plant and over 250 animal species are endangered and in need of immediate protection. About 90% of all medicines in India come from plant species, many harvested in the wild. In 1985-87, forests were estimated to have covered nearly 20% of the total land area, with 10% covered by closed forest. The total area of wetlands (excluding rivers) is approximately 18%, some 70% of which are under paddy cultivation.
- 9.2 India has the second highest population density among the Asian countries. It has about 15.4% of the total world population concentrated in a little over 2% of the world's land area, growing annually at a rate of 2.3% . About a third of this total population subsists below the poverty line. This, coupled with a very large livestock population, is regarded as the most important issue affecting biodiversity conservation in the country. Frequent grazing of cattle in forest land, cutting trees for firewood and timber, and extracting non- timber forest products (NTFP) necessary for the subsistence of the human population is widely practiced. Local people, who often have limited rights, have little incentive to use the forest in a sustainable way. Consequently, large areas of legally designated forest lands are being degraded.
- 9.3 Overall direction for the conservation of biological diversity in India is provided by the National Wildlife Action Plan (1983) which broadly identifies the following approaches for conservation of biodiversity: (a) establishment of a representative network of protected areas, (b) development of appropriate management systems for protected area, with due regard to the needs of local people and ensuring their support and involvement, (c) protection of biodiversity within multiple use area, and (d) ex-situ

conservation efforts. GOI has already taken important steps toward conservation through the establishment of a number of protected areas throughout the country. At present, there are some 500 national parks and sanctuaries covering about 4.0% of the country. However, these areas are often poorly managed with little consideration given to the local people living in and around them. Furthermore, by 1989 only 40% of the national parks and 8% of the sanctuaries had completed legal procedures for their establishment and only 43% of the national parks and 28% of the sanctuaries had management plans. Many of these deficiencies are due to the lack of resources.

- 9.4 The current proposal builds on earlier experience in ecodevelopment and joint forest management. Ecodevelopment activities have been implemented in various protected areas, notably around Kanha National Park in Madhya Pradesh. Similarly, there is considerable experience in joint forest management, starting from Arabari, in West Bengal, and extending through Orissa and Maharashtra to Haryana.
- 9.5 Sectoral Issues and Constraints: Although there is a proposal to expand the protected area coverage, biological resources in most of the existing and proposed areas seem certain to diminish dramatically in the near future, unless pragmatic operational strategies are developed and implemented. The reasons for the degradation of biodiversity are clear. Over the past decades, the needs and population of India's rural communities has multiplied manifold while forest area has shrunk. The resultant pressures have destroyed a largely self-regulating and sustainable system of forest land use by the local communities with the consequence that local people have adopted practices of over-exploitation of natural resources in which they have no real involvement in management and regulation.

The situation got aggravated because of rural resources, especially forests, being diverted for "development" projects and activities or to meet urban demands. Though in sheer numbers, the rural population is larger than the urban one, and the poor far out number the rich, in terms of consumption and consumerism the miniscule elite, mainly urban, have many times the impact on the environment than the rural masses. Occasional worry regarding the changing patterns of consumption in the rural areas, which are more and more trying to ape the urban elite, is well founded but inevitable. One cannot expect the rural people to continue to live in poverty just so that a few can continue to destroy what remains of nature. Therefore it is not only for the sake of biodiversity conservation but also for the sake of equity, that forest and other biodiversity resources must be better protected.

With the enactment of the Forest (Conservation) Act, in 1980, and its subsequent amendment in 1986, the diversion of forest lands for non-forestry purposes has been significantly reduced. Various other legal and administrative mechanisms, including the recent notification (1993) under the Environment (Protection) Act, making EIA of various types of development projects and activities legally mandatory, are working at minimising the impact of "development" activities and urban demands on biodiversity. However, much still remains to be done. A survey of the protected areas in India (IIPA

1989) reveals major gaps in the management status of the PA network. Some of these gaps are described below.

Rights, Leases and other Legal Uses

Human Population

Information was obtained separately for human populations residing inside each park or sanctuary and those living in areas adjacent to it (i.e. within a 10-km. radius).

Population within parks and sanctuaries

Of the 32 national parks and 138 sanctuaries responding, 18 (56%) and 100 (72%) respectively reported human populations within their boundaries.

Since the absolute quantum of population inside is not a good indicator of the potential biotic pressure it can put on to the ecosystem, the extended data base was used to work out population densities. This has been worked out by a simple division of the total population with the total area of each park and sanctuary. The resultant list is reproduced in the Table below, with areas arranged in descending order down to a density of 0.01.

The data obtained reveals the following ranges of density:

<u>Density</u> (No of people per ha.)	<u>No. of N/S</u>		
	N	S	T
> 10.00	0	3	3
5.0 to 10.00	0	3	3
1.0 to 4.99	0	24	24
0.5 to 0.99	1	14	15
0.1 to 0.49	4	35	39
0.01 to 0.09	11	22	33

Population adjacent to parks and sanctuaries

Of the 23 national parks and 132 sanctuaries responding, 19 (83%) and 115 (87%) respectively, reported populations in their adjacent areas. These high percentages are only to be expected in a country like India where the only areas left uninhabited are the most inaccessible ones.

An index of population pressures was worked out for each protected area by dividing the total population reported from adjacent areas with the total area of the park or sanctuary, both sets of data obtained from the extended data base. (Note that the index thus worked out is in relation to the area of each park and sanctuary, and not in relation to the area adjacent).

The ranges of index of population pressures on national parks and sanctuaries is presented below:

<u>Pressure</u> (No. of Persons per ha.)	<u>No. of N/S</u>		
	N	S	T
> 1000.00	0	2	2
100.0 to 1000.00	0	3	3
10.0 to 99.00	2	9	11
5.0 to 9.90	2	11	13
1.0 to 4.99	6	38	44
0.5 to 0.99	1	19	20
0.1 to 0.49	3	26	29
0.01 to 0.09	2	6	8

Rights and Leases

In 19 (43%) of the 44 national parks and 128 (68%) of the 187 sanctuaries responding there exist some rights or leases. In national parks the most common types of rights and leases pertain to grazing, which was present in 60% of the 20 parks with rights and leases, habitation in 50%, religious yatra in 45% and agriculture in 45%. Similarly, in sanctuaries grazing is by far the most common right, present in 84% of the 128 with rights. The other common ones are fuelwood collection in 54%, collection of minor forest produce in 47%, agriculture in 43%, and habitation in 42% of the sanctuaries with rights.

Grazing by Livestock

Of the 36 national parks and 138 sanctuaries responding, 14 (39%) and 101 (73%) respectively, allow grazing of livestock within their boundaries.

Of the 36 national parks and 138 sanctuaries responding, 24 (67%) and 114 (83%) respectively report incidence of grazing. In other words, grazing is occurring, though it is not authorised, in 10 of the national parks responding (42% of those which have grazing) and in 13 (11% of those with grazing) of the sanctuaries.

The range of densities obtained is as follows:

Cattle

<u>Density</u> (No. of cattle per ha.)	<u>No. of N/S</u>		
	N	S	T
>10.00	0	1	1
5.0 to 10.00	0	1	1
1.0 to 4.99	1	10	11
0.5 to 0.99	0	22	22
0.1 to 0.49	5	57	62
0.01 to 0.09	8	32	40

Goats

<u>Density</u> (No. of goats per ha)	<u>No. of N/S</u>		
	N	S	T
1.0 to 4.99	0	6	6
0.5 to 0.99	1	7	8
0.1 to 0.49	1	22	23
0.01 to 0.09	6	36	42

Extraction of Fodder Information presented below is from the extended data base. Of the 51 national parks and 204 sanctuaries responding, 7 (14%) and 63 (31%) respectively reported permitting extraction of fodder and from all these areas fodder was, in fact, being extracted.

Extraction of Timber and Non Timber Forest Products

Timber

Of the 44 national parks and 183 sanctuaries responding, 7 (16%) and 78 (43%) respectively reported extraction of timber.

Non Timber Forest Produce

14 (36%) of the 39 national parks and 104 (56%) of the 185 sanctuaries responding reported extraction of non timber forest produce (NTFP).

Use and Occupation by other Government Departments and Agencies

Of the 45 national parks responding, 25 (56%) reported use or occupation by government departments and agencies other than the Wildlife Wing. Similarly, of the 188 sanctuaries responding, 119 (63%) have such use.

In national parks the most common use or occupation is that of roads controlled/used by other departments, which is present in 60% of the parks reporting any use. Other relatively common ones are tourism and transmission lines, present in 28%, and irrigation and housing in 20% of the parks responding.

In the case of sanctuaries, 55% of those having such uses reported the existence of roads, 36% reported transmission lines, and 31% reported irrigation under other government agencies. 20% also reported forestry activities being carried out by wings of the Forest Department other than the wildlife wing.

Thoroughfare

Of the 47 national parks and 204 sanctuaries responding, 22 (47%) and 117 (57%) respectively, reported the existence of a public thoroughfare.

Illegal Use and Activities

Illegal Occupation and Use

Of the 36 national parks and 176 sanctuaries that responded, 3 (8%) and 46 (26%) respectively reported incidence of illegal occupation or illegal use, or both. "Occupation" in this context, means the spatial location of people or buildings, or both, while "use" refers only to activities without involving spatial location of people or buildings.

The most frequently reported illegal use was cultivation, 37% of all reported cases (of illegal uses and occupations). Next came grazing (20%), encroachment (20%), and fishing (5%). The other illegal use activities were all below 5% of the total number of cases reported.

Encroachment (20%), was the most frequent form of illegal occupation, followed by labour camps (2%) and temples (2%).

In response to the query "by whom", villagers were said to be responsible in 52% of the cases, Scheduled Tribes in 13%, "private persons" in 12%, agriculturists in 7% and lessees in 5% of the cases. The Government and nomadic tribes tied for sixth place with 3% each. Gujjars, mineworkers and "hillmen" were each mentioned in 2% of the cases. It might be noted that the term villager could also cover most of the other categories mentioned above.

Though prima facie these activities cannot be judged in terms of their ecological impact, their illegality certainly seems to imply that they have not been evaluated and found acceptable.

Encroachment

3 (7%) of the 44 national parks and 32 (20%) of the 160 sanctuaries responding reported encroachment (extended data base). These areas have been listed in the table, along with information on what action has been taken about the encroachment.

Offences

Of the 45 national parks and 172 sanctuaries responding, 31 (69%) and 96 (56%) respectively reported incidence of one or more types of offences.

Of the different types of offences, for national parks, destruction of habitat (average of 971 per park over the period 1979-84), illegal grazing/entry of cattle (369), causing fire hazards (38), illegal hunting (28) and improper entry

(22) were the most common [Table 1.2:2.3(b)]. Similarly, for sanctuaries destruction of habitat (471), improper entry (221), illegal grazing/entry of cattle (158), and causing fire hazards (22) were the most common. However, these averages do not give a very good picture, as variations between different areas was significant.

Conflicts

Injury or Death to Human Beings

A disturbing aspects of the human pressures in and around parks and sanctuaries is the incidence of injury or death of human beings caused by wild animals.

Of the 39 national parks and 167 sanctuaries responding, 14 (36%) and 49 (29%) respectively reported incidents of injury or death of human beings due to attacks by wild animals.

A total of 629 cases were reported for the five year period (1979-84) of which 379 (60%) were reported from national parks and 250 (40%) were reported from sanctuaries.

Fatal Cases: Of the 629 cases reported, 485 (77%) were fatal. Of these 485 fatal cases, 329 (68%) were in national parks and 156 (32%) in sanctuaries. Seen another way, of a total of 379 cases reported from national parks and 250 reported from sanctuaries, 87% and 62% respectively were fatal.

Clashes

The alienation of the local people from the natural resources around them and the inadequate alternative sources of fuel, fodder, water, timber and of earning a livelihood, often force the local people to make demands on the resources of parks and sanctuaries, thereby coming into conflict with park and sanctuary authorities. Sometimes vested interests also provoke, or directly participate in, such confrontations.

Whatever the reasons, very often conflicts over the use and control of natural resources become law and order problems and result in physical clashes between the people and the authorities.

16 (37%) of the 43 national parks and 31 (17%) of the 179 sanctuaries responding, reported the incidence of such clashes.

The major reasons given for these clashes were: illicit felling of trees, poaching, illegal grazing, encroachments and other forest offences.

Past Management Approach

From the setting up of the protected area network in India, the approach has been to protect by policing. This has meant that, funds permitting, parks and sanctuaries have been protected by walls and fences, guards and guns, against the local people and their livestock. The current state of these areas, as described earlier, bears witness to the fact that such a policing approach has proved increasingly ineffective. Public debates in the media, and confrontations between wildlife managers and the affected people, bear witness to the fact that the policing approach is also considered to be undesirable.

- 9.6 Protection of biodiversity must therefore provide due consideration to the needs of local people living in and around protected areas. Inputs into improved and sustainable land-use practices, alternative income-generation initiatives, rural cottage industries and marketing strategies will be necessary to support biodiversity efforts. However, the most important consideration would be to provide increased self-determination and participation to the local communities in selecting and implementing the preferred activities themselves.
- 9.7 Throughout India, there is an increasing number of initiatives demonstrating that productive forests can be effectively protected through cooperation between the forest departments and local communities. Recent experiences in joint management of forest lands in West Bengal, Haryana, Gujarat and Orissa have shown that forest lands have actually recovered appreciably, increasing productivity in firewood, fodder and other non-timber forest products, thereby sustaining the livelihoods of the local communities and improving biodiversity conservation. The Indian experience has catalyzed similar experiments in Nepal, Bhutan, and Bangladesh and has relevance for participatory management strategies in other countries in the region.
- 9.8 Joint management and ecodevelopment provide more clearly defined benefits and responsibilities to local people living adjacent to forest resources, building on traditional systems of resource management or generating new ones where these are defunct or inappropriate. Joint management is appropriate in forest areas outside but adjacent to national parks and sanctuaries.
- 9.9 As yet, joint management experiments have not been applied around protected areas, although these have considerable potential for application of joint management experiments. Areas of rich ecological diversity are often inhabited by traditional forest dwellers with strong cultural traditions of forest protection and sustained utilization. The local institutions developed for joint management of buffer zones and better utilization of areas outside protected areas are also appropriate for more participatory management of protected areas themselves. Particularly in areas of heavy population pressure, providing direct economic benefits from park and sanctuary management, especially through tourism revenues and employment to participants in joint management can provide a strong incentive to local

people to conserve these sites. Extension of the joint management experience to protected area management in India can generate innovative models applicable to protected areas management else where in the Asia region.

- 9.10 Despite the great amount of work already done in India in promoting conservation of biodiversity, including the adoption of a National Wildlife Action Plan (1983) and the production of a biogeographic classification for conservation planning and formulation of a plan for a revised protected area network by the Wildlife Institute of India (1988), there is an urgent need to focus on the critical priorities of protected areas and to develop a coherent long-term strategy to address biodiversity conservation needs in India.

10. STAGE OF PREPARATION:

- 10.1 Focused planning activities in the eight selected protected areas (PAs) started from July, 1992, subsequent to a day long meeting of the Field Directors/Directors and Chief Wildlife Wardens, at the Ministry of Environment and Forests, New Delhi, to initiate the process.

The Planning Process involved formulation of planning guidelines and plan format, identification of local level NGOs and institutions who would assist in the planning process, training of the representatives of the selected NGOs and the concerned PA staff in Planning methodology, especially participatory rural appraisal (PRA). Two such training programmes were organised, one in Delhi in February, 1993 and the other in Ranthambhore in July, 1993, and a total of 20 persons were trained. Concurrently, the Wildlife Institute of India organised a six week training programme in ecodevelopment planning, where officers from selected PAs (including those being covered under this proposal) were trained.

To facilitate the planning process, members of the IIPA team visited seven of the PAs as per the details given below:

Buxa TR	Farhad Vania	August 1993
	V. Sankaran	January 1994
	Avanti Mehta Vishaish Uppal	
Periyar TR	Raman Mehta	December, 1992 - January, 1993
	Vishaish Uppal	
	Raman Mehta Shekhar Singh	September, 1993
Nagarahole NP	V. Sankaran	August-September, 1993
	V. Sankaran	March, 1994
Gir NP/S	V. Sankaran Avanti Mehta	August, 1993
Pench TR	V. Sankaran P. Pande	June-July, 1993

Similipal TR	Raman Mehta Vishaish Uppal	July, 1993
	V Sankaran	April, 1994
Palamau TR	Raman Mehta Vishaish Uppal	July, 1993
	Shekhar Singh	July, 1993

The first phase of the planning involved the PA authorities compiling data about the PA, the pressures on the PA and the impact of the PA on the surrounding populations. Data were also compiled on landuse and socio-economic parameters in the areas surrounding the PA. This information was used to formulate the descriptive part of the development plan.

A day-long meeting was organised in July, 1993, by the MOEF, to take stock of the first phase of planning. This meeting was again attended by Field Directors/Directors of PAs and Chief Wildlife Wardens of various states.

Concurrently, PRA teams comprising of NGO representatives and PA officers, were visiting a sample of the villages in and around the protected area to get the views of the people on the negative impact that the PA had on their lives and how this could be minimised. The people also indicated ways by which the pressures on the PA could be lessened or negated. Linkages were also formed between PA authorities and the village communities and institutions : linkages that are crucial for the success of the ongoing planning and implementation process.

A third meeting, in the form of a workshop, was held by MOEF in October, 1993. In this meeting, each of the Field Directors/Directors presented their draft plans to their colleagues from other PAs, to NGO representatives, MOEF officials and national consultants.

In order to get feed back from the World Bank, who would be initially appraising the proposal on behalf of the GEF, it was decided to compile the existing plans, in various stages of completion, into a draft, preliminary, indicative plan so that this could be used for a pre-appraisal exercise by the World Bank team. This first draft was based on the plans prepared by the PA authorities, which in turn reflected the results of consultations with local people. This preliminary document was discussed in a meeting at the Ministry of Environment and Forests, Government of India, on 19 November, 1993.

Meanwhile, PRA was underway in a sample of villages around each of the parks and sanctuaries. As and when the PRA findings were received, they were also incorporated into the indicative plans being finalised. These modified and updated plans were again discussed in a workshop organised by the MOEF in February, 1994. At this workshop, apart from the PA Managers, representatives of the NGOs involved in the PRA also participated

and made presentations. The national consultants also presented their reports at this workshop.

The present proposal is based on the ecodevelopment plans prepared by the various PA authorities, as modified during the various meetings and discussions listed above. Wherever received, the outcome of the participatory rural appraisals, being undertaken by a team of PA officials and local NGO representatives, have also been incorporated in the respective PA plans, as have been relevant extracts from the reports submitted by Dr. Barucha, Mr Khare and Mr Mehta, consultants.

The indicative planning phase can be summarised as below:

Month /year	Activity
June 1992	Initial meeting of concerned officials and park managers to finalise the indicative planning methodology
December 1992	Start of field visits by IIPA team
February 1993	First PRA training programme for PA officials and NGO representatives
July 1993	Second PRA training programme for PA officials and NGO representatives
July 1993	Meeting at MOEF to discuss progress of the indicative planning process
September 1993	Receipt of first instalment of UNDP support for indicative planning
September 1993	PRA activities begin
October 1993	MOEF workshop to discuss the progress of the emerging indicative plans
November 1993	MOEF meeting with World Bank representatives
February 1994	MOEF workshop to discuss final drafts, including PRA reports and consultant's reports
April 1994	MOEF meeting with Project Steering Committee and UNDP representatives to approve final document
April 1994	Submission of final document to UNDP

11. PROJECT OBJECTIVES:

11.1 The overall objective of the project would be to develop and implement ecodevelopment projects between the forest departments and local communities, particularly tribal people, in and around protected areas. This entails undertaking pilot ecodevelopment activities around 8 protected areas which are subject to stress from local people and animals. Activities envisaged include: (a) issuing and implementing supportive policies for ecodevelopment and joint management between local communities and forest departments in and around protected areas; (b) facilitating the establishment of appropriate institutions at the local level to support ecodevelopment; (c) supporting local communities and non-governmental organizations to design and implement appropriate social and economic development activities, including alternative income generating activities; (d) building institutional capacities of the forest departments and other GOI institutions to support ecodevelopment efforts (e) involving local communities in applied field research on land restoration and sustainable utilization technologies for forest resources, including shifting cultivation areas in the tribal belt; (f) improving management of the core protection zones; (g) enhancing environmental awareness through education; and (h) development of capabilities of local institutions for monitoring and evaluation. The basic principles are described below.

11.2 Ecodevelopment Principles

Definitions

1. Ecodevelopment is a strategy for protecting ecologically valuable areas (protected areas) from unsustainable or otherwise unacceptable pressures resulting from the needs and activities of people living in and around such areas.
2. It attempts to do this by at least three means:
 - 2.1 by identifying, establishing and developing sustainable alternatives to the biomass resources and incomes that are being obtained from the protected areas in a manner, or to an extent, considered unacceptable.
 - 2.2 by increasingly involving the people living in and around such protected areas into the conservation planning and management of the area, thereby not only channelising some of the financial benefits of conservation to them, but giving them a sense of identity with it.
 - 2.3 By raising the levels of awareness, among the local community, of the value and conservation needs of the protected area, and of patterns of economic growth and development which are locally appropriate and environmentally sustainable.

3. Though, by their very nature, ecodevelopment initiatives will differ from area to area (and even from village to village), the three basic principles defining ecodevelopment are:
 - 3.1 Site - specific, micro-level planning
 - 3.2 Sectoral integration
 - 3.3 People's participation.
4. Ecodevelopment is not just rural development, for it is not solely directed at the economic development of the rural population for its own sake, but seeks to protect an ecologically valuable area by eliciting the support of local communities.
5. Ecodevelopment is not policing in the sense that it does not seek to protect an area by keeping the pressures out solely or primarily through the enforcement of laws aimed at excluding local people. Rather it involves the local people in the process of protecting the park from destructive activities.
6. For any ecodevelopment plan to succeed, it must be backed by an appropriate management plan for the protected area. Such a plan must, in simple terms:
 - 6.1 Define the requirements of conservation, thereby defining limits to human utilisation
 - 6.2. Make provisions for the institutional structure and processes required to manage the area and implement the ecodevelopment activities.
 - 6.3 Identify ways in which the local population can be involved in conservation planning for, and management of, the protected area.
 - 6.4 Identify the interface between the management plan and the ecodevelopment plan, especially details about employment and income generation opportunities for local people and the involvement of the local communities in the planning for, and management and protection of, the area.

Ecodevelopment Planning

7. As already mentioned, ecodevelopment planning needs to be site-specific, micro level, and participatory.
8. Ecodevelopment is not a once-and-for-all, prior-to-project-implementation, planning process. It is a dynamic, ongoing, planning process which is concurrent to implementation.

9. Considering the planning process is essentially participative (using appropriate participatory rural appraisal (PRA) techniques), it involves going into village after village and taking up many days of the villager's time. Whereas this would be justified when there is a certainty that funds are going to be shortly available for responding to the needs of the village, it seems very inconsiderate to waste so much of the villager's time and unnecessarily raise their hopes when funding is uncertain or much in the future.
10. Therefore, detailed, microlevel, ecodevelopment planning, for this and many other reasons, is seen as starting as soon as the project is approved and running concurrently with the first phase (18 months) of the ecodevelopment project implementation.
11. For the purpose of determining the broad thrusts and the budget required, and to avoid raising unnecessary expectations, a small sample of villages is surveyed and the costs worked out and extrapolated for the whole area.
12. The planning process involves detailed discussion with the village communities on various aspect including:
 - 12.1 Negative impacts of the protected area on the village (wild animals causing human death or injury, livestock death or injury, crop depredation; restriction of access to natural resources, or culturally or religiously significant locations; denial of traditional routes; ban on hunting; etc.)
 - 12.2 Negative impacts of the village on the protected area (illegal or unsustainable grazing; collection of timber, fuelwood and non wood forest produce; setting fire or otherwise degrading the habitat; poaching or disturbing wild animals; etc)
 - 12.3 Possibilities of minimising both types of negative impacts through ecodevelopment (measures for protection of humans, livestock and crops, and for compensating death, injury and damage; generation of biomass like fuel, fodder and small timber; soil and water conservation activities, both to generate employment and to conserve the environment; income generation activities like bee-keeping, mat and rope weaving, poultry rearing, visitor facilitation and hospitality, manufacture and marketing of other artisanal goods; education and awareness; participation in protected area planning and management; etc.)
 - 12.4 Village level institutional structures and processes existing and required (ecodevelopment committees, panchayats, mahila mandals, etc.)
 - 12.5 Finances, training, research and other inputs required for implementing ecodevelopment activities.

- 12.6 Constraints, if any, to the success of such activities
- 12.7 Strategy for the transitional process and period, between the stopping of use of protected area and the establishment of the ecodevelopment initiative.
- 12.8 Perceptions of the villagers about the protected area, its value and management strategy.

Institutional Structures

- 13. There would be three main actors in the planning and implementation of ecodevelopment.
 - 13.1 The protected area (park/sanctuary) management authority, who should have adequate staff, preferably exclusive staff, to look after their part of the work.
 - 13.2 Local level NGOs or, where there are no suitable local level NGOs, regional or national level NGOs who are interested and capable of working in the area.
 - 13.3 The village community, especially the women, who need to operate out of existing institutional structures (like panchayats or mahila mandals) or, preferably, organise themselves into ecodevelopment committees.
- 14. In addition, there need to be district level co-ordination committees to co-ordinate between the various field agencies and departments.
- 15. Some regional and central research and training institutions also need to be identified and involved with the planning, training, research, monitoring and evaluation activities.
- 16. For the planning process, a planning team consisting of local wildlife officials (Rangers), local NGO representatives, wildlife experts and some local community leaders needs to be set up. They would have the task of going from village to village and finalising village level plans in consultation with the people. They would be supported by a regional/national institution which would provide regional and macro level data, and help prepare the consolidated plan for the area.
- 17. Depending on the major thrust of ecodevelopment activities identified for the area, specialist groups, comprising of members from local NGOs and specialised government agencies, will be set- up to advise on specific issues (ground-water harvesting, water conservation, bee keeping, horticulture, poultry, etc. etc.). These specialist groups will assist both in the planning process and in the implementation. Only in rare cases would there be a need to bring in experts from outside.

18. Independent institutions will be identified to monitor and evaluate the project, periodically and at the end.
19. There might be a need to set up a trust or a society, involving the local wildlife officials and NGOs, in order to:
 - 19.1 Provide an alternate process for financially supporting some of the ecodevelopment activities.
 - 19.2 Raise additional resources for ecodevelopment activities.
 - 19.3 Undertake various tasks, like the training and appointment of tourist guides, development and sale of local handicrafts, development of appropriate tourist facilities, through the involvement of the local people, and to their benefit.
 - 19.4 Develop educational and awareness programmes for visitors and local communities.

Transitional Phase Planning

20. Many, perhaps most, ecodevelopment activities have a gestation period of one to three years before they start giving the intended benefits to the local people. For ecodevelopment to succeed as a strategy, it has to be ensured that during the gestation period (transitional phase) the people are not put through unnecessary hardships, nor is the protected area allowed to degrade.
21. Measures aimed at tiding over the transitional period could include the making available of alternate sources of biomass (fuel, fodder, etc.) to the community on terms and conditions not worse than what they were getting earlier. However, care should be taken to ensure that transitional measures do not compromise, for example by making people dependent on free handouts, the chances of success of sustainable ecodevelopment initiatives.
22. Such measures could also include developing alternate systems of income, for example long term employment as forest guards or occasional employment in the various management activities in the protected area. Training programmes, with stipends, intended to develop the skills required for pursuing various ecodevelopment activities can also be scheduled in the transitional period. Efforts must also be made to find employment in construction and other activities related to the ecodevelopment project and to schemes of districts agencies. Transitional planning must attempt to make accessible, to the local people, other areas in the region, especially waste, common and forest land. Whereas ecological regeneration and afforestation work in waste and common lands can provide almost immediate employment to a significant number of the local people, forest land outside the protected area can support Joint Forest Management (JFM) initiatives.

23. The development of appropriate tourism can also provide almost immediate employment to the local people, especially as tourist guides or through the provision of food and accommodation to the tourists.
24. The Environment (Protection) Act might also need to be invoked in the buffer areas for ensuring the success of ecodevelopment initiatives.

Financial Arrangements

25. The timely release of ecodevelopment funds to the park director and, further, to the concerned voluntary agencies and village committees has to be guaranteed.
26. There also has to be adequate decentralisation of financial powers to ensure that sanction of activities and expenditure are not delayed. It also has to be ensured that field officers have the flexibility to respond to all of the various eco-development needs.
27. There must also be an ability to release funds to voluntary organisations and village level committees.

Criteria for Site Selection

28. From the protected areas in India, a list has to be developed of those which are threatened by the types of pressures that can be tackled by ecodevelopment. Eco-development, as a strategy, is appropriate only for those areas where the threats are due to pressures from local (rural) communities. In areas where the major threat is from a national highway, or from commercial logging by an industry, or from pollution by a factory, strategies other than eco-development might be more appropriate.

Ofcourse, an area can have both types of pressures. In such cases, ecodevelopment can become the means of tackling pressures from local communities while other strategies can be employed to tackle non-localised problems.

29. After a selection has been done of potential areas for ecodevelopment, they need to be classified as follows.
 - I. Areas where current, local community, needs for biomass (grass, fuelwood, fodder, non-timber produce etc.) are the major threats and these can be sustainably met from available resources, once these resources are better managed (closing/rotation of grazing areas, regeneration/plantation of fuelwood and other species, soil and water conservation activities etc.)

- II. Areas where though current, local community, needs for biomass cannot be completely met, in a sustainable manner, from local resources, there is potential for reducing local needs for biomass to sustainable levels through indirect methods.

Such indirect methods could include minor interventions like stall feeding of livestock, upgradation of local breeds of cattle, or introduction of smokeless chullahs, to major interventions like setting up schools and training programmes to enable villagers to seek non-biomass based employment, minor irrigation, water harvesting and soil conservation schemes to enhance agricultural productivity, development of cottage industries and artisanal skills, etc.

- III. Areas where even the combination of direct (biomass regeneration) and indirect (diversion of biomass needs) strategies would not be adequate to remove the threat to the environment and where larger, perhaps regional, interventions would be required.

Within each category, the areas should be graded in accordance with the severity of the problem.

30. A decision has, then, to be made on which areas are to be selected. In the long run it might be possible to cover all the areas, but in the short run a priority has to be established.

Given the circumstances, in some cases it might be preferable to first take up the easier areas (category I), especially if experience needs to be accumulated and resources are scarce. On the other hand, the more difficult areas (category II & III) might require attention more urgently and any further delay might cause irretrievable damage. Though the final decision would have to be made case by case, depending on the experience, training and confidence of the persons concerned, the resources available and the ecological value and level of threat pertaining to each area, as a general principle it is advisable to go from the simpler to the more difficult areas as the experience and confidence gained would help in facing increasing levels of difficulty.

Another factor that should influence the choice of the area is the willingness and ability of the local communities to participate in the process. Even simple problems cannot be tackled without involvement of local communities, while the most difficult ones can be overcome if the people are willing to co-operate.

31. Initially it is advisable to deal with each area separately, though at a later stage it might be advantageous to link up the various ecodevelopment initiatives in a region.

12. SUMMARISED PROJECT DESCRIPTION:

Given below is the summary project description, separately for each of the eight PAs. More area wise details are given in part D. These eight sites have been selected keeping in mind their global significance and their representativeness of the varied ecological zones of India. Six of them (Buxa, Periyar, Simlipal, Ranthambhore, Pench, and Palamau) are Tiger Reserves and represent between them the most valuable tiger habitat in all its variations. Nagarhole, though not formally a Tiger Reserve, is also an important habitat for the Tiger. It is also one of the most valuable Elephant habitats. The eighth area, Gir, has the last surviving population of the Asiatic Lion. For greater details of the biodiversity value of these areas, please see the profiles in part D and the lists of flora and fauna in part E and F.

The proposed strategies described below are of three basic types. The first are those which require an investment from the project and are aimed at micro level planning, improved management, conservation and regeneration of the ecosystem, income generation, human resources development, research and development, education and awareness, monitoring, and village support.

The second type of strategy requires an investment from sources other than the project fund, and the project becomes a method of identifying and channelising these resources, especially from sectors like animal husbandry, agriculture, transport, irrigation, rural development and education, among others.

The third type of strategy requires better regulation and more effective enforcement of laws and policies, with the cooperation and involvement of the local communities. Here it must be remembered that first viable alternatives to the biomass and other needs of the local communities have to be established before they are required to accept restrictions. The spirit of ecodevelopment requires that the costs to be paid by the local communities for the conservation of the PA must be minimised and that they must willingly accept and, whenever possible, self impose the restrictions required for such conservation.

12.1 BUXA TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

Buxa Tiger Reserve comprises of intended national park (area of 117.1 sq. kms) and sanctuary (area of 268 sq. kms) and reserved forests (392 sq. kms). The total area of the tiger reserve is 761 sq. kms. The main management problems are the 37 forest settlement villages inside the sanctuary area of the PA, and the occurrence of devastating floods. These floods entail enormous maintenance operations by the forest department.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># estimated 1,05,00 cattle</p> <p># average annual consumption of fodder per family is 10.74 tons</p>	<ol style="list-style-type: none"> 1. Grow fodder on village wastelands outside the PA 2. Reduce the number of cattle 3. Improve cattle breed 4. Stall feeding
<p>2. Fuelwood collection</p> <p>The average consumption of fuelwood per family is 3.6 tons. Fuelwood is for domestic purposes</p>	<ol style="list-style-type: none"> 1. Develop fuelwood plantations outside PA 2. Establish non-conventional sources of energy (biogas and solar) 3. Introduce fuelwood saving devices such as the smokeless chullahs 4. Increase sustainable access to fuelwood through JFM activities in the reserved forests in the Project Area 5. Support fuelwood plantations on private land 6. Ensure that the tea estates adjacent to the PA have their own fuelwood plantations
<p>3. Low agricultural productivity in the Project Area</p> <p>Marginal and small farmers raise one monsoon crop and leave the land fallow after the harvest, mainly due to lack of irrigation facility.</p>	<ol style="list-style-type: none"> 1. Increase irrigation facilities by: <ul style="list-style-type: none"> -locating tubewells and establishing pipelines to take care of irrigation -minor irrigation schemes like impounding water in small streams and carrying water to upstream areas by lift irrigation 2. Increase productivity by providing agricultural inputs like seeds and fertilizers, encouraging use of bio-fertilizer and compost.
<p>4. Poaching</p> <p>Poachers, mainly poaching herbivores, are active in the PA.</p>	<ol style="list-style-type: none"> 1. Induction of local tribals in anti-poaching squads 2. Development of anti-poaching camp sites 3. Soliciting the co-operation of surrounding communities in anti-poaching programmes

<p>5. Lack of NGOs in the Project Area</p> <p>There are no NGOs in the vicinity of BTR to take on the ecodevelopment activities</p>	<ol style="list-style-type: none"> 1. Involve and prepare local community groups to take on most of the NGO tasks. 2. Persuade a well established NGO at State level to take on planning and implementing ecodevelopment activities in this area
<p>6. Crop damage</p> <p>Mainly by Elephants</p>	<ol style="list-style-type: none"> 1. Crop protection measures, mainly electric fencing 2. Participative patrolling of fields 3. Crop insurance
<p>7. Lack of employment opportunities</p> <p>Forestry work provided each Forest Village family 100 days of employment in the past. In 1983 forestry operations generated 5,94,000 person days of work as against only 2,77,500 person days of work in 1991</p>	<ol style="list-style-type: none"> 1. Increasing involvement of the local people in management and environment regeneration activities within the PA 2. Employment of local people in biomass regeneration and land improvement schemes in the adjacent areas 3. Establishing environmentally sustainable income generation activities.
<p>8. Extraction of Timber</p> <p>With a number of Veneer factories being established near the BTR, timber poaching has assumed alarming proportions</p>	<ol style="list-style-type: none"> 1. Discourage wood demanding industries in the vicinity of the BTR 2. Acquire boats and train anti-poaching squads, involving the local people, to guard stream banks and thereby prevent smuggling of timber
<p>9. Flooding</p>	<ol style="list-style-type: none"> 1. The phenomenon of floods needs to be properly studied to understand the flood ecology and the biotic interferences which disturb the ecological balance 2. This study should be a joint venture of the West Bengal and Bhutan Governments

12.2 GIR NATIONAL PARK

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The entire area of Gir PA has now been declared a national park (7 July, 1993). Consequently, all habitation within the PA is now illegal, as is all grazing and other human uses or extraction. At present, there are 54 Maldhari nesses with 361 families, and 14 forest villages within the PA. The Park Authorities propose to relocate these families outside the PA. Though this is not part of the ecodevelopment proposal, if and when this happens, those of these families who are relocated within the project area (extending to a radius of 6 kms around the PA) would be covered by the ecodevelopment project.

There are also two temple complexes within the PA which have people living within. These complexes will either have to be excluded from the national park, by creating enclaves, or the people shifted out.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># 14,180 cattle from within PA</p> <p># 94,582 cattle from the project area of 6 kms</p>	<p>1. Grow fodder on village wastelands outside the PA</p> <p>2. Supply grass from fireline to villagers</p> <p>3. Improve cattle breed</p> <p>4. Stall feeding</p> <p>5. Alternate employment opportunities for the Maldharis</p>
<p>2. Fuelwood collection</p> <p>Fuelwood requirement in PA and project area : 1,54,050 kgs per day (56,228.25 metric tonnes annually)</p>	<p>1. Develop fuelwood plantations outside PA</p> <p>2. Establish non-conventional sources of energy (biogas and solar)</p> <p>3. Introduce fuelwood saving devices such as the smokeless chullahs</p> <p>4. Provide alternate employment to headloaders</p> <p>5. Support fuelwood plantations on private land</p>
<p>3. Disturbance due to thoroughfares</p> <p>Six roads, of approximately 100 kms, passing through the PA and used by pilgrims, local inhabitants, and general buses</p>	<p>1. Restrict use by heavy vehicles</p> <p>2. Divert bus routes outside PA</p> <p>3. Restrict traffic at night</p> <p>4. Provide shuttle service to local inhabitants and pilgrims (using battery vans if possible)</p>
<p>4. Disturbance from the railway line</p> <p>The noise and pollution from steam engines on the line disturb the animals and the habitat. The trains also, occasionally, run over animals</p>	<p>1. Alternate alignment for the railway line</p> <p>2. In the interim, ban of steam engines and reduced speed within the park</p>

<p>5. High Lion density</p> <p>284 Lions within 1,41,213 ha (1412.13 sq kms) resulting in a density of one Lion per five kms (against a prescribed density of one Lion per 100 sq kms)</p>	<p>1. Translocation to alternative habitats</p>
<p>6. Livestock depredation by Lions</p> <p>An estimated 800 heads of livestock killed within PA and 1700 in the adjacent area by Lions, annually (1979-1984 estimates). Currently 32% of Lion's prey is estimated to be livestock</p>	<p>1. Provision of adequate compensation for livestock kill or injury</p> <p>2. Simplification of compensation procedures</p> <p>3. Establish livestock protection measures in neighbouring villages.</p>
<p>7. Declining ground water level</p>	<p>1. Soil and water conservation for enhancing recharge</p> <p>2. Agricultural and other water use planning</p>
<p>8. Water shortage in the adjacent areas</p> <p>In the summer months, livestock from the neighboring areas to the PA come to the water holes within the PA</p>	<p>1. Development of water harvesting and conservation structures</p>
<p>9. Crop damage</p> <p>Mainly by Wild boar, Neelgai, Langur and Peafowl</p>	<p>1. Crop protection measures such as live fencing, trenches and other biological and mechanical devices</p> <p>2. Participative patrolling of fields</p> <p>3. Crop insurance</p>
<p>10. Dependence on NTFP from within the PA for use and as a source of income</p> <p>Especially Amla, Bor, Karamdi, Aritha, Honey, Bee's wax and many medicinal plants</p>	<p>1. Alternative income generation activities</p> <p>2. Cultivation of NTFP species outside the PA</p>
<p>11. Occurrence of fire</p> <p>Summer fires occur, either accidentally ignited, often by the steam engine, or on purpose to facilitate the collection of NTFP</p>	<p>1. Banning steam engines</p> <p>2. Alternate sites/sources for NTFP, or alternates to NTFP</p> <p>3. Increased coverage of firelines</p> <p>4. Construction of additional watchtowers</p> <p>5. Involvement of local communities in fire prevention and combating</p>
<p>12. Weed infestation</p> <p>Lantana, Neurocanthes spherostachys</p>	<p>1. Weed eradication programmes</p> <p>2. Manufacture of Lantana chipboard</p>

12.3 NAGARAHOLE NATIONAL PARK

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The entire area of Nagarahole PA has now been declared a national park (May, 1992). Consequently, all habitation within the PA is now illegal, as is all grazing and other human uses or extraction. At present, there are 54 tribal settlements with a total population of 6145 tribals within the PA. The Park Authorities propose to relocate these families outside the PA. Though this is not part of the ecodevelopment proposal, if and when this happens, those of these families who are relocated within the project area (extending to a radius of 5 kms around the PA) would be covered by the ecodevelopment project.

There are also a hotel complex within the PA which is illegal. Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># estimated 27,000 cattle from the project area of 5 kms</p>	<ol style="list-style-type: none"> 1. Grow fodder on village wastelands outside the PA 2. Supply grass from fireline to villagers 3. Improve cattle breed 4. Stall feeding 5. Alternate self-employment for cattle owners 6. Use of crop residue as fodder (straw of ragi and rice crops, cotton seed concentrate)
<p>2. Fuelwood collection</p> <p>An estimated 500 people collect fuelwood from within the PA every day. The tobacco cultivators of adjacent areas encourage headloaders as they require firewood for curing the tobacco</p>	<ol style="list-style-type: none"> 1. Develop fuelwood plantations outside PA 2. Establish non-conventional sources of energy (biogas and solar) 3. Introduce fuelwood saving devices such as the smokeless chullahs 4. Provide alternate employment to headloaders 5. Support fuelwood plantations on private land 6. Insist that tobacco growers generate their own fuelwood 7. Restrict tobacco growing in the region 8. Supplement fuel supply by using crop residues like cotton and mulberry stalk

<p>3. Degradation of forests in the eastern fringe of the PA</p>	<ol style="list-style-type: none"> 1. Effective protection of the area by involving the local communities 2. Gap plantation, appropriate silvicultural practices, and soil and water conservation measures 3. Completion and maintenance of elephant proof trenches
<p>4. Poaching</p> <p>Poachers, especially ivory poachers, are active in the PA.</p>	<ol style="list-style-type: none"> 1. Induction of local tribals in anti-poaching squads 2. Development of anti-poaching camp sites 3. Soliciting the co-operation of surrounding communities in anti-poaching programmes
<p>5. Disturbance due to additional tourist facilities</p> <p>There is a hotel building complex within the PA which is reportedly being handed over to a private sector hotel group to run</p>	<ol style="list-style-type: none"> 1. Banning of the takeover of the hotel building complex by hoteliers, and its conversion to an environmentally friendly tourist facility. 2. Prohibition on any new tourist building within the PA
<p>6. Crop damage</p> <p>Mainly by Elephants</p>	<ol style="list-style-type: none"> 1. Crop protection measures, mainly Elephant proof trenches. 2. Where existing trenches are being filled in by villagers to allow their livestock to enter the PA, involvement of the local ecodevelopment committees in ensuring that this does not happen and suspension of compensation to defaulting villages. 3. Participative patrolling of fields 4. Crop insurance
<p>7. Lack of employment opportunities</p> <p>The closure of forestry operations within the forests of Nagarahole, after they became a national park, has significantly reduced the employment opportunities in the region. Also, the stopping of access to NWFP and fuelwood from the PA has reduced the livelihood opportunities of many of the landless and tribals</p>	<ol style="list-style-type: none"> 1. Increasing involvement of the local people in management and environment regeneration activities within the PA 2. Employment of local people in biomass regeneration and land improvement schemes in the adjacent areas 3. Establishing environmentally sustainable income generation activities.

<p>8. Occurrence of fire</p> <p>Summer fires occur, either accidentally ignited or on purpose to facilitate the collection of NTFP</p>	<ol style="list-style-type: none"> 1. Alternate sites/sources for NTFP, or alternates to NTFP 2. Increased coverage of firelines 3. Construction of additional watchtowers 4. Involvement of local communities in fire prevention and combating
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12.4 PALAMAU TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

An area of 1026 sq km comprising of Reserve forests, Khalsa Reserve forests, and Protected forests was declared as Palamau Tiger Reserve in 1974. 979.27 sq km out of 1026 sq km of the Reserve was declared as a Sanctuary in 1976. The Reserve has been divided into a core zone of 213 sq km and a buffer zone of 813 sq km. The buffer zone of the Reserve is divided into sanctuary and non sanctuary buffer. An area of 225.37 sq km covering the entire core zone and a part of the buffer zone has been included into the intended Betla National Park.

At present, there are 72 villages inside the Sanctuary, out of which 69 villages are geographically located within the Palamau Sanctuary, but are legally excluded. The remaining 3 villages are within the core zone/intended national park.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># 43,000 cow units in the buffer zone</p> <p># 30,000 cattle from in and around the reserve area graze in the buffer zone</p> <p># 677 cattle from 3 villages in the core zone</p>	<p>1. Controlled grazing in Sanctuary.</p> <p>2. Replace cattle with other sources of income where ever possible</p> <p>3. Develop fodder plantations in villages with common lands.</p> <p>4. Prohibit grazing in the core zone.</p>
<p>2. Fuelwood collection</p> <p># Fuelwood requirement of each household is 60 quintals per annum</p> <p># 53,500 tonnes of fuelwood is collected annually from within the buffer zone.</p>	<p>1. Planting of fuelwood species where wasteland or common land is available outside PA</p> <p>2. Establish non-conventional sources of energy (biogas and solar)</p> <p>3. Introduce fuelwood saving devices such as the smokeless chullahs</p> <p>4. Joint Forest Management(JFM) in villages near the reserved forest outside the sanctuary</p>
<p>3. Regulation of Tourism</p> <p>34,719 tourists visited the reserve in 1992. Number of tourists on peak days is 150-200.</p>	<p>1. No increase in tourist facilities such as hotels, restaurants etc.</p> <p>2. No more than 5 vehicles at a time should enter the reserve</p> <p>3. Tourism to be handled by local people.</p>

4. Dual Control Of 4 divisions , 3 are under the control of the territorial wing of the forest department	1. Complete control over the entire reserve should be handed over to the wildlife wing of the forest department
5. Crop Damage # Main damage to crop is by elephants. # Rs.4,368,00 was paid as crop compensation in 1990-91 # Rs 100 per acre is paid as crop compensation.	1. Compensate crop damage adequately and, in the meantime reduce incidence by using measures listed below. Introduce crop insurance, if possible and necessary. 2. Provide crop protection measures such as elephant proof trenches/or fencing 3. Increase number of crop watchers, especially local ones.
6. Livestock Lifting # 1991-92: 257 cattle killed, Rs 1,77,300 compensation paid. # 1992-93: 287 cattle killed, Rs 2,27,325 compensation paid. # Compensation (80% of market price) paid only inside reserve.	1. Compensation for livestock kills outside the reserve.
7. Illegal Activities # Poaching of ungulates in the periphery area. # Encroachment on reserve forests # Illegal felling of timber.	1. Involve local people in management and protection of the reserve. 2. Training and motivation of the staff
8. Dependence on NTFP from within the PA for use and as a source of income # Collection of Kendu, Mahulam leaves and sal seeds. 100 tonnes of Mahulam leaves removed annually. 500 metric tonnes of sal seeds removed annually. # 80,000 ha is exploited for NTFP collection	1. Alternative income generation activities 2. Cultivation of certain species, outside the PA

<p>9. Occurrence of fire Accidently and intentionally caused</p> <p>Intentional fires aimed at creating a demand for labour and for regeneration of grass for grazing</p> <p># 1992 :11.82 sq. kms of core, 5.48 sq. kms of buffer # 1993 : 3.09 sq kms of core, 6.04 sq.kms of buffer # 1.29% of reserve is affected annually</p>	<ol style="list-style-type: none"> 1. Maintenance of firelines 2. Provide alternative sources of wage labour. 3. Restrict grazing to the level that is sustainable without seasonal burning.
<p>10. Forest Working</p> <p>Bamboo forests are exploited by a government agency. On an average an area of 250 sq kms of the sanctuary is exploited for bamboo and 10,000 tonnes of bamboo are removed year.</p>	<ol style="list-style-type: none"> 1. The only option is to stop this practice, as it is in violation of the law.
<p>11. Weed infestation</p> <p>Lantana camara and Flemingia chapper.</p>	<ol style="list-style-type: none"> 1. Uprooting of weeds, thereby also providing employment to local people 2. Manufacture of Lantana chipboard and baskets

12.5 PENCH TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The Pench Tiger Reserve comprises of intended national park (292.85 sq. kms), sanctuary (156.542 sq. kms.), and 308.508 reserved and protected forests. The project area is calculated as the area falling within a ten kilometer radius of the sanctuary and intended national park component of the reserve, much of which is, therefore, within the reserve, especially in the western side.

The reserve contains, within its boundaries, 75% of the reservoir of the Pench Hydroelectric Project. The boundary of the reserve is contiguous with the boundary of the State of Maharashtra, along the south. Across the Maharashtra border is the Pandit Jawahar Lal Nehru National Park. The remaining part of the reservoir falls within this park in Maharashtra, and fishing is currently being allowed there. Also, there are villages in Maharashtra which impact on Pench Tiger Reserve and, consequently, need to be covered under the ecodevelopment project.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># 8,000 cattle from the adjacent area of 5 kms</p> <p># 6250 ha in Chhindwara district and 1252.4 ha in Seoni district of the PA have been opened for grazing.</p>	<ol style="list-style-type: none"> 1. Grow fodder on village wastelands outside the PA 2. Supply grass from fireline to villagers 3. Improve cattle breed 4. Stall feeding 5. Alternate self-employment for cattle owners. 6. Allow sustainable grazing within the already opened compartments in the PA.
<p>2. Fuelwood collection</p> <p>Majority of the people adjacent to the PA are dependent on the PA for fuelwood. Headloads and cartloads are removed.</p>	<ol style="list-style-type: none"> 1. Develop fuelwood plantations outside PA 2. Establish non-conventional sources of energy (biogas and solar) 3. Introduce fuelwood saving devices such as the smokeless chullahs 4. Provide alternate employment to headloaders 5. Support fuelwood plantations on private land
<p>3. Disturbance due to thoroughfares</p> <p>The Totladoh to Guntara road which passes through the PA is used daily by the villagers resulting in disturbance to wildlife. Due to no alternative roads being available, forest roads are used in the Chhindwara district of the PA by villagers to get to markets.</p>	<ol style="list-style-type: none"> 1. Construction of an alternate road from Totladoh to Guntara. 2. Restrict traffic at night

<p>4. Fishing within the Pench Hydroelectric Project (PHEP) reservoir</p> <p>Fishing is carried out in the Maharashtra area of the reservoir. As there is no dividing line within the reservoir, fishermen often fish in the Madhya Pradesh portion of the reservoir.</p>	<ol style="list-style-type: none"> 1. The dividing boundary between the states in the reservoir should be demarcated with buoys or pillars. 2. The reservoir should be policed, using local people and their institutional structures.
<p>5. Control of Bodanala Tank</p> <p>The Bodanala tank is under the control of the irrigation department. People in the villages adjacent to this area fish in the tank illegally. As the forest department has no control over this area, it becomes difficult to control the illegal fishing.</p>	<ol style="list-style-type: none"> 1. The tank should be brought under the forest department control. 2. Alternate income generating activities for the people who are fishing in the area
<p>6. Working of a Stone Quarry</p> <p>A stone quarry of 1.62 ha was sanctioned by the Central Government to the Pench Hydroelectric Project in 1983 to be worked until March 1992. The PHEP has applied for renewal for working of the quarry.</p>	<ol style="list-style-type: none"> 1. As quarrying within national parks and sanctuaries is illegal, alternate sites need to be found outside the PA.
<p>7. Shortage of water for irrigation and drinking in areas adjacent to the PA</p>	<ol style="list-style-type: none"> 1. Harvesting of water for irrigation and drinking purposes within the sustainability of ground water resources 2. Agricultural and other water use planning
<p>8. Water shortage in the adjacent areas</p> <p>In the summer months, livestock from the neighboring areas to the PA come to the water holes within the PA</p>	<ol style="list-style-type: none"> 1. Development of water harvesting and conservation structures
<p>9. Crop damage</p> <p>Mainly by Wild boar, Neelgai, and Chital</p>	<ol style="list-style-type: none"> 1. Crop protection measures such as live fencing and other biological and mechanical devices 2. Participative patrolling of fields

<p>10. Dependence on NTFP from within the PA for use and as a source of income</p> <p>Especially Mahua, Mahul bel, Chironji, Tendu, Stercula gum, shed antlers, honey and Bee's wax</p>	<ol style="list-style-type: none"> 1. Alternative income generation activities 2. Cultivation of NTFP species outside the PA 3. Initiate beekeeping to provide an alternate source of honey and bees wax
<p>11. Occurrence of fire</p> <p>500 ha are burnt annually. Summer fires occur, either accidentally ignited, or on purpose to facilitate the collection of NTFP, antlers and honey. Often the fisherfolk start the fires to divert the attention of the forest department.</p>	<ol style="list-style-type: none"> 1. Alternate sites for NTFP, or alternates to NTFP 2. Provide alternate sources of income to people dependent on antler collection and to fisherfolk 3. Increased coverage of firelines 4. Construction of additional watchtowers 5. Involvement of local communities in fire prevention and combating
<p>12. Proposed new tourist entry point</p> <p>A new entry point has been proposed at Totladoh. Totladoh is near the PHEP reservoir and entry of tourists at this point would cause disturbance to wildlife.</p>	<ol style="list-style-type: none"> 1. Develop a management plan which clearly outlines the tourist entry points, zones and activities for the PA, based on the ecological requirements.
<p>13. Antler collection within the PA.</p> <p>Shed antlers are collected from within the PA and sold. Often fires are started to distract the attention of the forest department.</p>	<ol style="list-style-type: none"> 1. Provide alternative employment generation activities for the people dependent on antler collection for an income.
<p>14. Degradation of forest land</p>	<ol style="list-style-type: none"> 1. Initiate soil and water conservation projects for the regeneration of degraded areas 2. Plantation of degraded areas
<p>15 Inadequate employment opportunities</p> <p>90% of the people in the project area are tribals who have small landholdings. They grow only one crop in a year and are underemployed for 4 to 8 months of the year.</p>	<ol style="list-style-type: none"> 1. Provide alternate employment generation activities
<p>16. Weed infestation</p> <p>Lantana, Parthenium and Xanthium</p>	<ol style="list-style-type: none"> 1. Weed eradication programmes 2. Manufacture of Lantana chipboard

12.6 PERIYAR TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The Periyar Tiger Reserve (777 sq km) comprises of a core zone, which is an intended national park (350 sq km), a buffer zone (377 sq km) and a tourism zone (50 sq km), both of which are a part of the Periyar Sanctuary.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
1. Grazing # 2000 Cattle graze within the PA	1. Allow grazing in the buffer zone of the PTR. 2. Purchase land outside for fodder plantations 3. Upgradation of local cattle breeds
2. Fuelwood collection # Collected by people living within the PTR # By people living in adjacent areas for own use and as a source of income	1. Establish non-conventional sources of energy (biogas and solar) 2. Introduce fuelwood saving devices such as the smokeless chullahs 3. Provide alternate income generation activities 4. Consider buying land outside the PTR for fuelwood plantations. 5. Make cooking gas available to populations living in the periphery.
3. Presence of Government Agencies: # KTDC hotels and boats in the tourism zone. # PWD rest houses in PTR. # PA authorities have no control over them.	1. Control of the KTDC and PWD establishments should be handed over to the PA authorities.
4. Management of Tourism # 3,50,000 exert a direct pressure on the PTR # hotels use fuelwood for cooking.	1. Ensure a regular supply of LPG cylinders to hotels around PTR and ban the use of fuelwood in the restaurants.
5. Ganja Cultivation # plots are reportedly located in the remote parts of the core zone.	1. Stringent policing of the vulnerable areas, with the cooperation of the local people who must also be involved in the policing activities. 2. Aerial survey of core zone should be carried out along with infrared photography.

6. Timber Extraction # Extraction of wood for Hindustan Newsprints Co. Ltd (HNCL). # Eucalyptus plantations, started in the 1960's are being harvested now	1. Disallow extraction of timber for HNCL 2. Remove all Eucalyptus trees from PTR and allow the natural grasslands to regenerate
7. Rationalisation of Boundaries	1. Boundaries of PTR should be rationalised so that as its status as an area of biodiversity is improved
8. Dependence on NTFP from within the PA for use and as a source of income # Cinnamon bark ,Thelli powder(Canarium strictum), honey etc.	1. Alternative income generation activities 2. Cultivation of certain species of NTFP outside the PA
9. Occurrence of fire # caused by people who come into the park for NTFP collection.	1. Local people should be employed as fire watchers during the fire season. 2. NTFP collection should be minimised.
10. Staff # Number of staff is inadequate, and the staff is inadequately trained	1. Training of staff. 2. Additional posts should be sanctioned for the ecodevelopment work.
11. Weed infestation # Lantana camara	1. Weed eradication programmes 2. Manufacture of Lantana chipboard

12.7 RANTHAMBHORE TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The core area of Ranthambhore Tiger Reserve was declared a national park on 1/11/1980 and the area is 274.5 sq. kms. It has a sanctuary area of 118 sq. kms around it forming the buffer. Currently, the Kailadevi Sanctuary and Sawai Mansingh Sanctuary have been added to this area to form the Ranthambhore Tiger Reserve (RTR). There are 4 villages within the National Park area of the RTR.

Given below is a table of issues and proposed strategies for the PA.

Issues	Proposed Strategies
<p>1. Grazing</p> <p>Grazing within PA:</p> <p># approximately 1.5 lakh migratory sheep enter the reserve during the monsoon and winter. This is in addition to the regular grazing by the cattle of the project area</p>	<ol style="list-style-type: none"> 1. Grow fodder on village wastelands outside the PA 2. Supply grass from fireline to villagers 3. Improve cattle breed 4. Stall feeding 5. Alternate self-employment for cattle owners 6. Alternate closures in sanctuary area 7. Fodder plantations in private lands
<p>2. Fuelwood collection</p> <p>A large amount of fuel wood collected by people living in and around the RTR</p>	<ol style="list-style-type: none"> 1. Develop fuelwood plantations outside PA 2. Establish non-conventional sources of energy (biogas and solar) 3. Introduce fuelwood saving devices such as the smokeless chullahs 4. Provide alternate employment to headloaders 5. Support fuelwood plantations on private land
<p>3. Degradation of forests in the eastern fringe of the PA</p>	<ol style="list-style-type: none"> 1. Effective protection of the area by involving the local communities 2. Gap plantation and soil and water conservation measures

<p>4. Poaching</p> <p>Poachers, especially the Moghyar, are active in the PA.</p>	<ol style="list-style-type: none"> 1. Induction of local tribals in anti-poaching squads 2. Development of anti-poaching camp sites 3. Soliciting the co-operation of surrounding communities in anti-poaching programmes 4. Developing alternate employment opportunities for the Moghyar tribals
<p>5. Disturbance due to tourism</p> <p>There has been an enormous increase in tourist traffic. It is confined to the core area of the PA</p>	<ol style="list-style-type: none"> 1. Make tourism activity eco-sensitive 2. Develop suitable tourism spots in other areas of RTR to reduce tourist concentration in core area
<p>6. Crop damage</p> <p>Mainly by Wild boar and Nilgai</p>	<ol style="list-style-type: none"> 1. Crop protection measures, such as electric fences, trenches, stone walls, live fencing, etc. 2. Participative patrolling of fields
<p>7. Lack of employment opportunities</p> <p>The stopping of access to NWFP and fuelwood from the PA has reduced earning opportunities of many of the landless and tribals. Because of the National Park large scale industries such as cement plants are not allowed to be set up in the area, also reducing local employment opportunities.</p>	<ol style="list-style-type: none"> 1. Increasing involvement of the local people in management and environment regeneration activities within the PA 2. Employ local people in biomass regeneration and land improvement schemes in the adjacent areas 3. Establish environmentally sustainable income generation activities (listed separately)
<p>8. Lowering of water table and land degradation</p>	<ol style="list-style-type: none"> 1. Run off to be stored for irrigation purposes 2. Repair existing tanks and construct new ones 3. Water and soil conservation techniques to be introduced
<p>9. Lack of proper infrastructure for staff</p> <p>Staff posted in remote areas need proper shelters and drinking water facilities. Their families require housing and other infrastructure at headquarters.</p>	<ol style="list-style-type: none"> 1. Provide staff shelters and drinking water facility

<p>10. Disturbances due to pilgrims</p> <p>Pilgrims visit the Ganesh temple within the national park, and the Kailadevi temple within Kailadevi sanctuary.</p>	<p>1. Awareness programmes to be introduced for pilgrims on the value of the forest</p>
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12.8 SIMILIPAL TIGER RESERVE

SUMMARY DESCRIPTION OF ISSUES AND STRATEGIES

The Similipal Tiger Reserve (STR) comprises of the intended Similipal National Park 845.7 sq km, Similipal Sanctuary 1354.3 sq km, and revenue land 550 sq km.

There are 65 revenue villages with 8643 people (85 with 8574 people, according to the District Census Handbook, 1981) situated within STR, of which 4 are located in the intended national park. The majority of the population living inside STR is tribal.

Given below is a table of issues and proposed strategies for STR

ISSUES	PROPOSED STRATEGIES
<p>1. Akhand Shikar</p> <p>Groups of tribals (upto 500 people), locals, as well as from Bihar and Bengal, carry out ritual hunting of animals in the month of April every year.</p>	<p>1. Based on a proper understanding of the reasons, especially the socio-economic basis, for 'Akhand shikar', involve the tribal communities in a dialogue with the purpose of discontinuing the practice.</p>
<p>2. Stone Quarries</p> <p>There are some soft stone quarries located near the northern boundary of STR, within the PA.</p>	<p>1. Alternate quarry sites should be found where there is no disturbance to the PA.</p>
<p>3. Grazing</p> <p>Grazing within the PA:</p> <p>Approximately 50,000 livestock graze in the Reserve. Cattle from upto a distance of 5-7 km from the Reserve boundary graze inside. Grazing takes place in the core as well as in the buffer zone.</p>	<p>1. Encourage stall feeding of cattle, along with raising of fodder plantations in village common lands, wastelands, or available forest lands. In addition, try and convince people to go in for better breeds of cattle.</p> <p>2. Identify and develop alternate grazing grounds, outside the PA for cattle grazing inside the core zone.</p> <p>3. In case the purpose for keeping cattle is to earn cash, then alternate income generating activities acceptable to the people can be identified.</p>

<p>4. Fuelwood Collection</p> <p>100 cycle loads of wood are removed daily from the Reserve. Fuelwood is collected for sale as well as for domestic use.</p>	<ol style="list-style-type: none"> 1. Provide alternate income generation activities for those people who are dependent on fuelwood collection as their livelihood. 2. Establish fuelwood plantations on available land outside the PA 3. Provide alternate energy sources.
<p>5. Timber and NWFP Collection</p> <p>500 people are engaged in NWFP collection daily for their own use as well as for sale.</p>	<ol style="list-style-type: none"> 1. Provide alternate income generation activities. 2. Develop alternative small timber plantations.
<p>6. Forest Fires</p> <p>Between 1991 to 1993, 91.20 sq km of forest was burnt.</p>	<ol style="list-style-type: none"> 1. Maintain firelines. 2. Employ local people as fire watchers. 3. Additional fire watch towers should be constructed.
<p>7. Encroachment of forest land</p> <p>Forest land within STR is encroached by local people for agriculture.</p>	<ol style="list-style-type: none"> 1. Demarcate forest land/boundary of STR. 2. More effective patrolling.
<p>8. Inadequate Staff</p> <p>There is a felt need for additional staff, especially women.</p>	<ol style="list-style-type: none"> 1. Employ additional people on daily wages. Also employ women as Guards, Rangers, etc.

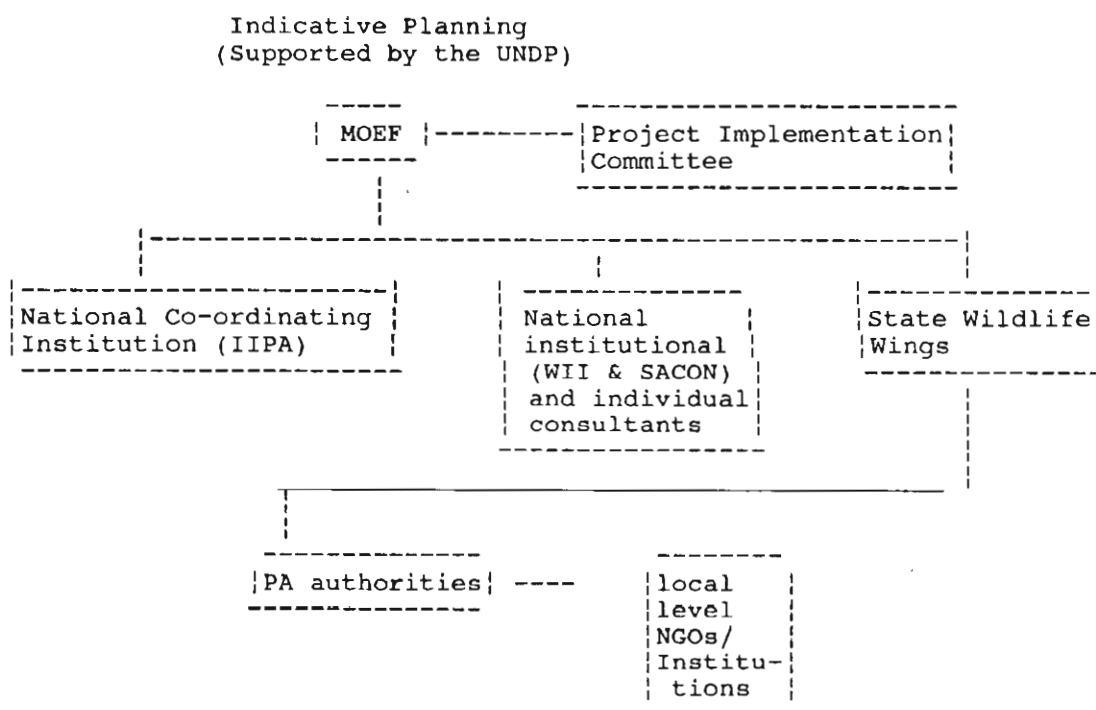
13. INSTITUTIONAL ARRANGEMENTS:

Indicative Planning Phase

The indicative planning exercise is being taken up with the support of the UNDP, by the Ministry of Environment and Forests (MOEF), Government of India, in collaboration with the concerned State Governments. To assist the MOEF and the State Governments, the Indian Institute of Public Administration (IIPA) has been identified as the National Co-ordinating Institution. The Wildlife Institute of India (WII) and the Salim Ali Centre for Ornithology and Nature (SACON) have been identified as National Consulting Institutions. Four national consultants, viz. Erach Bharucha, S. Debroy, Arvind Khare and Raman Mehta have also been identified.

At the state level, the Wildlife Wing of the forest department is co-ordinating the indicative planning process, which is being implemented through the PA authorities. The PA authorities are being assisted by local level consulting institutions/NGOs.

The indicative planning process involves village surveys and consultations in a sample of villages. This is being done by a joint team of PA officials and members of the local level NGO/institution. The flow chart below gives an idea of the institutions and processes involved:



Micro level Planning and Implementation Phase

The project, involving micro level planning for, and implementation of, ecodevelopment and management activities, would be executed by the respective state governments through their PA authorities. For overseeing the implementation, a national level committee is suggested, and for co-ordination, state level and PA level committees. Also suggested are a national and various local level monitoring institutions, as also involvement of local level NGOs in microplanning and implementation.

The suggested national level committee could be chaired by the Secretary (Environment and Forests), Government of India, and the state level co-ordination committee by the Chief Secretary or, when he is not present, by the Forest Secretary.

PA level co-ordination committees could be chaired by prominent, non official, environmentalists and should involve both the Field Director/PA Director (who could be the convenor) and the District Collector(s). Whereas the national committee could oversee the implementation of the whole project, in all the states, and take up any co-ordination or other issues involving Central Government agencies or donor agencies, the State level co-ordination committees could ensure that the different state departments/agencies operating in the project area work in harmony with each other and collectively attempt to make the project a success. The state level committee needs to be supported by the PA level committee which could, on the one hand, oversee the implementation of the project in the field, especially the aspects relating to the integration of efforts by different agencies or sectors, and on the other hand raise the issues that need to be sorted out at the State or Central level.

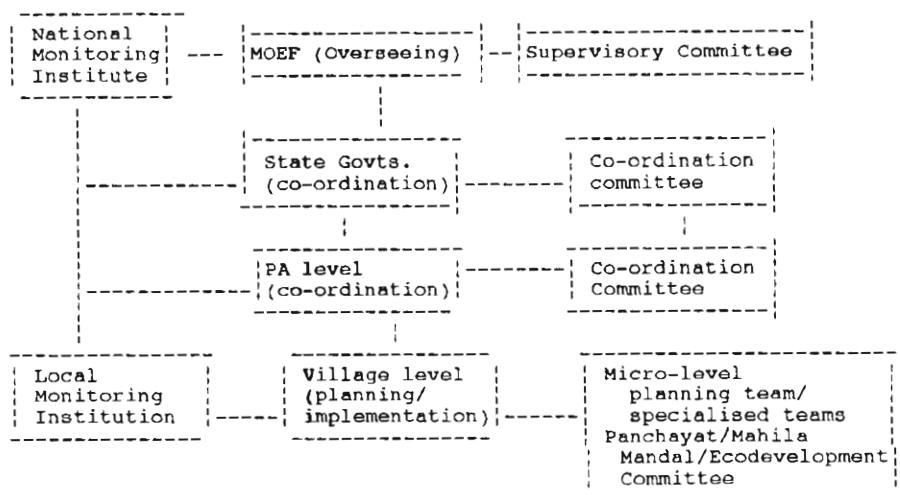
The Monitoring institutions, when identified, could monitor the progress of the planning and implementation processes, in terms of the objectives, strategies and methodology laid down in the indicative plan and emerging from the micro planning exercise.

The actual micro-level planning process needs to be facilitated by micro-level planning teams comprising of PA officials, local NGO representatives, wildlife experts sensitive to the needs of wild animals, and local community leaders/representatives, especially women. These teams should be supported by specialised teams/NGOs who could be called in to design and implement special types of activities (training, education and awareness, research, types of income generation activities, etc.) or find solutions for special problems (water logging, salinity, water scarcity, intense social conflicts, etc.).

At the village level, there need to be a people's institution which would prepare the village plans, with the help of the micro-level planning teams and the specialized teams/NGOs, and which would implement the ecodevelopment activities. The appropriate village institution (panchayat, mahila' mandal, eco-development committee, etc.) should be identified by the villagers themselves, and set-up by them if not already existing.

The overall organisation could be :

Micro-level Planning and Implementation



14. POLICIES AND PROCESSES

The project would ensure that:

- (1) Project funds are released in time to the implementing agencies.
- (2) Local level officers have adequate sanctioning powers
- (3) Since the planning process is going to be dynamic, there is to adequate flexibility in selection of heads for incurring expenditure.
- (4) There is an appropriate coordinating mechanism at the local level between the various players viz. the people, NGOs, Forest Departments, etc.
- (5) There is an appropriate coordinating mechanism and institutional support for the planning and implementing of schemes at the state level
- (6) There are monitoring and evaluating processes and institutions for each site
- (7) That the project area (approximately between 1 and 10 km around the PA, depending on the PA) is also under the control of the PA Director, at least for those aspects critical for the success of ecodevelopment
- (8) That appropriate legal cover, perhaps through the Environmental (Protection) Act, is provided to the surrounds of all protected areas so that it can be ensured that no activities and patterns of land use that are a threat to the PA are allowed in these areas.

15. MONITORING AND EVALUATION

The ongoing monitoring, and periodic evaluation, of the planning and implementation activities is very important both to enable mid-term corrections and to learn from the experience. The aspects that need to be especially monitored, and evaluated, are:

1. The appropriateness of the indicative and micro-level plans, and of the planning methodology used, especially in terms of their participativeness, site specificity, practicality, optimality, and the ability to integrate sectors and levels.
2. The ecological state of the PA, especially trends regarding the state of the habitat, species distribution, diversity, population, stability of the water and soil regimes, and of biomass productivity.
3. The socio-economic status of the local population, especially in terms of sustainable access to the basic requirements of biomass and other natural resources, and to means of earning their livelihood without degrading the PA.
4. The attitude of the local population, towards the PA, especially in terms of their recognising its value and legitimacy, acknowledging its local benefits, and feeling a sense of empowerment and ownership.
5. The establishment and evolution of social and governmental institutions, and their interactions, especially in terms of sharing of control between the government and the community, integration and cooperation between different levels and sectors of the government, and the transcending of barriers of wealth, caste, religion, age and gender in rural communities.

Whereas the monitoring of these parameters, through appropriate indicators and methodology, is one of the functions of the PA authorities, there must also be independent monitoring and evaluation through professional institutions unconnected with the planning and implementation of the project. Such monitoring and evaluation, apart from using remote sensing and other scientific methods, must be based on detailed discussions with the local people, perhaps by using participatory rural appraisal methods.

In order to evaluate the impact of ecodevelopment on a PA and its surrounds, baseline data have to be collected to form a basis of assessment. Therefore, it is essential that the task of collecting baseline data be urgently initiated so that it can be completed before the start of ecodevelopment activities.

16. RATIONALE FOR GEF SUPPORT

- 16.1 The project would attempt to apply the lessons learned from implementation of joint management and ecodevelopment programmes elsewhere in India to protected areas themselves, by supporting the development and implementation of 8 ecodevelopment (integrated conservation and development) projects in biologically significant protected areas in a selected number of ecologically distinct locations, and provide opportunities for testing a wide range of management innovations. The project would also stress policy, institutional and management changes to facilitate ecodevelopment and sharing of resources with the local communities and support ultimately the development of appropriate strategies and guidelines for meeting needs of local communities living in and around protected areas.
- 16.2 The project would encourage decentralised control of forest resources, and create and reinforce innovative community-based incentives for sustainable management of natural resources in and around the selected protected areas, especially in regard to tribal and other long-term occupants. Experiences gained from implementation of the project would form the basis for dealing with local communities in and around protected areas, throughout India in the future. Given the importance and threats to the conservation of biodiversity and the government support and experiences with community participatory programmes, the World Bank Asia Biodiversity Strategy Paper suggests that India, Indonesia and Thailand are the most suitable countries in the region for the development of integrated conservation and development projects.
- 16.3. In view of the current budgetary constraints in India, it seems unlikely that the conservation of biodiversity would get adequate funds. It is even less likely that the limited resources available for managing protected areas would be channeled for ecodevelopment activities. Even if this was done, there would not be enough to go around and it would be at the cost of other management activities. GEF funding is therefore imperative for implementation of this project.

17. INCREMENTAL COSTS

The proposal reflects the incremental costs required to make the conservation of biodiversity sustainable and to minimise the costs that have to be paid by local communities, especially tribals, due to restrictions related to wildlife protected areas. The Central and the State governments already provide resources through the plan and non-plan budgets to meet the expenditure for the basic management of these protected areas. In addition, the Government of India has initiated, in the Eighth Plan, a centrally sponsored scheme for ecodevelopment which is supporting ecodevelopment planning and implementation around a few protected areas. However, considering the magnitude of pressures and the number of protected areas, it seems unlikely that, in the near future, adequate funds would become available from internal budgetary sources. Consequently, incremental funding is being sought from the GEF.

The Wildlife Institute of India has been conducting training programmes, sponsored by the UNDP\FAO, on ecodevelopment for PA managers. The funding that is being sought through the GEF would, consequently, be managed by appropriately trained personnel.

18. COST EFFECTIVENESS

The detailed budgets, appended, show that the proposed investment varies between US \$15 to US\$67 per family, per annum, in the project area. However, even with this low level of investment, the decentralised, micro-level, nature of the proposed set of activities ensure that a viable set of sustainable income and biomass generation processes would get established which, before the end of the project, would become self-sustaining. In fact, the budgets have been so designed that by the last (fifth) year of the proposed project very little investment would be required to be made.

There is a fair amount of investment in capacity building (10%) and in income generation activities (22.6%). Almost 40% of the investment would be for environmental regeneration and conservation and the project is designed to ensure that these activities progress on the "decreasing investments, increasing returns" principle.

19. SPECIFIC ENVIRONMENTAL ISSUES ADDRESSED

The project covers two types of legal areas. First, there are the national parks and sanctuaries where the effort is to minimise human interference and disturbance. The major thrust for such areas would involve:

- Protection from disturbance to the level required by each specific area and prescribed by law.
- Negation of impacts of past disturbance, like weed infestation or degradation of habitats.
- Maintenance, in the case of sanctuaries, of a sustainable level of permitted human uses (like grazing).
- Prevention of poaching and trapping of wild animals.

For the surrounding areas, outside the PA, the thrust would be on:

- Sustainable use.
- Enhanced productivity.
- Regeneration of degraded areas
- Protection of animals from illegal hunting and trapping.

20. INVOLVEMENT OF NGOs/ LOCAL COMMUNITIES

As already described (see section 11 above), ecodevelopment is a micro level, participatory process where, right from the planning phase, local communities are the major actors, with help, as required, from local level NGOs.

The described institutional structure (see section 13 above) gives details of the involvement of NGOs and the local community.

21. BUDGET

The consolidated budget statement is given below. Detailed budget statements are appended. Also appended is a description of some of the income generation, biomass regeneration and wage earning activities listed in the budget. However, the budget remains indicative in the sense that it only indicates the levels of investment required and broadly the types of activities that will be supported. The final decision on what activities are to be supported where will be done during the micro level planning exercise, based on detailed discussions with the local communities. In fact, most of these decisions, within the broad context of the indicative plan and budget, would be taken by the local communities themselves. It must also be ensured that the resources allocated are within the ability of the PA authorities and other involved institutions to spend responsibly. The expenditure will have to be built up keeping in mind the infrastructure available to implement the programme, within both the government and the local community.

It must be remembered that the method of disbursing the funds would be determined separately for each area. For many of the proposed activities, only part of the required funding might be provided from the project and the rest might be contributed by the local communities themselves. Again, for some others, a part or the full amount might be in the form of a loan, to be repaid by the beneficiary to a common fund controlled by the local community, and available for further loans and assistance.

Part of the resources will flow to the Central Government (MOEF) for organising training, especially at national/international institutions and facilities, and for supporting monitoring, R&D, and planning activities in relation to these eight areas. The resources indicated for each PA also include those that would flow to NGOs and local community institutions. In the case of Periyar Tiger Reserve, some of the resources might also need to be used for promoting ecodevelopment in neighbouring impacting villages in Tamil Nadu.

B. BUDGET ESTIMATES

CONSOLIDATED BUDGET (In US \$ '00,000)											
HEAD/ SUBHEAD	CENTRAL	PROTECTED AREAS								TOTAL	PERCENT
		BUXA	GIR	NAGARAHOLE	PALAMAU	PENCIN	PERIYAR	RANTHAMBHORE	SIMILIPAL		
1 Planning	1.50	0.35	0.65	0.50	0.59	0.69	0.23	0.89	0.67	4.58	1.44%
2 Management		5.17	12.74	7.27	5.50	3.65	5.66	9.60	4.85	54.43	17.12%
3 Environment Conservation and Regeneration		15.89	15.69	12.99	23.85	16.00	2.32	32.67	7.38	126.78	39.88%
4 Income Generation		5.56	6.62	7.10	4.37	12.56	20.31	6.14	9.11	71.77	22.57%
5 Human Resources Development	2.50	3.51	0.96	2.31	4.35	2.08	2.62	4.43	3.23	23.49	7.39%
6 Research and Development	3.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.67	3.00	0.94%
7 Education and Awareness		0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	5.33	1.68%
8 Monitoring	3.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.50	2.83	0.89%
9 Village support		3.39	0.60	2.60	0.79	1.23	0.00	0.35	1.50	10.47	3.29%
10 Miscellaneous and unforeseen expenses	1.00	1.76	2.03	1.71	2.04	1.88	1.62	2.76	1.43	15.22	4.79%
Total	11.67	36.96	40.63	35.81	42.82	39.43	34.10	56.17	29.99	317.90	100.00%

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	500.00	10	20	40			70	5.00	10.00	20.00			35.00	35.00	0.95%
2. Management															516.80	13.98%
2.1 Personnel																
Wage labour	Person days	1.33	30000	30000	20000	15000	5000	100000	40.00	40.00	26.67	20.00	6.67	133.33		
Support staff																
Project Officer (DFO)	Person/year	3333.33	1	1	1	1	1	5	3.33	3.33	3.33	3.33	3.33	16.67		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Roads	Kms	333.33	20	20	20			60	6.67	6.67	6.67			20.00		
2.3 Vehicles	Nos	10000.00	1					1	10.00					10.00		
2.4 Equipment																
Computers	Nos	3333.33	1					1	3.33					3.33		
Inflatable boats	Nos	5000.00	2					2	10.00					10.00		
Solar lantern	Nos	100.00	60	60	60			180	6.00	6.00	6.00			18.00		
Crop protection equipment																
Search lights and battery	Nos	200.00	10	20	20	10		60	2.00	4.00	4.00	2.00		12.00		
Battery charger	Nos	666.67	5	5				10	3.33	3.33				6.67		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.5 Crop Protection Measures																
Electric fence	Km	300.00	10	20	30			60	3.00	6.00	9.00			18.00		
Crop Watcher	Person days	1.33	500	400	400	200	100	1600	0.67	0.53	0.53	0.27	0.13	2.13		
Crop compensation	Actuals					-			23.33	23.33	16.67	10.00	3.33	76.67		
2.6 Tourism																
Visitor Centre	Nos	20000.00	1	1				2	20.00	20.00				40.00		
Furniture	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
Seed money	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
2.7 Maintenance and Operation	Actuals								6.67	16.67	16.67	6.67	3.33	50.00		
2.8 Compensation for human deaths/injury	Actuals								1.67	1.67	1.67	1.67	1.67	8.33		
2.9 Elephants for patrolling	Nos	5000.00	1	1				2	5.00	5.00				10.00		
3. Environment Conservation and Regeneration															1588.83	42.99%
3.1 Fuelwood Plantation	Ha	333.33	100	300	600	200		1200	33.33	100.00	200.00	66.67		400.00		
3.2 Fodder development	Ha	250.00	100	200	350	180		830	25.00	50.00	87.50	45.00		207.50		
3.3 Soil and Water Conservation																
Bunding	Km	3333.33	5	15	15	10	5	50	16.67	50.00	50.00	33.33	16.67	166.67		
Gully Plugging	Km	3333.33	5	15	15	10	5	50	16.67	50.00	50.00	33.33	16.67	166.67		
Slip treatment	Km	13333.33	5	5				10	66.67	66.67				133.33		
Check Dam	Nos	666.67	20	35	35	25	10	125	13.33	23.33	23.33	16.67	6.67	83.33		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.4 Land Improvement	Ha	166.67	50	150	150	100	50	500	8.33	25.00	25.00	16.67	8.33	83.33		
3.5 Regeneration of forest land	Ha	166.67	30	130	130	80	30	400	5.00	21.67	21.67	13.33	5.00	66.67		
3.6 Joint Forest Management	Ha	166.67	50	100	100	50		300	8.33	16.67	16.67	8.33	0.00	50.00		
3.7 Nurseries	Plant	0.07	215000	625000	1225000	420000	25000	2510000	14.33	41.67	81.67	28.00	1.67	167.33		
3.8 Energy Conservation																
Smokeless Chullah	Nos	5.00	2000	3000	3000	2000		10000	10.00	15.00	15.00	10.00		50.00		
Biogas plant	Nos	200.00	20	30	20			70	4.00	6.00	4.00			14.00		
4. Income Generation															555.67	15.04%
4.1 Duckery	Unit/11 birds	166.67	25	100	100	50	25	300	4.17	16.67	16.67	8.33	4.17	50.00		
4.2 Pig rearing	Unit/5 pigs	233.33	20	100	100	20		240	4.67	23.33	23.33	4.67		56.00		
4.3 Poultry	Unit/250 birds	216.67	20	30	30	20		100	4.33	6.50	6.50	4.33		21.67		
4.4 Apiculture	Unit	166.67	50	150	150	100	50	500	8.33	25.00	25.00	16.67	8.33	83.33		
4.5 Mushroom cultivation	Unit	200.00	10	50	50	10		120	2.00	10.00	10.00	2.00		24.00		
4.6 Handicrafts [handloom & cane work]	Family	200.00	30	100	100	40		270	6.00	20.00	20.00	8.00		54.00		
4.7 Upgradation of cattle	Family	166.67	200	300	300	200		1000	33.33	50.00	50.00	33.33		166.67		
4.8 Marketing Infrastructure									1.67	5.00	6.67	1.67	1.67	16.67		
4.9 Unspecified Exodevelopment									8.33	25.00	33.33	8.33	8.33	83.33		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5. Human Resources Development															350.50	9.48%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	75	75	25		200	0.83	2.50	2.50	0.83		6.67		
# Trainer	Month	50.00	1	3	3	1		8	0.05	0.15	0.15	0.05		0.40		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	75	125	125	100		425	2.50	4.17	4.17	3.33		14.17		
# Trainer	Month	50.00	3	5	5	4		17	0.15	0.25	0.25	0.20		0.85		
5.3 Duckery (1 month)																
# Stipend	Person	33.33	100	200	200	100		600	3.33	6.67	6.67	3.33		20.00		
# Trainer	Month	50.00	4	8	8	4		24	0.20	0.40	0.40	0.20		1.20		
5.4 Apiculture (1 month)																
# Stipend	Person	33.33	150	300	450	100		1000	5.00	10.00	15.00	3.33		33.33		
# Trainer	Month	50.00	6	12	18	4		40	0.30	0.60	0.90	0.20		2.00		
5.5 Mushroom cultivation (1 month)																
# Stipend	Person	33.33	50	100	100			250	1.67	3.33	3.33			8.33		
# Trainer	Month	50.00	2	4	4			10	0.10	0.20	0.20			0.50		
5.6 Handicrafts (1 month)																
# Stipend	Person	33.33	100	150	200	125		575	3.33	5.00	6.67	4.17		19.17		
# Trainer	Month	50.00	4	6	8	5		23	0.20	0.30	0.40	0.25		1.15		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.7 Tourist guide (3 months)																
# Stipend	Person	33.33	150					150	5.00					5.00		
# Trainer	Month	50.00	3					3	0.15					0.15		
5.8 Health care training (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.9 Training for adult education (1 month)																
# Stipend	Person	33.33	25	50				75	0.83	1.67				2.50		
# Trainer	Month	50.00	1	2				3	0.05	0.10				0.15		
# Tool kit	Kit	10.00	25	50				75	0.25	0.50				0.75		
5.10 Training for bogas repair (1 month)																
# Stipend	Person	33.33	25					25	0.83					0.83		
# Trainer	Month	50.00	1					1	0.05					0.05		
# Tool kit	Kit	10.00	25					25	0.25					0.25		
5.11 Integrated pest management and biofertilisers (1 month)																
# Stipend	Person	33.33	500	1000	800	200		2500	16.67	33.33	26.67	6.67		83.33		
# Trainer	Month	50.00	20	40	32	8		100	1.00	2.00	1.60	0.40		5.00		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.12 PA Management for Staff (3 months)	Course	2500.00	2	2	1	1	1	7	5.00	5.00	2.50	2.50	2.50	17.50		
5.13 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	50	50	50	25	200	0.83	1.67	1.67	1.67	0.83	6.67		
# Trainer	Month	50.00	1	2	2	2	1	8	0.05	0.10	0.10	0.10	0.05	0.40		
5.14 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.15 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.16 General Training Costs	10%								6.98	11.63	9.44	3.43	0.34	31.82		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.90%
7. Education and Awareness									6.67	16.67	16.67	16.67	10.00	66.67	66.67	1.80%
8. Monitoring									3.33	10.00	10.00	5.00	5.00	33.33	33.33	0.90%
9. Village support															339.33	9.18%
9.1 Drinking Water																
Ring Well	Nos	333.33	50	50				100	16.67	16.67				33.33		
Tube Well	Nos	166.67	50	50	50			150	8.33	8.33	8.33			25.00		
Pipeline construction	Kms	1666.67		5	5	5		15		8.33	8.33	8.33		25.00		

BUXA TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
9.2 Roads for Villages	Kms	333.33	5	5	5			15	1.67	1.67	1.67			5.00		
9.3 Health and family welfare camps	Actuals								6.67	6.67	6.67	6.67	6.67	33.33		
9.4 Adult education																
Remuneration	Person	20.00	60	60	60	60	60	300	1.20	1.20	1.20	1.20	1.20	6.00		
Material	Actuals								0.67	0.67	0.67	0.67	0.67	3.33		
9.5 Irrigation facilities																
Ponds	Nos	2000.00	5	10	10			25	10.00	20.00	20.00			50.00		
Dugwell	Nos	500.00	10	20	20			50	5.00	10.00	10.00			25.00		
Janpoi [Water channels]	Kms	6666.67	5	10	5			20	33.33	66.67	33.33			133.33		
10. Miscellaneous and unforeseen expenses	5%								31.98	56.01	56.06	24.93	6.98	175.95	175.95	4.76%
Total									671.49	1176.17	1177.26	523.46	146.54	3695.42	3695.42	100.00%
									18.17%	31.83%	31.86%	14.17%	3.97%	100.00%		

Project Area (Radius in kms)	5
Number of villages	35
Average population per village	2726
Total population in Project Area	95000
Total number of households in Project Area	18000
Forest land in Project Area (Ha.)	415
Wasteland in Project Area (Ha.)	2100
Annual Total Investment per Household (in US\$)	41.06
Annual Ecodevelopment Investment per Household (in US\$)	35.32

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1 Planning	Village	500.00	25	45	26			96	12.50	22.50	13.00			48.00	64.67	1.59%
# Water use planning										3.33	10.00	3.33		16.67		
2. Management															1274.33	31.37%
2.1 Personnel																
Wage labour	Person days	1.33	50000	80000	30000	20000	10000	190000	66.67	106.67	40.00	26.67	13.33	253.33		
Support staff																
Project Officer (DFO)	Person/year	3333.33	1	1	1	1	1	5	3.33	3.33	3.33	3.33	3.33	16.67		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Vehicles																
Jeep	Nos	6666.67	1	1				2	6.67	6.67				13.33		
Motorcycle	Nos	666.67	2	2				4	1.33	1.33				2.67		
Battery vans	Nos	16666.67	2	2				4	33.33	33.33				66.67		

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.3 Equipment																
Computer	Nos	3333.33	1					1	3.33					3.33		
Slide projector	Nos	1666.67	1	1				2	1.67	1.67				3.33		
Pumpset	Nos	583.33	20	10	10			40	11.67	5.83	5.83			23.33		
2.4 Crop Protection Measures																
Green fence	Km	166.67	40	40	20			100	6.67	6.67	3.33			16.67		
Electric fence	Km	1833.33	20	20	10	0	0	50	36.67	36.67	18.33			91.67		
Trenches	Km	16666.67	2	3	3	2		10	33.33	50.00	50.00	33.33		166.67		
Crop watchers	Person days	1.33	3000	3000	2000	1000	1000	10000	4.00	4.00	2.67	1.33	1.33	13.33		
Crop insurance									13.33	10.00	6.67	3.33		33.33		
2.5 Fire Lines	Person days	1.33	1500	1500	1000	500	500	5000	2.00	2.00	1.33	0.67	0.67	6.67		
2.6 Construction of Watch Towers	Nos	1666.67	5	5	5			15	8.33	8.33	8.33			25.00		
2.7 livestock compensation									16.67	16.67	10.00	6.67	6.67	56.67		
2.8 Tourism																
Visitor Centre	Nos	20000.00		1	1			2		20.00	20.00			40.00		
Furniture	Per centre	4166.67		1	1			2		4.17	4.17			8.33		
Seed money	Per centre	4166.67		1	1			2		4.17	4.17			8.33		

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.9 Maintenance and Operation									6.67	10.00	10.00	6.67	3.33	36.67		
2.10 Others																
Translocation of lions											33.33	33.33	33.33	100.00		
Cattle immunisation	Per cattle	0.13	45000	45000	45000	45000	45000	225000	6.00	6.00	6.00	6.00	6.00	30.00		
Water tank for cattle	Nos	666.67	20	20	10			50	13.33	13.33	6.67			33.33		
Cattle protection measures	Village	1666.67	30	40	25			95	50.00	66.67	43.33			160.00		
3. Environment Conservation and Regeneration															1569.00	38.62%
3.1 Fuelwood plantation	Ha	266.67	100	150	150	50		450	26.67	40.00	40.00	13.33		120.00		
3.2 Fodder development	Ha	250.00	250	250	100	100		700	62.50	62.50	25.00	25.00		175.00		
3.3 Soil and Water Conservation																
Check Dam	Nos	666.67	30	45	45	30		150	30.00	30.00	30.00	20.00		100.00		
Percolation tanks	Nos	833.33	40	60	60	40		200	33.33	50.00	50.00	33.33		166.67		
Gully Plugging	cu.mt.	1.67	18000	20000	20000	5000		63000	30.00	33.33	33.33	8.33		105.00		
Desiltation	cu.mt.	0.40	10000	20000	20000	5000		55000	4.00	8.00	8.00	2.00		22.00		
Village tanks	Nos	133.33	20	40	30	10		100	2.67	5.33	4.00	1.33		13.33		

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.4 Energy Conservation																
Biogas plants	Plant	200.00	500	1500	1500	500		4000	100.00	300.00	300.00	100.00		800.00		
Solar cookers	Nos	20.00	10	40	40	10		100	0.20	0.80	0.80	0.20		2.00		
Windmills	Nos	666.67	10	10				20	6.67	6.67				13.33		
Smokeless chulias	Nos	5.00	750	1750	1750	750		5000	3.75	8.75	8.75	3.75		25.00		
Fuel efficient funeral pyres	Nos	833.33	10	10	12			32	8.33	8.33	10.00			26.67		
4. Income Generation															662.00	16.29%
4.1 Poultry	Unit/250 birds	216.67	20	30	30	20		100	4.33	6.50	6.50	4.33		21.67		
4.2 Apiculture	Unit	166.67	20	30	30	20		100	3.33	5.00	5.00	3.33		16.67		
4.3 Horticulture	Ha	100.00	100	150	150	100		500	10.00	15.00	15.00	10.00		50.00		
4.4 Handicrafts	Family	33.33	10	15	15	10		50	0.33	0.50	0.50	0.33		1.67		
4.5 Stitching	Person/machine	33.33	5	15	15	5		40	0.17	0.50	0.50	0.17		1.33		
4.6 Diamond cutting	Family	50.00	5	15	15	5		40	0.25	0.75	0.75	0.25		2.00		
4.7 Papad making	Family	50.00	5	15	15	5		40	0.25	0.75	0.75	0.25		2.00		
4.8 Medicinal plants/Edible species cultivation	Ha	666.67	5	15	20	10		50	3.33	10.00	13.33	6.67		33.33		
4.9 Upgradation of cattle	Family	166.67	200	500	500	500	300	2000	33.33	83.33	83.33	83.33	50.00	333.33		
4.10 Marketing Infrastructure										3.33	6.67	6.67		16.67		
4.11 Unspecified									33.33	50.00	50.00	33.33	16.67	183.33		

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5. Human Resources Development															96.27	2.37%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.2 Apiculture (1 month)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.3 Horticulture (1 month)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.4 Handicrafts (3 month)																
# Stipend	Person	33.33	75	75				150	2.50	2.50				5.00		
# Trainer	Month	50.00	3	3				6	0.15	0.15				0.30		
5.5 Tailoring (3 months)																
# Stipend	Person	33.33	75	75				150	2.50	2.50				5.00		
# Trainer	Month	50.00	3	3				6	0.15	0.15				0.30		
5.6 Diamond cutting (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		

GIR NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.7 Papad making (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.8 Training for biogas repair (15 days)																
# Stipend	Person	16.67	25					25	0.42					0.42		
# Trainer	Month	25.00	1					1	0.03					0.03		
# Tool kit	Kit	10.00	25					25	0.25					0.25		
5.9 PA Management for Staff (3 months)	Course	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
5.10 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	50	50	25	25	175	0.83	1.67	1.67	0.83	0.83	5.83		
# Trainer	Month	50.00	1	2	2	1	1	7	0.05	0.10	0.10	0.05	0.05	0.35		
5.11 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.12 Tourist Guides (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		

GTR NATIONAL PARK																
HEADS/UBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.13 Use of integrated pest management and biofertilisers (1 month)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.14 Unspecified																
# Stipend	Person	33.33														
# Trainer	Month	50.00														
5.15 General Training Costs	10%								2.30	2.71	2.91	1.05	0.65	9.63		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.82%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.64%
8. Monitoring										3.33	10.00	3.33	16.67	33.33	33.33	0.82%
9. Village support															60.00	1.48%
9.1 Drinking Water	Source	1666.67	10	10				20	16.67	16.67				33.33		
9.2 Roads for Villages	Kms	333.33	20	30	20	10		80	6.67	10.00	6.67	3.33		26.67		
10 Miscellaneous and Unforeseen Expenses	5%								42.30	66.82	56.75	27.76	9.52	203.14	203.14	5.00%
Total									845.92	1336.35	1134.91	555.17	190.39	4062.74	4062.74	100.00%
									20.82%	32.89%	27.93%	13.66%	4.69%	100.00%		

Project Area (radius in Kms)	6
Total number of villages	97
Average population per village	1365
Total population in project area	131087
Total number of households in project area	20052
Total forest land in project area (Ha.)	17771
Total wastelands in project area (Ha.)	17542
Annual Total Investment per Household (in US\$)	40.51
Annual Ecodevelopment Investment per Household (in US\$)	27.80

NAGARTHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1 Planning	Village	500.00	25	50	25			100	12.50	25.00	12.50			50.00	50.00	1.40%
2. Management															726.50	20.29%
2.1 Personnel																
Wage labour	Person days	1.33	60000	60000	40000	30000	10000	200000	80.00	80.00	53.33	40.00	13.33	266.67		
Support staff																
Project Officer (DFO)	Person/year	266.67	12	12	12	12	12	60	3.20	3.20	3.20	3.20	3.20	16.00		
Range Officer	Person/year	166.67	24	24	24	24	24	120	4.00	4.00	4.00	4.00	4.00	20.00		
Other	Person/year	116.67	36	36	36	36	36	180	4.20	4.20	4.20	4.20	4.20	21.00		
2.2 Anti-poaching camp sites	Nos	833.33	3	8	3			14	2.50	6.67	2.50			11.67		
2.3 Vehicles	Nos	10000.00	1	1				2	10.00	10.00				20.00		
2.4 Equipment	Nos								6.67	6.67	3.33			16.67		
2.5 Crop Protection Measures																
Green fence	Kms	166.67														
Elephant Proof Trench	Kms	5000.00	10	10	10			30	50.00	50.00	50.00			150.00		
Wall	Metre	6.67														
Electric fence	Kn	1833.33														
Crop watchers	Person days	1.33	3000	3000	2000	1000	1000	10000	4.00	4.00	2.67	1.33	1.33	13.33		
Crop compensation	Actuals								16.67	13.33	10.00	3.33		43.33		
Crop insurance	Actuals								13.33	10.00	6.67	3.33		33.33		
2.6 Fire Lines	Person days	1.33	3000	3000	2000	1000		9000	4.00	4.00	2.67	1.33		12.00		

NAGARHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.7 Fire Watch Towers	Nos	1666.67	8	8				16	13.33	13.33				26.67		
2.8 Tourism																
Visitor Centre	Nos	20000.00		1		1		2		20.00		20.00		40.00		
Furniture	Per centre	4166.67		1		1		2		4.17		4.17		8.33		
Seed money	Per centre	4166.67		1		1		2		4.17		4.17		8.33		
2.9 Maintenance and Operation	Actuals								3.33	6.67	4.17	3.33	1.67	19.17		
3. Environment Conservation and Regeneration															1299.33	36.29%
3.1 Fuelwood Plantation	Ha	266.67	200	300	300	200		1000	53.33	80.00	80.00	53.33		266.67		
3.2 Fodder Development	Ha	250.00	100	200	200	100	100	700	25.00	50.00	50.00	25.00	25.00	175.00		
3.3 Soil and Water Conservation																
Wells	Nos	1000.00														
Check Dam	Nos	666.67	10	10	10	10		40	6.67	6.67	6.67	6.67		26.67		
Bunding	Km	3333.33	5	10	10			25	16.67	33.33	33.33			83.33		
Gully Plugging	cu.mt.	1.67	2000	5000	5000	3000		15000	3.33	8.33	8.33	5.00		25.00		
3.5 Land Improvement	Ha	166.67	50	200	200	150	100	700	8.33	33.33	33.33	25.00	16.67	116.67		
3.6 Regeneration of forest land	Ha	166.67	200	300	500	500	200	1700	33.33	50.00	83.33	83.33	33.33	283.33		
3.7 Nurseries	Plant	0.07	500000	750000	850000	650000	50000	2800000	33.33	50.00	56.67	43.33	3.33	186.67		
3.8 Joint Forest Management	Ha.	100.00	50	50	50	25	10	185	5.00	5.00	5.00	2.50	1.00	18.50		

NAGARHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.9 Energy Conservation																
Biogas plants	Plant	200.00	20	40	40			100	4.00	8.00	8.00			20.00		
Solar Cooker	Nos	20.00	100	300	500	500	100	1500	2.00	6.00	10.00	10.00	2.00	30.00		
Smokeless chullahas	Nos	5.00	500	2000	5000	5000	1000	13500	2.50	10.00	25.00	25.00	5.00	67.50		
4 Income Generation															710.33	19.84%
4.1 Poultry	Unit/250 birds	216.67	20	30	30	20		100	4.33	6.50	6.50	4.33		21.67		
4.2 Pig rearing	Unit/5 pigs	233.33	20	30	30	20		100	4.67	7.00	7.00	4.67		23.33		
4.3 Improving cattle breed	Unit/family	166.67	100	200	500	500		1300	16.67	33.33	83.33	83.33		216.67		
4.4 Apiculture	Box	33.33	20	30	50			100	0.67	1.00	1.67			3.33		
4.5 Horticulture	Ha	100.00	25	50	75	50		200	2.50	5.00	7.50	5.00		20.00		
4.7 Handicrafts	Family	166.67	10	30	30	30		100	1.67	5.00	5.00	5.00		16.67		
4.8 Pisciculture	Per unit	166.67	25	50	25			100	4.17	8.33	4.17	0.00		16.67		
4.9 Cultivation of medicinal/edible plants	Ha	666.67	15	30	30	25		100	10.00	20.00	20.00	16.67		66.67		
4.9 Tailoring	Person/machine	50.00	10	50	50	30		140	0.50	2.50	2.50	1.50		7.00		
4.10 Iron Smithy	Tool kit	250.00	10	15	15	10		50	2.50	3.75	3.75	2.50		12.50		
4.11 Carpentry																
Tools	Toolkit	116.67	10	15	15	10		50	1.17	1.75	1.75	1.17		5.83		
4.12 Marketing Infrastructure									1.67	3.33	3.33	5.00	3.33	16.67		
4.13 Unspecified Income generation									66.67	100.00	66.67	33.33	16.67	283.33		

NAGARHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5. Human Resources Development															230.76	6.44%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	50	50			125	0.83	1.67	1.67			4.17		
# Trainer	Month	50.00	1	2	2			5	0.05	0.10	0.10			0.25		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	25	50	50			125	0.83	1.67	1.67			4.17		
# Trainer	Month	50.00	1	2	2			5	0.05	0.10	0.10			0.25		
5.3 Integrated Pest Management and Biofertilizer (1 month)																
# Stipend	Person	33.33	100	250	250	200		800	3.33	8.33	8.33	6.67		26.67		
# Trainer	Month	50.00	4	10	10	8		32	0.20	0.50	0.50	0.40		1.60		
5.4 Tourist guide (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.6 Horticulture (1 month)																
# Stipend	Person	33.33	25	50	100	50		225	0.83	1.67	3.33	1.67		7.50		
# Trainer	Month	50.00	1	2	4	2		9	0.05	0.10	0.20	0.10		0.45		

NAGRIHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.7 Handicrafts (3 months)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.8 Pisciculture (1 month)																
# Stipend	Person	33.33	25	25	25	25		100	0.83	0.83	0.83	0.83		3.33		
# Trainer	Month	50.00	4	4	4	4		16	0.20	0.20	0.20	0.20		0.80		
5.9 Tailoring (3 months)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.10 Iron Smithy (3 months)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.11 Carpentry (3 months)																
# Stipend	Person	33.33	75	75				150	2.50	2.50				5.00		
# Trainer	Month	50.00	3	3				6	0.15	0.15				0.30		
5.12 PA Management for staff (3 months)	Course	2500.00	2	2	1	1	1	7	5.00	5.00	2.50	2.50	2.50	17.50		

NAGARIHOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.13 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	25	25	25	25	125	0.83	0.83	0.83	0.83	0.83	4.17		
# Trainer	Month	50.00	1	1	1	1	1	5	0.05	0.05	0.05	0.05	0.05	0.25		
5.14 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.15 Unspecified																
# Stipend	Person	33.33	500	1000	1000	500		3000	16.67	33.33	33.33	16.67		100.00		
# Trainer	Month	50.00	20	40	40	20		120	1.00	2.00	2.00	1.00		6.00		
5.16 General Training Costs	10%								3.96	6.70	6.71	3.27	0.34	20.98		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.93%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.86%
8. Monitoring										3.33	10.00	3.33	16.67	33.33	33.33	0.93%

NAGARTIOLE NATIONAL PARK																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
9. Village support															260.00	7.26%
9.1 Drinking Water	Source	1666.67	20	30	40	10		100	33.33	50.00	66.67	16.67		166.67		
9.2 Supplementing Health Facilities									6.67	10.00	16.67			33.33		
9.3 Irrigation facilities									13.33	16.67	16.67	13.33		60.00		
10 Miscellaneous & Unforeseen	5%								32.76	49.40	49.13	31.00	8.22	170.51	170.51	4.76%
Total									688.06	1037.31	1031.71	651.02	172.68	3580.77	3580.77	100.00%
									19.22%	28.97%	28.81%	18.18%	4.82%	100.00%		

Project Area (Radius in kms)	5
Number of villages	100
Average population per village	984
Total population in Project Area	98400
Total number of households in Project Area	22800
Forest land in Project Area (Ha.)	24800
Wasteland in Project Area (Ha.)	15260
Annual Total Investment per Household (in US\$)	31.41
Annual Ecodevelopment Investment per Household (in US\$)	25.04

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	333.33	90	100	28			178	16.67	33.33	9.33			59.33	59.33	1.39%
2. Management															549.50	12.83%
2.1 Personnel																
Wage labour	Person days	1.33	30000	30000	20000	15000	5000	100000	40.00	40.00	26.67	20.00	6.67	133.33		
Support staff																
Project Officer (DFO)	Person/year	3333.33	1	1	1	1	1	5	3.33	3.33	3.33	3.33	3.33	16.67		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Vehicles	Nos	10000.00	1	1				2	10.00	10.00				20.00		
2.3 Equipment	Actuals								3.33	6.67	3.33	3.33		16.67		
2.4 Crop Protection Measures																
Green fence	Kms	166.67	5	10	10	5		30	0.83	1.67	1.67	0.83		5.00		
Elephant proof trench	Kms	1666.67	5	5				10	8.33	8.33				16.67		
Electric fence	Km	833.33	10	20	15	5		50	8.33	16.67	12.50	4.17		41.67		
Crop watchers	Person day	1.33	3000	3000	2000	1000	1000	10000	4.00	4.00	2.67	1.33	1.33	13.33		
Crop compensation	Actuals								25.00	25.00	16.67	10.00	3.33	80.00		
2.5 Fire Lines	Person days	1.33	3000	3000	2000	1000		9000	4.00	4.00	2.67	1.33		12.00		
2.6 livestock compensation	Actuals								20.00	13.33	13.33	3.33		50.00		

PALAMAU HIGER RESERVE																
HEAD'SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
7 Tourism																
Visitor Centre	Nos	20000.00	1	1				2	20.00	20.00				40.00		
Furniture	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
Seed money	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
2.8 Maintenance and Operation	Actuals								1.67	3.33	4.17	3.33	1.67	14.17		
2.9 Compensation for human death injury	Actuals								1.67	1.67	1.67	1.67	1.67	8.33		
Environment Conservation and Regeneration															2384.93	55.70%
3.1 Fuelwood plantation	Ha	266.67	200	500	500	200	100	1500	53.33	133.33	133.33	53.33	26.67	400.00		
3.2 Fodder development	Ha	250.00	200	500	500	200	100	1500	50.00	125.00	125.00	50.00	25.00	375.00		
3.3 Soil and Water Conservation																
Wells	Nos	1000.00	30	35	35	20	10	130	30.00	35.00	35.00	20.00	10.00	130.00		
Check Dam	Nos	666.67	30	45	45	20	10	150	20.00	30.00	30.00	13.33	6.67	100.00		
Tank	Nos	833.33	20	30	30	10	10	100	16.67	25.00	25.00	8.33	8.33	83.33		
Bunding	Km	3333.33	5	10	10			25	16.67	33.33	33.33			83.33		
Gully Plugging	Km	3333.33	5	10	10			25	16.67	33.33	33.33			83.33		
Allicus	Nos	833.33	20	30	30	10	10	100	16.67	25.00	25.00	8.33	8.33	83.33		
3.5 Land Improvement	Ha	166.67	30	90	90	60	30	300	5.00	15.00	15.00	10.00	5.00	50.00		
3.6 Regeneration of forest land	Ha	166.67	200	300	500	300	200	1500	33.33	50.00	83.33	50.00	33.33	250.00		
3.7 Nurseries	Plant	0.07	500000	1075000	1125000	475000	250000	3425000	33.33	71.67	75.00	31.67	16.67	238.33		
3.8 Joint Forest Management	Ha	166.67	25	100	100	100	25	350	4.17	16.67	16.67	16.67	4.17	58.33		

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.9 Multi Tier Cropping (chakriya vikas pranali)	Village	3333.33	15	30	30	20	5	100	50.00	100.00	100.00	66.67	16.67	333.33		
3.10 Energy Conservation																
Biogas plants	Nos	200.00	25	50	75	28		178	5.00	10.00	15.00	5.60		35.60		
Smokeless Chullah	Nos	5.00	2000	5000	5000	1000		13000	10.00	25.00	25.00	5.00		65.00		
Solar Cooker	Nos	20.00	200	500	500	100		1300	4.00	10.00	10.00	2.00		26.00		
4. Income Generation															436.67	10.20%
4.1 Poultry	Unit/250 birds	216.67	25	25	25	25		100	5.42	5.42	5.42	5.42		21.67		
4.2 Pig rearing	Unit/5 pigs	233.33	10	30	30	20	10	100	2.33	7.00	7.00	4.67	2.33	23.33		
4.3 Upgradation of cattle breed	Unit/family	166.67	100	250	500	150		1000	16.67	41.67	83.33	25.00		166.67		
4.4 Apiculture	Unit	166.67	25	25	25	25		100	4.17	4.17	4.17	4.17		16.67		
4.5 Lac Culture	Unit/family	16.67	20	50	50	50	30	200	0.33	0.83	0.83	0.83	0.50	3.33		
4.6 Horticulture	Ha	100.00	50	100	100	50		300	5.00	10.00	10.00	5.00		30.00		
4.7 Handicrafts	Family	166.67	10	30	30	20	10	100	1.67	5.00	5.00	3.33	1.67	16.67		
4.8 Tailoring	Person/machine	50.00	10	30	30	20	10	100	0.50	1.50	1.50	1.00	0.50	5.00		
4.9 Iron Smithy	Tool kit	250.00	5	15	10	5	5	40	1.25	3.75	2.50	1.25	1.25	10.00		
4.10 Carpentry																
Tools	Toolkit	116.67	2	5	5	4	4	20	0.23	0.58	0.58	0.47	0.47	2.33		
Workshop	Sq. ft.	25.00	20	20				40	0.50	0.50				1.00		

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
4.11 Medicinal/edible plant cultivation	Ha	666.67	5	10	10	10		35	3.33	6.67	6.67	6.67		23.33		
4.12 Marketing Infrastructure									6.67	10.00	10.00	5.00	1.67	33.33		
4.13 Unspecified ecodevelopment									8.33	25.00	33.33	8.33	8.33	83.33		
5 Human Resources Development															434.92	10.16%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	50	50	50		175	0.83	1.67	1.67	1.67		5.83		
# Trainer	Month	50.00	1	2	2	2		7	0.05	0.10	0.10	0.10		0.35		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	25	50	50	25		150	0.83	1.67	1.67	0.83		5.00		
# Trainer	Month	50.00	1	2	2	1		6	0.05	0.10	0.10	0.05		0.30		
5.3 Use of integrated pest management and biofertilisers (1 month)																
# Stipend	Person	33.33	100	150	250	250	150	900	3.33	5.00	8.33	8.33		30.00		
# Trainer	Month	50.00	4	6	10	10	6	36	0.20	0.30	0.50	0.50		1.80		
5.4 Apiculture (1 month)																
# Stipend	Person	33.33	100	400	400	100		1000	3.33	13.33	13.33	3.33		33.33		
# Trainer	Month	50.00	6	20	15	4		45	0.30	1.00	0.75	0.20		2.25		
5.5 Lac Culture (1 month)																
# Stipend	Person	33.33	75	150	150	75		450	2.50	5.00	5.00	2.50		15.00		
# Trainer	Month	50.00	3	6	6	3		18	0.15	0.30	0.30	0.15		0.90		

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.6 Multi tier cropping (Chakriya Vikas Pranali (3 months)																
# Stipend	Person	33.33	150	300	750	300	150	1650	5.00	10.00	25.00	10.00	5.00	55.00		
# Trainer	Month	50.00	6	12	30	12	6	66	0.30	0.60	1.50	0.60	0.30	3.30		
5.7 Handicrafts (1 months)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.8 Tourist guide (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.9 Tailoring (3 months)																
# Stipend	Person	33.33	75	75	150			300	2.50	2.50	5.00			10.00		
# Trainer	Month	50.00	3	3	6			12	0.15	0.15	0.30			0.60		
5.10 Iron Smithy (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.11 Carpentry (3 months)																
# Stipend	Person	33.33	75					75	2.50					2.50		
# Trainer	Month	50.00	3					3	0.15					0.15		

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.12 Health care training (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.13 Training for adult education (1 month)																
# Stipend	Person	33.33	25	50	100			175	0.83	1.67	3.33			5.83		
# Trainer	Month	50.00	1	2	4			7	0.05	0.10	0.20			0.35		
5.14 Training for handpump repair (1 month)																
# Stipend	Person	33.33	25					25	0.83					0.83		
# Trainer	Month	50.00	1					1	0.05					0.05		
# Tool kit	Kit	10.00	25					25	0.25					0.25		
5.15 Training for biogas repair (1 month)																
# Stipend	Person	33.33	25					25	0.83					0.83		
# Trainer	Month	50.00	1					1	0.05					0.05		
# Tool kit	Kit	10.00	25					25	0.25					0.25		
5.16 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.17 PA Management for Staff (3 months)	Course	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		

PALAMAU TIGER RESERVE																
HEADS/UBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.18 PA Management for Community (1 month)																
# Stipend	Person month	33.33	25	50	50	50	25	200	0.83	1.67	1.67	1.67	0.83	6.67		
# Trainer	Person month	50.00	1	2	2	2	1	8	0.05	0.10	0.10	0.10	0.05	0.40		
5.19 PRA Training (1 months)																
# Stipend	Person month	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Person month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.20 Unspecified																
# Stipend	Person month	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Person month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.21 General Training Costs	10%								7.63	13.15	12.16	5.01	1.12	39.06		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.78%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.56%
8. Monitoring									3.33	10.00	10.00	5.00	5.00	33.33	33.33	0.78%
9. Village support															79.33	1.85%
9.1 Drinking Water																
Drinking Water Sources	Source	1000.00	5	10	10			25	5.00	10.00	10.00			25.00		
Decontamination	Actuals								0.33	0.33	0.33	0.33	0.33	1.67		
9.2 Roads for Villages	Kms	333.33	5	10	10	5		30	1.67	3.33	3.33	1.67		10.00		

PALAMAU TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
9.3 Health and family welfare camps	Actuals								6.67	6.67	6.67	6.67	6.67	33.33		
9.4 Adult education																
Remuneration	Person	20.00	60	60	60	60	60	300	1.20	1.20	1.20	1.20	1.20	6.00		
Material	Actuals								0.67	0.67	0.67	0.67	0.67	3.33		
10. Miscellaneous	5%								36.62	63.83	62.70	28.25	12.24	203.64	203.64	4.76%
Total									769.12	1340.45	1316.60	593.24	236.95	4281.66	4281.66	100.00%
									17.96%	31.31%	30.75%	13.86%	6.00%	100.00%		

Project Area (Radius in kms)	5
Number of villages	178
Average population per village	445
Total population in Project Area	79243
Total number of households in Project Area	12953
Forest land in Project Area (Ha.)	48255
Wasteland in Project Area (Ha.)	4347
Annual Total Investment per Household (in US\$)	66.11
Annual Ecodevelopment Investment per Household (in US\$)	57.63

PENCH TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	333.33	50	100	33			183	16.67	33.33	11.00			61.00	69.33	1.76%
1.1 Water use planning									1.67	3.33	3.33			8.33		
2. Management															365.33	9.27%
2.1 Personnel																
Wage labour	Person days	1.33	20000	30000	20000	10000	5000	85000	26.67	40.00	26.67	13.33	6.67	113.33		
Project Officer (DFO)	Person/year	266.67	12	12	12	12	12	60	3.20	3.20	3.20	3.20	3.20	16.00		
Range Officer	Person/year	166.67	24	24	24	24	24	120	4.00	4.00	4.00	4.00	4.00	20.00		
Other	Person/year	116.67	36	36	36	36	36	180	4.20	4.20	4.20	4.20	4.20	21.00		
2.2 Vehicles	Nos	10000.00	1	1				2	10.00	10.00				20.00		
2.3 Equipment	Nos								3.33	6.67	3.33			13.33		
2.4 Crop Protection Measures									0.00	0.00						
Green fence	Kms	166.67	15	15	10	5		45	2.50	2.50	1.67	0.83		7.50		
Wall	Metre	6.67	1000	1500	1000	500		4000	6.67	10.00	6.67	3.33		26.67		
Electric fence	Km	666.67	5	5	5			15	3.33	3.33	3.33			10.00		
Crop watchers	Person days	1.33	3000	3000	2000	1000	1000	10000	4.00	4.00	2.67	1.33	1.33	13.33		
Crop compensation	Actuals								3.33	3.33	0.50	1.67	0.83	9.67		
2.5 Fire Lines	Person days	1.33	3000	5000	3000	2000	1000	14000	4.00	6.67	4.00	2.67	1.33	18.67		
2.6 Watch Towers	Nos	1666.67	5	5	5	5		20	8.33	8.33	8.33	8.33		33.33		
2.7 Livestock compensation																

PENCH TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.8 Tourism																
Visitor Centre	Nos	20000.00		1				1		20.00				20.00		
Furniture	Per centre	4166.67		1				1		4.17				4.17		
Seed money	Per centre	4166.67		1				1		4.17				4.17		
2.9 Maintenance and Operation	Actuals								1.67	3.33	4.17	3.33	1.67	14.17		
3 Environment Conservation and Regeneration															1599.83	40.57%
3.1 Fuelwood Plantation	Ha	266.67	300	500	500	50		1350	80.00	133.33	133.33	13.33		360.00		
3.2 Fodder Development	Ha	250.00	200	500	500	300		1500	50.00	125.00	125.00	75.00		375.00		
3.3 Soil and Water Conservation																
Wells	Nos	1000.00	5	10	20	15		50	5.00	10.00	20.00	15.00		50.00		
Check Dams	Nos	666.67	10	15	15	10		50	6.67	10.00	10.00	6.67		33.33		
Tanks	Nos	833.33	10	15	20	5		50	8.33	12.50	16.67	4.17		41.67		
Bunding	Km	3333.33	2	2	2	1		7	6.67	6.67	6.67	3.33		23.33		
Gully Plugging	cu.mt.	1.67	10000	25000	50000	10000		95000	16.67	41.67	83.33	16.67		158.33		
3.4 Land Improvement	Ha	166.67	25	50	100	25		200	4.17	8.33	16.67	4.17		33.33		
3.5 Regeneration of forest land	Ha	166.67	200	400	500	300	100	1500	33.33	66.67	83.33	50.00	16.67	250.00		
3.6 Nurseries	Plant	0.07	650000	1200000	1250000	250000		3350000	43.33	80.00	83.33	16.67		223.33		
3.7 Joint Forest Management	Ha.	100.00	25	25	25	25	10	110	2.50	2.50	2.50	2.50	1.00	11.00		

PENCH TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.8 Energy Conservation																
Biogas plants	Plant	200.00	10	20	20			50	2.00	4.00	4.00			10.00		
Solar Cooker	Nos	20.00	50	100	200	50		400	1.00	2.00	4.00	1.00		8.00		
Smokeless chulha	Nos	5.00	500	1000	2000	1000		4500	2.50	5.00	10.00	5.00		22.50		
4. Income Generation															1255.83	31.85%
4.1 Poultry	Unit/250 birds	216.67	10	15	15	10		50	2.17	3.25	3.25	2.17		10.83		
4.2 Pig rearing	Unit/5 pigs	233.33	10	15	15	10		50	2.33	3.50	3.50	2.33		11.67		
4.3 Upgrading local cattle breed	Unit/family	166.67	500	1000	2000	1000		4500	83.33	166.67	333.33	166.67		750.00		
4.4 Apiculture	Unit	166.67	20	30	30	20		100	3.33	5.00	5.00	3.33		16.67		
4.5 Cultivation of NTFP species	Ha	666.67	25	50	50	25		150	16.67	33.33	33.33	16.67		100.00		
4.6 Horticulture	Ha	100.00	25	50	100	25		200	2.50	5.00	10.00	2.50		20.00		
4.7 Handicrafts	Family	166.67	10	25	50	15		100	1.67	4.17	8.33	2.50		16.67		
4.8 Pisciculture	Per tank	333.33	3	5	3	3		14	10.00	16.67	10.00	10.00		46.67		
4.9 Tailoring	Person/machine	50.00	10	20	20			50	0.50	1.00	1.00			2.50		
4.10 Iron Smithy	Tool kit	250.00	5	10	10			25	1.25	2.50	2.50			6.25		
4.11 Carpentry Tools	Toolkit	116.67	5	10	10			25	0.58	1.17	1.17			2.92		
4.12 Rope making	Unit	666.67	20	30	30	20		100	13.33	20.00	20.00	13.33		66.67		
4.13 Marketing Infrastructure									3.33	6.67	6.67	3.33	1.67	21.67		
4.14 Unspecified									33.33	50.00	50.00	33.33	16.67	183.33		

PENCH TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5. Human Resources Development															208.25	5.28%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1	1		4	0.05	0.05	0.05	0.05		0.20		
5.3 Use of Integrated Pest Management and biofertilizer (1 month)																
# Stipend	Person	33.33	50	100	100	50		300	1.67	3.33	3.33	1.67		10.00		
# Trainer	Month	50.00	2	4	4	2		12	0.10	0.20	0.20	0.10		0.60		
5.4 Apiculture (1 month)																
# Stipend	Person	33.33	25	75	75	25		200	0.83	2.50	2.50	0.83		6.67		
# Trainer	Month	50.00	1	3	3	2		9	0.05	0.15	0.15	0.10		0.45		
5.5 Horticulture (1 month)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.7 Handicrafts (3 months)																
# Stipend	Person	33.33	75	75	75	75		300	2.50	2.50	2.50	2.50		10.00		
# Trainer	Month	50.00	3	3	3	3		12	0.15	0.15	0.15	0.15		0.60		

PENCH TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
8. Pisciculture (1 month)																
# Stipend	Person	33.33	200	300	300	200		1000	6.67	10.00	10.00	6.67		33.33		
# Trainer	Month	50.00	8	12	12	8		40	0.40	0.60	0.60	0.40		2.00		
5.9 Rope making (3 months)																
# Stipend	Person	33.33	150	300	150			600	5.00	10.00	5.00			20.00		
# Trainer	Month	50.00	6	12	6			24	0.30	0.60	0.30			1.20		
5.10 PA Management for Staff (3 months)	Course	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
5.11 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	25	25	25	25	125	0.83	0.83	0.83	0.83	0.83	4.17		
# Trainer	Month	50.00	1	1	1	1	1	5	0.05	0.05	0.05	0.05	0.05	0.25		
5.12 PRA Training (1 months)																
# Stipend	Person	33.33	25	25				50	0.83	0.83				1.67		
# Trainer	Month	50.00	1	1				2	0.05	0.05				0.10		
5.13 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.14 General Training Costs	10%								0.45	0.76	0.54	0.26	0.06	2.06		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.85%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.69%
8. Monitoring										3.33	10.00	3.33	16.67	33.33	33.33	0.85%

PINCH FINDER RESERVE																
HEADS/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
9. Village support															123.33	3.13%
9.1 Drinking Water	Source	1000.00	10	15	20	5		50	10.00	15.00	20.00	5.00		50.00		
9.2 Roads for Villages	Kms	333.33	20	30	20	20	10	100	6.67	10.00	6.67	6.67	3.33	33.33		
9.3 Irrigation facilities									6.67	10.00	16.67	6.67		40.00		
10 Miscellaneous and unforeseen expenses	5%								31.43	57.13	65.41	29.04	4.76	187.76	187.76	4.76%
Total									660.03	1199.70	1373.51	609.84	99.93	3943.01	3943.01	100.00%
									16.74%	30.43%	34.83%	15.47%	2.53%	100.00%		

Project Area (Radius in kms)	10
Number of villages	183
Average population per village	398
Total population in Project Area	73012
Total number of households in Project Area	12877
Forest land in Project Area (Ha.)	14628
Non-forest land in Project Area (Ha.)	8517
Total Investment per Household (in US\$)	61.24
Ecodevelopment Investment per Household (in US\$)	55.57

PERIYAR TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	666.67	10	15	10			35	6.67	10.00	6.67			23.33	23.33	0.68%
2. Management															565.83	16.39%
2.1 Personnel																
Wage labour	Person days	1.67	40400	40400	40400	40400	40400	202000	67.33	67.33	67.33	67.33	67.33	336.67		
Support staff																
Project Officer (DFO)	Person/year	4000.00	1	1	1	1	1	5	4.00	4.00	4.00	4.00	4.00	20.00		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Buildings	Nos															
2.3 Roads	Kms	333.33	5	10	15			30	1.67	3.33	5.00			10.00		
2.4 Vehicles	Nos	10000.00	1					1	10.00					10.00		
2.5 Equipment	Nos								3.33	3.33	3.33			10.00		
2.6 Crop compensation	Actuals								16.67	13.33	10.00	3.33		43.33		
2.8 Tourism																
Visitor Centre	Nos	20000.00	1	1				2	20.00	20.00				40.00		
Furniture	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
Seed money	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
2.9 Maintenance and Operation	Actuals								1.67	3.33	4.17	3.33	1.67	14.17		

PERIYAR TIGER RESERVE																
HEAD'SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3. Environment Conservation & Regeneration															231.67	6.79%
3.1 Soil and Water Conservation																
Tank	Nos	833.33	5	10				15	4.17	8.33				12.50		
3.2 Land Improvement	Ha	166.67	5	10	10			25	0.83	1.67	1.67			4.17		
3.3 Purchase of land for plantations	Ha	3333.33	50					50	166.67					166.67		
3.4 Fuel and fodder plantations	Ha	266.67		50				50		13.33				13.33		
3.5 Conservation of energy																
Solar cooker	Nos	20.00	50	100	200	150		500	1.00	2.00	4.00	3.00		10.00		
Smokeless chulha	Nos	5.00	500	1000	2000	1500		5000	2.50	5.00	10.00	7.50		25.00		
Biogas Plants	Nos															
4. Income Generation															2031.25	59.56%
4.1 Poultry	Unit/250 birds	216.67	20	30	30	20		100	4.33	6.50	6.50	4.33		21.67		
4.2 Pig rearing	Unit/5 pigs	233.33	20	30	30	20		100	4.67	7.00	7.00	4.67		23.33		
4.3 Apiculture	Unit	166.67	20	30	30	20		100	3.33	5.00	5.00	3.33		16.67		
4.4 Horticulture	Ha	100.00	25	50	75			150	2.50	5.00	7.50			15.00		
4.5 Handicrafts (cissal and reed)	Family	166.67	100	150	200	50		500	16.67	25.00	33.33	8.33		83.33		
4.6 Pisciculture	Per tank	3333.33	1	1	1			3	3.33	3.33	3.33			10.00		
4.7 Iron Smithy	Tool kit	250.00	1	1	3			5	0.25	0.25	0.75			1.25		
4.8 Mechanical & electrical repairs	Tool kit	66.67	5	10	20	10	5	50	0.33	0.67	1.33	0.67	0.33	3.33		
4.9 Upgradation of cattle breed	Family	1666.67	100	300	500	100		1000	166.67	500.00	833.33	166.67		1666.67		

PERIYAR TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
4.10 Marketing Infrastructure									1.67	1.67	1.67	1.67		6.67		
4.11 Unspecified									33.33	50.00	50.00	33.33	16.67	183.33		
5 Human Resources Development															262.43	7.70%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	100	150	150	100		500	3.33	5.00	5.00	3.33		16.67		
# Trainer	Month	50.00	4	6	6	4		20	0.20	0.30	0.30	0.20		1.00		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	100	150	150	100		500	3.33	5.00	5.00	3.33		16.67		
# Trainer	Month	50.00	4	6	6	4		20	0.20	0.30	0.30	0.20		1.00		
5.3 Apiculture (1 month)																
# Stipend	Person	33.33	100	150	150	100		500	3.33	5.00	5.00	3.33		16.67		
# Trainer	Month	50.00	4	6	6	4		20	0.20	0.30	0.30	0.20		1.00		
5.4 Horticulture (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.5 Handicrafts (3 months)																
# Stipend	Person	33.33	25	50	100	50	25	250	0.83	1.67	3.33	1.67	0.83	8.33		
# Trainer	Month	50.00	1	2	4	2	1	10	0.05	0.10	0.20	0.10	0.05	0.50		
5.6 Pisciculture (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		

PERIYAR TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.7 Iron Smuthy (3 months)																
# Stipend	Person	33.33	75	75	150	150	75	525	2.50	2.50	5.00	5.00	2.50	17.50		
# Trainer	Month	50.00	3	3	6	6	3	21	0.15	0.15	0.30	0.30	0.15	1.05		
5.8 Lantana board making (3 months)																
# Stipend	Person	33.33	75	75	150	150	75	525	2.50	2.50	5.00	5.00	2.50	17.50		
# Trainer	Month	50.00	3	3	6	6	3	21	0.15	0.15	0.30	0.30	0.15	1.05		
5.9 Tourism (1 month)																
# Stipend	Person	33.33	50	100	250	50	50	500	1.67	3.33	8.33			16.67		
# Trainer	Month	50.00	2	4	10	2	2	20	0.10	0.20	0.50			1.00		
5.10 Driving, repairs, and other skills (1 month)																
# Stipend	Person	33.33	50	100	250	50	50	500	1.67	3.33	8.33			16.67		
# Trainer	Month	50.00	2	4	10	2	2	20	0.10	0.20	0.50			1.00		
5.11 PA Management for Staff (3 months)	Course	2500.00	2	2	1	1	1	7	5.00	5.00	2.50	2.50	2.50	17.50		
5.12 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	25	25	25	25	125	0.83	0.83	0.83	0.83	0.83	4.17		
# Trainer	Month	50.00	1	1	1	1	1	5	0.05	0.05	0.05	0.05	0.05	0.25		
5.13 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25											
# Trainer	Month	50.00	1	1	1											

PERIYAR TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.14 Unspecified																
# Stipend	Perion	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.15 General Training Costs	10%								4.56	7.30	7.05	3.34	0.96	23.22		
6. Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.98%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.95%
8. Monitoring										3.33	10.00	3.33	16.67	33.33	33.33	0.98%
9. Miscellaneous	5%								31.76	44.55	59.66	19.06	7.01	162.39	162.39	4.76%
Total									666.87	935.62	1252.81	400.32	147.20	3410.24	3410.24	100.00%
									19.55%	27.44%	36.74%	11.74%	4.32%	100.00%		

Project Area (Radius in kms)	2
Number of villages	35
Average population per village	6429
Total population in Project Area	225000
Total number of households in Project Area	45000
Forest land in Project Area (Ha.)	21000
Wasteland in Project Area (Ha.)	4100
Annual Total Investment per Household (in US\$)	15.16
Annual Ecodevelopment Investment per Household (in US\$)	12.64

RANTHAMBHORE TIGER RESERVE

HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	333.33	70	150	48			268	23.33	50.00	16.00			89.33	89.33	1.54%
2. Management															959.83	16.50%
2.1 Personnel																
Wage labour	Person days	1.33	30000	30000	20000	15000	5000	100000	40.00	40.00	26.67	20.00	6.67	133.33		
Support staff																
Project Officer (DFO)	Person/year	3333.33	1	1	1	1	1	5	3.33	3.33	3.33	3.33	3.33	16.67		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Vehicles	Nos	10000.00	1	1				2	10.00	10.00				20.00		
2.3 Equipment	Actuals								3.33	6.67	3.33	3.33		16.67		
2.4 Crop Protection Measures																
Green fence	Kms	166.67	20	40	30	10		100	3.33	6.67	5.00	1.67		16.67		
Electric fence	Km	1833.33	30	60	50	10		150	55.00	110.00	91.67	18.33		275.00		
Wall	Km	666.67	50	75	75	50		250	33.33	50.00	50.00	33.33		166.67		
Crop watchers	Person days	1.33	4000	4000	3000	2000	1000	14000	5.33	5.33	4.00	2.67	1.33	18.67		
Crop compensation	Actuals								25.00	25.00	16.67	10.00	3.33	80.00		
2.5 Fire Lines	Person days	1.33	3000	3000	2000	1000		9000	4.00	4.00	2.67	1.33		12.00		
2.6 livestock compensation	Actuals								20.00	13.33	13.33	3.33		50.00		

RANTHAMBHORE TIGER RESERVE																
HEAD'SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
2.7 Tourism																
Visitor Centre	Nos	20000.00	1	1				2	20.00	20.00				40.00		
Furniture	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
Seed money	Per centre	4166.67	1	1				2	4.17	4.17				8.33		
2.8 Maintenance and Operation	Actuals								1.67	3.33	4.17	3.33	1.67	14.17		
2.9 Drinking Water Sources for staff	Source	1000.00	5	5				10	5.00	5.00				10.00		
2.10 Compensation for human death/injury	Actuals								1.67	1.67	1.67	1.67	1.67	8.33		
3. Environment Conservation and Regeneration															3266.93	56.16%
3.1 Fuelwood plantation	Ha	333.33	300	700	700	300	200	2200	100.00	233.33	233.33	100.00	66.67	733.33		
3.2 Fodder development	Ha	250.00	200	600	600	300	200	1900	50.00	150.00	150.00	75.00	50.00	475.00		
3.3 Soil and Water Conservation																
Check Dam	Nos	666.67	60	90	90	40	20	300	40.00	60.00	60.00	26.67	13.33	200.00		
Tank	Nos	833.33	20	30	30	10	10	100	16.67	25.00	25.00	8.33	8.33	83.33		
Bunding	Km	3333.33	5	10	10	10	5	40	16.67	33.33	33.33	33.33	16.67	133.33		
Gully Plugging	Km	3333.33	5	10	10	10	5	40	16.67	33.33	33.33	33.33	16.67	133.33		
Ancuts	Nos	833.33	40	60	60	20	20	200	33.33	50.00	50.00	16.67	16.67	166.67		
3.5 Land Improvement	Ha	166.67	30	90	90	60	30	300	5.00	15.00	15.00	10.00	5.00	50.00		
3.6 Regeneration of forest land	Ha	166.67	400	600	1000	900	400	3300	66.67	100.00	166.67	150.00	66.67	550.00		
3.7 Nurseries	Plant	0.07	800000	1800000	1900000	1100000	600000	6200000	53.33	120.00	126.67	73.33	40.00	413.33		
3.8 Joint Forest Management	Ha	166.67	100	200	300	150		750	16.67	33.33	50.00	25.00		125.00		

RANTHAMBHORE TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.9 Energy Conservation																
Biogas plants	Nos	200.00	30	70	70	70	28	268	6.00	14.00	14.00	14.00	5.60	53.60		
Smokeless Chullah	Nos	5.00	4000	1000	10000	2000		26000	20.00	50.00	50.00	10.00		130.00		
Solar Cooker	Nos	20.00	100	200	400	300		1000	2.00	4.00	8.00	6.00		20.00		
4 Income Generation															613.88	10.55%
4.1 Poultry	Unit/250 birds	216.67	40	80	80	50		250	8.67	17.33	17.33	10.83		54.17		
4.2 Upgradation of cattle breed	Unit/family	166.67	200	300	300	200		1000	33.33	50.00	50.00	33.33		166.67		
4.3 Apiculture	Unit	166.67	50	150	150	100	50	500	8.33	25.00	25.00	16.67	8.33	83.33		
4.4 Horticulture	Ha	100.00	150	350	350	150		1000	15.00	35.00	35.00	15.00		100.00		
4.5 Handicrafts	Family	166.67	10	30	30	20	10	100	1.67	5.00	5.00	3.33	1.67	16.67		
4.6 Tailoring	Person/machine	50.00	10	30	30	20	10	100	0.50	1.50	1.50	1.00	0.50	5.00		
4.7 Iron Smithy	Tool kit	250.00	5	15	10	5	5	40	1.25	3.75	2.50	1.25	1.25	10.00		
4.8 Carpentry																
Tools	Toolkit	116.67	5	15	10	5	5	40	0.58	1.75	1.17	0.58	0.58	4.67		
Workshop	Sq. ft.	25.00	1	1				2	0.03	0.03				0.05		
4.9 Medicinal/edible plant cultivation	Ha	666.67	10	30	30	20	10	100	6.67	20.00	20.00	13.33		66.67		
4.10 Marketing Infrastructure									3.33	6.67	6.67	3.33	3.33	23.33		
4.10 Unspecified ecodevelopment									8.33	25.00	33.33	8.33	8.33	83.33		

RANTHAMBHORE TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5. Human Resources Development															443.13	7.62%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	50	150	150	100	50	500	1.67	5.00	5.00	3.33		16.67		
# Trainer	Month	50.00	2	6	6	4	2	20	0.10	0.30	0.30	0.20		1.00		
5.3 Use of integrated pest management and biofertilisers (1 month)																
# Stipend	Person	33.33	300	600	1500	600	300	3300	10.00	20.00	50.00	20.00		110.00		
# Trainer	Month	50.00	12	24	60	24	12	132	0.60	1.20	3.00	1.20		6.60		
5.4 Apiculture (1 month)																
# Stipend	Person	33.33	100	400	400	100		1000	3.33	13.33	13.33	3.33		33.33		
# Trainer	Month	50.00	6	20	15	4		45	0.30	1.00	0.75	0.20		2.25		
5.7 Handicrafts (1 months)																
# Stipend	Person	33.33	25	50	100	25		200	0.83	1.67	3.33	0.83		6.67		
# Trainer	Month	50.00	1	2	4	1		8	0.05	0.10	0.20	0.05		0.40		
5.8 Tourist guide (3 months)																
# Stipend	Person	33.33	150	150	150			450	5.00	5.00	5.00			15.00		
# Trainer	Month	50.00	6	6	6			18	0.30	0.30	0.30			0.90		
5.9 Tailoring (3 months)																
# Stipend	Person	33.33	75	75	50			200	2.50	2.50	1.67			6.67		
# Trainer	Month	50.00	3	3	2			8	0.15	0.15	0.10			0.40		

RANTILAMBHORE TIGER RESERVE																
HEADSUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COS I							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.10 Iron Smithy (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.11 Carpentry (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.14 Training for handpump repair (1 month)																
# Stipend	Person	33.33	25	50				75	0.83					2.50		
# Trainer	Month	50.00	1	2				3	0.05					0.15		
# Tool kit	Kit	10.00	25	50				75	0.25					0.75		
5.15 Training for biogas repair (1 month)																
# Stipend	Person	33.33	25	50				75	0.83					2.50		
# Trainer	Month	50.00	1	2				3	0.05					0.15		
# Tool kit	Kit	10.00	25	50				75	0.25					0.75		
5.16 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.17 PA Management for Staff (3 months)	Course	2500.00	2	2	1	1	1	7	5.00	5.00	2.50	2.50	2.50	17.50		

RANTHAMBHORE TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.18 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	50	50	25	25	175	0.83	1.67	1.67	0.83	0.83	5.83		
# Trainer	Month	50.00	1	2	2	1	1	7	0.05	0.10	0.10	0.05	0.05	0.35		
5.19 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.20 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.21 General Training Costs	10%								7.45	13.42	12.88	4.67	0.34	38.75		
6 Research and Development									3.33	10.00	10.00	6.67	3.33	33.33	33.33	0.57%
7 Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	1.15%
8 Monitoring									3.33	10.00	10.00	5.00	5.00	33.33	33.33	0.57%
9 Village support															35.00	0.60%
9.1 Drinking Water																
9.2 Decontamination	Actuals								0.33	0.33	0.33	0.33	0.33	1.67		
9.3 Health and family welfare camps	Actuals								6.67	6.67	6.67	6.67	6.67	33.33		
10 Miscellaneous	5%								45.93	83.96	82.48	44.20	19.32	275.89	275.89	4.74%
Total									964.57	1763.24	1732.13	928.20	405.64	5817.34	5817.34	100.00%
									16.58%	30.31%	29.78%	15.96%	6.97%	100.00%		

Project Area (Radius in kms)	10
Number of villages	268
Average population per village	790
Total population in Project Area	211695
Total number of households in Project Area	36121
Forest land in Project Area (Ha.)	104721
Wasteland in Project Area (Ha)	27573
Annual Total Investment per Household (in US\$)	32.21
Annual Ecodevelopment Investment per Household (in US\$)	26.90

SIMILIPAL TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
1. Planning	Village	333.33	50	100	50			200	16.67	33.33	16.67			66.67	66.67	2.22%
2. Management															485.00	16.17%
2.1 Personnel																
Wage labour	Person days	1.33	20000	30000	30000	10000	3000	93000	26.67	40.00	40.00	13.33	4.00	124.00		
Support staff																
Project Officer (DFO)	Person/year	3333.33	1	1	1	1	1	5	3.33	3.33	3.33	3.33	3.33	16.67		
Range Officer	Person/year	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
Other	Person/year	2000.00	4	4	4	4	4	20	8.00	8.00	8.00	8.00	8.00	40.00		
2.2 Buildings	Nos															
2.3 Roads	Kms	333.33														
2.4 Vehicles	Nos	10000.00	1	1				2	10.00	10.00				20.00		
2.5 Equipment	Actuals								3.33	6.67	3.33			13.33		
2.6 Crop Protection Measures																
Green fence	Kms	166.67	5	5	5	5		20	0.83	0.83	0.83	0.83		3.33		
Wall	Metre	6.67	1000	1500	1000	500		4000	6.67	10.00	6.67	3.33		26.67		
Electric fence	Km	833.33	5	10	10	10	0	35	4.17	8.33	8.33	8.33		29.17		
Crop watchers	Person days	1.33	3000	3000	2000	1000	1000	10000	4.00	4.00	2.67	1.33	1.33	13.33		
Crop compensation	Actuals								5.00	5.00	3.33	1.67	0.83	15.83		
2.7 Fire Lines	Person days	1.33	5000	7500	10000	5000	2000	29500	6.67	10.00	13.33	6.67	2.67	39.33		

SIMILIPAL TIGER RESERVE																
HEADS/UBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	IBFAD TOTAL	PERCENT
									(in US\$ '000)							
2.8 Compensation for human injury/ death	Actuals								3.33	3.33	3.33	2.50	1.67	14.17		
2.9 Tourism																
Visitor Centre	Nos	20000.00		1	1			2		20.00	20.00			40.00		
Furniture	Per centre	4166.67		1	1			2		4.17	4.17			8.33		
Seed money	Per centre	4166.67		1	1			2		4.17	4.17			8.33		
2.10 Forest demarcation										6.67	16.67	10.00		33.33		
2.11 Maintenance and Operation	Actuals								1.67	3.33	4.17	3.33	1.67	14.17		
3. Environment Conservation and Regeneration															737.50	24.59%
3.1 Fuelwood and small timber plantation	Ha	266.67	100	200	200			500	26.67	53.33	53.33			133.33		
3.2 Fodder Development	Ha	250.00	25	50	50	25		150	6.25	12.50	12.50	6.25		37.50		
3.3 Soil and Water Conservation																
Check Dam	Nos	666.67	15	25	25	15		80	10.00	16.67	16.67	10.00		53.33		
Tank	Nos	833.33	5	5	5	5		20	4.17	4.17	4.17	4.17		16.67		
Bunding	Km	3333.33	2	2	2	1		7	6.67	6.67	6.67	3.33		23.33		
Gully Plugging	cu.mt	1.67	2500	5000	5000	2500		15000	4.17	8.33	8.33	4.17		25.00		
3.4 Land Improvement	Ha	166.67	30	30	30	10		100	5.00	5.00	5.00	1.67		16.67		
3.5 Regeneration of forest land	Ha	166.67	100	250	300	300	150	1100	16.67	41.67	50.00	50.00	25.00	183.33		
3.6 Nurseries	Plant	0.07	225000	550000	700000	200000		1675000	15.00	36.67	46.67	13.33		111.67		

SIMILIPAL TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
3.7 Joint Forest Management	Ha.	100.00	100	100	200	100	100	600	10.00	10.00	20.00	10.00	10.00	60.00		
3.8 Energy Conservation																
Smokeless chullah	Nos.	3.33	1000	2000	2000			5000	3.33	6.67	6.67			16.67		
Biogas plant	Plant	200.00	40	80	80			200	8.00	16.00	16.00			40.00		
Solar cooker	Nos	20.00	200	500	300			1000	4.00	10.00	6.00			20.00		
4. Income Generation															910.94	30.37%
4.1 Poultry	Unit/250 birds	216.67	20	30	30	20		100	4.33	6.50	6.50	4.33		21.67		
4.2 Pig rearing	Unit/5 pigs	233.33	25	50	50	50		175	5.83	11.67	11.67	11.67		40.83		
4.3 Sericulture	Ha.	333.33	10	20	20			50	3.33	6.67	6.67			16.67		
4.4 Apiculture	Unit	166.67	20	30	30	20		100	3.33	5.00	5.00	3.33		16.67		
4.5 Sabai grass plantation	Ha.	333.33	100	150	200	50		500	33.33	50.00	66.67	16.67		166.67		
4.6 Sabai furniture & rope making	Unit	66.67	25	25	50			100	1.67	1.67	3.33			6.67		
4.7 Upgrade local cattle	Family	166.67	200	300	500	300		1300	33.33	50.00	83.33	50.00		216.67		
4.8 Pisciculture & tank renovation	Per tank	333.33	5	10	10	10	5	40	16.67	33.33	33.33	33.33	16.67	133.33		
4.9 Tailoring	Person/machine	50.00	25	75	75	75		250	1.25	3.75	3.75	3.75		12.50		
4.10 Iron Smithy	Tool kit	250.00	10	20	20			50	2.50	5.00	5.00			12.50		
4.11 Sissal plantation	Ha.	233.33	20	30	30	20		100	4.67	7.00	7.00	4.67		23.33		
4.12 Sissal fibre decorator	Unit	500.00	5	10	5			20	2.50	5.00	2.50			10.00		

SIMILIPAL TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
4.13 Kitchen garden kit	Per kit	16.67	200	300	500			1000	3.33	5.00	8.33			16.67		
4.14 Arrowroot cultivation	Ha.	0.83	50	50	25			125	0.04	0.04	0.02			0.10		
4.15 Marketing Infrastructure									3.33	10.00	10.00	6.67	3.33	33.33		
4.13 Unspecified (income generation)									33.33	50.00	50.00	33.33	16.67	183.33		
5. Human Resources Development															322.89	10.77%
5.1 Poultry (1 month)																
# Stipend	Person	33.33	25	75	75	25		200	0.83	2.50	2.50	0.83		6.67		
# Trainer	Month	50.00	1	3	3	1		8	0.05	0.15	0.15	0.05		0.40		
5.2 Pig rearing (1 month)																
# Stipend	Person	33.33	25	75	75	25		200	0.83	2.50	2.50	0.83		6.67		
# Trainer	Month	50.00	1	3	3	1		8	0.05	0.15	0.15	0.05		0.40		
5.3 Tailoring (3 months)																
# Stipend	Person	33.33	200	400	400	200		1200	6.67	13.33	13.33	6.67		40.00		
# Trainer	Month	50.00	8	16	16	8		48	0.40	0.80	0.80	0.40		2.40		
5.4 Use of Integrated Pest Management and biofertilizer (1 month)																
# Stipend	Person	33.33	100	200	200	100		600	3.33	6.67	6.67	3.33		20.00		
# Trainer	Month	50.00	4	8	8	4		24	0.20	0.40	0.40	0.20		1.20		

SIMILIPAL TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.5 Nursery management (1 month)																
# Stipend	Person	33.33	300	500	500	200		1500	10.00	16.67	16.67	6.67		50.00		
# Trainer	Month	50.00	12	20	20	8		60	0.60	1.00	1.00	0.40		3.00		
5.6 Pisciculture (1 month)																
# Stipend	Person	33.33	200	300	300	200		1000	6.67	10.00	10.00	6.67		33.33		
# Trainer	Month	50.00	8	12	12	8		40	0.40	0.60	0.60	0.40		2.00		
5.7 Sabai furniture & rope (3 months)																
# Stipend	Person	33.33	75	150	75			300	2.50	5.00	2.50			10.00		
# Trainer	Month	50.00	3	6	3			12	0.15	0.30	0.15			0.60		
5.8 Tourist guide (3 months)																
# Stipend	Person	33.33	75	75	75			225	2.50	2.50	2.50			7.50		
# Trainer	Month	50.00	3	3	3			9	0.15	0.15	0.15			0.45		
5.9 PA Management for Staff (3 months)	Course	2500.00	2	2	2	2	2	10	5.00	5.00	5.00	5.00	5.00	25.00		
5.10 PA Management for Community (1 month)																
# Stipend	Person	33.33	25	50	25			100	0.83	1.67	0.83			3.33		
# Trainer	Month	50.00	1	2	1			4	0.05	0.10	0.05			0.20		

SIMULIPAL TIGER RESERVE																
HEAD/SUBHEAD	UNIT	UNIT COST	QUANTITY						BASE COST							
			1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTAL	HEAD TOTAL	PERCENT
									(in US\$ '000)							
5.11 PRA Training (1 month)																
# Stipend	Person	33.33	25	25	25			75	0.83	0.83	0.83			2.50		
# Trainer	Month	50.00	1	1	1			3	0.05	0.05	0.05			0.15		
5.12 Unspecified																
# Stipend	Person	33.33	500	1000	500	200		2200	16.67	33.33	16.67	6.67		73.33		
# Trainer	Month	50.00	20	40	20	8		88	1.00	2.00	1.00	0.40		4.40		
5.13 General Training Costs	10%								5.98	10.57	8.45	3.86	0.50	29.35		
6. Research and Development									6.67	16.67	16.67	16.67	10.00	66.67	66.67	2.22%
7. Education and Awareness									16.67	16.67	16.67	10.00	6.67	66.67	66.67	2.22%
8. Monitoring										6.67	16.67	6.67	20.00	50.00	50.00	1.67%
9. Village support															150.00	5.00%
9.1 Roads for Villages	Kms	166.67	50	100	150	100		400	8.33	16.67	25.00	16.67		66.67		
9.2 Irrigation wells	Nos.	833.33	20	50	30			100	16.67	41.67	25.00			83.33		
10. Miscellaneous & unforeseen	5%								24.61	43.95	45.60	21.54	7.12	142.82	142.82	4.76%
Total									516.72	923.01	957.66	452.29	149.45	2999.14	2999.14	100.00
									17.23	30.78	31.93	15.08	4.98	100.00		

Project Area (Radius in kms)	1
Number of villages	200
Average population per village	348
Total population in Project Area	69600
Total number of households in Project Area	12963
Forest land in Project Area (Ha.)	9100
Wasteland in Project Area (Ha.)	1000
Annual Total Investment per Household (in US\$)	46.27
Annual Fooddevelopment Investment per Household (in US\$)	38.79

**C. INDICATIVE LIST OF ACTIVITIES RELATED
TO THE DEVELOPMENT OF
INFRASTRUCTURE AND INCOME
GENERATION**

INDICATIVE LIST OF INFRASTRUCTURE/ACTIVITIES

PA MANAGEMENT INFRASTRUCTURE/ACTIVITIES				
Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
<u>Protection Activities</u>				
Construction of Roads Metalled Jeepable Motorcycle/Pony	To facilitate mobility leading to better protection. Construction and maintenance would generate local employment	A proper survey of the area is required, to decide on the optimal alignment.	Construction of roads disturbs the environment. Availability of roads some times increases threats to the environment	Per Km. Per Km. Per Km.
Operationalising anti poaching squads	Comprising of local people, to help protection. Also generates employment and involves local people in PA management.	Training of the recruits	Unless properly managed these squads can themselves become a disturbance/threat to the environment	Per squad of 5-20 persons
Employment of fire watchers/ protection workers	Fire watchers will be employed during the fire season to act as look-outs and as an early warning system. They would also assist in fighting fires. Other protection workders will be employed to make fire lines and clear inflammable undergrowth.	Men and women to be recruited as wage labourers and trained to perform the required functions.	Wage labour should only be a temporary phenomenon. It can lead to insecurity and appression. Wage labourers must be urgently made self-employed or permanent.	per person
Constructing stone walls as a crop protection measure	Stone walls with deep foundations can be built to prevent wild boar and other animals from entering the farmer's fields. Some local employment will be generated.	Availability of local stones or other appropriate building material	Expensive to build & maintain. Sometimes resented by the local people, because also prevent cattle from entering PA and at times interfere with drainage.	per km.

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Constructing elephant proof trenches as a crop protection measure	Trenches dug to specific dimensions in order to prevent elephants and other animals from leaving the PA. Also provides some local employment.	None	Likely to be filled up with slit and therefore requires regular maintenance. Villagers are also likely to fill it up in some places in order to allow their cattle into the forest.	per km.
Elephant proof energized fencing as a crop protection measures	Electrified fences around PA to keep elephants & other animals from straying out.	Energy source	Needs regular maintenance. Also, often wires are stolen and have to be replaced.	per km.
<u>Tourism Related Activities</u>				
Training and/or appointment of nature guides	Local people could be appointed to accompany tourists as guides. Given their local knowledge, they would be invaluable to the visitors. This activity would also generate income for the local people and give them a stake in the PA, as protecting the PA would mean sustained tourist traffic and, therefore, a sustained income for them.	Training for requisite skills and to familiarize them with local fauna, flora and habitats.	Unless strictly controlled, can lead to disturbance as guides compete with each other to show wildlife to tourists.	Per person/ per course of 1-4 weeks

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Development and provision of tourist accommodation	Local people around the PA could provide bed and breakfast to tourists in their houses. They could also form co-operatives to run common tourist facilities, run on self-service, minimum disturbance, principles.	In appropriate tourist facilities run by the government or corporate/business interests will have to be phased out from the area. Training in 'appropriate hotel management' will have to be provided. Proper accommodation and other infrastructure; and marketing, of the tourist accommodation will have to be ensured.	Like all business ventures' there is an element of risk and, as the investment is heavy, there could be a loss. Also, if the facilities are not run on a minimum disturbance principle, there could be resultant environmental damage. Has the risks associated with any business venture.	per unit/bed and breakfast
Development & sale of literature on the PA	Literature such as bird/mammal lists, maps, information on the PA, & of historic monuments within PA tribal lore etc. can be published by co-operatives of the local people.	Requires research and survey and some training in publishing and marketing.	None	Per publication
Setting up and running of interpretation centers	Interpretation centers can be a method for disseminating information on the PA and its fauna & flora. They can also be a centre for information exchange between local people and visitors and can provide some local employment.	Buildings, equipment, literature, audio visual aids and trained staff.	At present, interpretation centres in many PAs have not been functioning very well. Perhaps the reasons for this need to be assessed.	per unit
Operating a safari park	A safari park can divert some of the tourist pressure from the PA and also provide assured viewing of sought after species.	Space should be available in the periphery of the PA. Staff to manage.	Requires a large number of visitors to be viable. Is expensive to set up and maintain.	per unit

NATURAL RESOURCES MANAGEMENT INFRASTRUCTURE/ACTIVITIES				
Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
<u>Water, Soil, and Energy Related Activities</u>				
Construction of check dams	Construction of check dams for soil and water conservation will provide local employment and other ecological benefits.	Selection of appropriate sites for the check dams, and the use of appropriate designs.	Need regular maintenance.	Per dam
Plugging of gullies	Gully plugging for soil and water conservation will also provide local employment and other benefits.	Selection of appropriate sites	Need regular maintenance	Per Km.
Establishment of dug/bore/tube wells	For Provision of drinking and irrigation water. Will provide local employment and help local communities and their agricultural activities.	Availability, location and sustainability of ground water resources has to be determined.	Ground water levels need to be monitored and sources protected from contamination.	Per well/ Dug well Tube well Bore well
Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Development of lift Irrigation	This would involve bunding of small depressions and installing pump sets with pipe lines.	A thorough hydrological survey for ground water sustainability should be carried out. Pumpsets required.	Pipelines difficult to maintain. Expensive to set up and run.	Per unit of Pumpset and 200 mts. of PVC Pipe Line

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Setting up of bio-gas plants	Individual and community bio-gas plants set up to utilise local dung, meet fuel demand and encourage stall feeding of cattle.	Training in running and maintenance of the bio gas plants. Sufficient gobar and water supply.	In the past, community plants have not proved very successful and individual plants are only viable in the homes of the richer people having at least five or six heads of cattle.	Per individual unit of Janata Model. Per community model
Introduction of improved Stoves	To provide fuel-efficient stoves suited to local needs and conditions, and thereby conserve fuel, especially wood, and prevent diseases caused by wood-fire smoke.	Training in the manufacture, installation & maintenance of these stoves	Difficult to get the community to accept and keep	Per stove, including training costs
Bio-mass Generation in Common Lands				
Establishment of nurseries	To supply fuel-fodder-timber and fruit saplings for local use. This would also generate local employment, especially among the women, and ensure adequate supply of good quality saplings.	Adequate land for the nursery should be available in the project area. The local people might require some training.	Seed and sapling quality are critical to the success of the nursery. Nursery will not succeed in areas, where sapling are being distributed free or at subsidised rates by other agencies.	Per nursery
Establishment of fuel wood plantations	Fuelwood plantations outside the PA, especially in village common lands and on forest lands through joint forest management, will supplement local fuelwood supply. Local employment will also be generated.	Technical help from the Forest Department, adequate & timely supply of good quality saplings, and availability of land.	Usually difficult to protect, unless there is strong co-operation among the local people.	Per hectare

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Establishment of fodder plantations	Fodder plantations in village common lands, and forest and other lands outside the PA, would supplement the local fodder supply. Local employment will also be generated.	Technical help from the Forest Department. Availability of village common land, forest and other lands.	As above.	Per hectare
INCOME GENERATION ACTIVITIES				
Primary Sector Activities				
Sericulture (family units)	Silk weaving has been a traditional craft in rural India. Local expertise can be tapped for silk cocoon rearing and production of silk yarn.	Where the climate is stable mulberry plantation can be started. Small plots in the project area are required to started mulberry plantations. Rearing sheds need to be built. Larvae are to be supplied.	This activity requires some land. Mulberry cultivation can be given only to those beneficiaries who have some land. The possibility of starting it on common lands as a co-operative venture should be explored. If exotic species are involved, it can be hazardous to the environment. It can also lead to the conversion of natural habitats into sericulture plantations.	One acre of mulberry plantation with irrigation facility and rearing
Bee keeping	Keeping of bees for sale of honey and bees wax.	Bee hive and other equipment. Training	Not suitable for places far away from forests. Collection of nectar by bees becomes constrained due to lack of vegetation.	10+5 bee boxes (Jungle wood boxes)
Pig rearing	Rearing of pigs for supply to the meat market.	Some land for sheds.	Can be given as an income generation unit only if there is a convenient market for pigs/pork.	3+1 breeder unit

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Rearing of poultry (broilers)	Rearing broilers for both eggs and meat.	Broiler unit requires land to build the cages and store the feed. Veterinary care and insurance also required.	High yielding but requires well developed market structure. Subject to diseases.	Broiler 200 bird unit:-
Rearing of poultry local variety	Rearing of poultry for eggs and meat.	The local variety of chicken can be maintained even by the landless.	Danger of depredation by predatprs. Some danger of disease.	10+1
Mushroom cultivation (button)	Edible mushroom has a ready market. It can be grown at the homestead in about 50 metal trays. Three crops can be raised per annum.	Shed Equipment Spawn Some training Market Linkages		Per unit of 50 trays
Mushroom cultivation (Paddy Straw Mushroom)	As above	- Do -		Per unit of 50 beds
Inland Fisheries	Small ponds, the size varying from 0.25 to 2.5 acres may be excavated for breeding fish and to serve as seed farms. Larger ponds on common lands to be controlled by the ecodevelopment committee can also be planned.	Land and Water	Lack of land among the poor. May be suitable only for medium/large farmers.	Per 0.25 acre pond.
Rabbit rearing	In colder climates rabbits can be reared for fur. Meat is also consumed. Animal husbandry department supplies the breeder unit and buys back the animals. The breed may be Angora or local breed as per site requisites.	Some cages are required. Feed concentrates are required. Insurance cover has to be arranged	Not suitable for all areas. There is a danger that exotic varieties of rabbits get accidentally introduced into the PA.	Per unit of 10 females and 2 males.

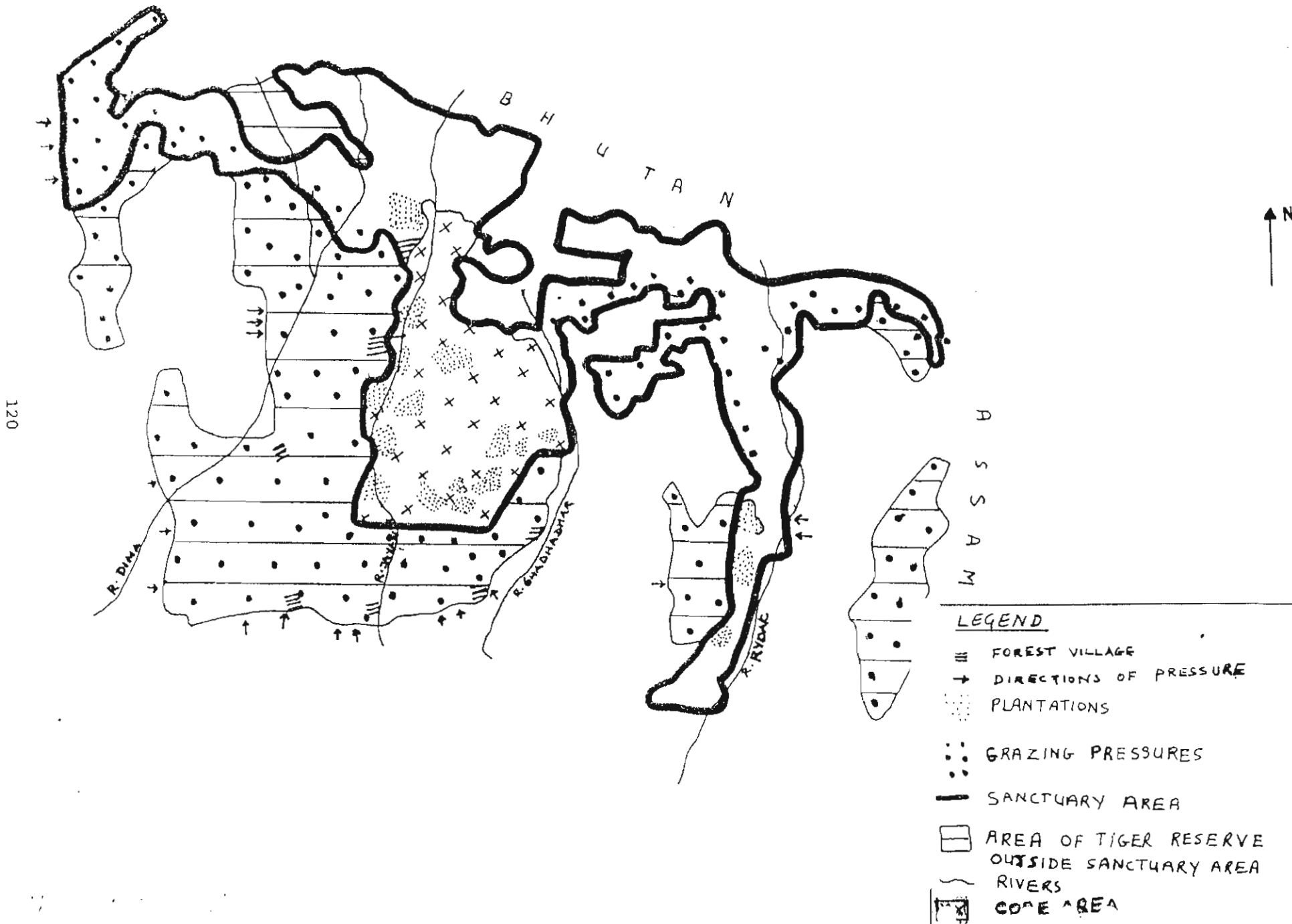
Primary Sector Activities (Community units)				
Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Sericulture (Kosa/Tassar)	Local varieties like Kosa silk worms and Tassar Silk Worms can be established for producing silk.	Proper selection of host trees and training to the locals in yarn making. Market linkages to sell the collected cocoons and the yarn needs to be built up.	Can modify the environment and affect biodiversity if taken up too intensively.	Individual beneficiaries
Production Lac	Lac insects can be introduced on the host trees in JFM areas. They grow on a number of host trees covering a wide range of climates. In western and central India, lac has been a traditional raw material for artisans.	Collection centers and training cum production centre for lac articles. Suitable host trees.	Though lac bangles and jewelry are popular, lac production has not yet been developed on a commercial scale. More research has to be done on the various strains of lac insects and the respective host trees. There might also be adverse impact on the ecosystem through the introduction of lac insects.	
Secondary Sector (family units)				
Sissal/banana/ coir/rope making	Rope from sissal fiber, banana fiber and coir fiber is made by hand or machines to be used for packing and also in making door-mats and other utilitarian articles.	Training for 6-10 months and availability of raw materials. Markets survey is also required.	The market for being rope is uncertain, prices are low, and there is competition from the industrial sector and from plastic and other synthetic products.	Per unit of 10-15 persons.
Weaving khadi through the use of improved charkhas	Khadhi Village Industries Board will impart training, supply the charkhas, supply cotton and buy back the yarn	Training. Procurement of charkhas	none	Per beneficiaries

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Chalk crayon making	Making of chalk crayons to be used by schools.	Training, procurement of raw materials and cooperatives Market Linkages. Training will be given for these activities under DWACRA scheme of government.	Till market linkage are established and the required quantity is estimated, the activity may not take off.	10 to 15 person to form groups
Envelope making	Making Paper envelopes for stationery stores	As above	As above	As above
Paper making from waste material	Some parts of Rajasthan have been having the tradition of making paper from waste collected in urban centres. Training will be given in paper making from recycled waste products. Will also generate some employment.	Waste Paper & other material will be the raw material. Machinery & Shed, market linkages.	None	Per paper making unit
Tailoring	To teach tailoring skills, mainly to women.	Training, and loan for procuring raw materials Market survey and linkages	It may not be possible to train a large number from the area as, one or two artisans are engaged to service a large number of households.	2 beneficiaries
Carpet Weaving	Where local expertise exist carpet weaving can be one of the income generating schemes.	Machinery, Wool, Shed & Market. Training will be given under IRDP scheme of Government.	Heavy investments. For the supply of materials sheep breeding may require investment which is not environmentally friendly. activity should be waste only in environmentally sheep rearing areas.	1 Carpet manufacturing unit
Blanket weaving	As above	As above	A	1 Blanket weaving unit

Infrastructure/ Activities	Description	Prerequisites	Constraints	Units
Lantana Chip Board Cottage Industry	From eradicated Lantana weeds, compacted chip boards are being manufactured. This is a waste recycling unit suitable to areas having Lantana weed infestation.	Raw material from forest Unit with machinery Markets.	Heavy initial investment is required. Whether this unit will have sustained raw material input has to studied.	Per Chip board making unit.
Dals/Pulses processing	De huskings and Cleaning the dal and pulses and packaging for sale	Procurement of raw materials	Heavy initial investment in raw materials	Processing Unit

D. PROTECTED AREAS ABSTRACTS

BUXA TIGER RESERVE



BUXA TIGER RESERVE

I. THE PROJECT AREA (BUXA TIGER RESERVE [BTR])(Kindly refer to the attached map while reading the text)

1. The PA Area

- 1.1 Location and Approaches: Buxa Tiger Reserve is situated in Jalpaiguri District, Kalchini Tahsil, Alipurduar Sub-division, of West Bengal [edp:1]. It comprises of the entire erstwhile Buxa Forest Division and a part of the Coochbehar Forest Division [Anon. nd a:1], covering a tract of sub-montane and plains country, locally known as the 'Duars'. The Reserve lies between latitudes 23°30'N to 23°50'N and longitudes 89°25'E to 89°55'E. [edp:1].

The Reserve headquarter is located at Alipurduar, 5 km from the Reserve. NH 31 (National Highway), by-passes Alipurduar along the Reserve boundary. The town is on the meter gauge line of the North-East Frontier Railway. Cooch Behar, 25 km away, is the nearest broad gauge railhead and airport. Bagdogra, near Siliguri is the nearest airport, 175 km from the Reserve. The northern boundary of the Reserve is co-terminous with the international boundary between India and Bhutan.

- 1.2 Area, Zoning, and Legal Status: The area was declared the country's fifteenth Project Tiger Reserve on February 16, 1983 vide notification no. J-11025/18/B/FRY (PT). On January 24, 1986, a part of the Tiger Reserve was declared a Sanctuary, to which additional area (from within the Reserve) was added on October 10, 1990. [edp:1]. Details of area of Buxa Tiger Reserve are given below:

Date	Area	Legal Status	Final Area/Unit
16.2.1983	75,882 ha. (758.82 sq.km)	Buxa Tiger Reserve	75,882 ha./Tiger Reserve (TR)
24.1.1986	31,452 ha. (314.52 sq.km)	Area initially declared Buxa Sanctuary out of BTR	75,882 ha./TR 31,452 ha./Sanct.
15.5.1989	209.84 ha. (20.98 sq.km)	Area added to TR	76,091.84 ha./TR 31,452 ha./Sanct.
6.10.1990	5,447 ha. (54.47 sq.km)	Area added to Sanct.	76,091.84 ha./TR 36,899 ha./Sanct.
6.1.1992	11,710 ha. (117.10 sq.km)	Intended National Park (NP)	76,091.84 ha./TR 36,899 ha./Sanct, of which 11,710 ha./Intd. NP

- 1.3 Description of Ecosystems: The Reserve lies in the biogeographic zones of Central Himalayas [2 C] and the Lower Gangetic Plains [7 B], as identified by Rodgers and Panwar (1988). Conservation priority suggested by them is "National".

Flora: The forests of the Reserve can broadly be classified as Moist Tropical Forests as per Champion and Seth (1968). The forest types and sub-types, found in the Reserve, in this classification are as follows :

- i) Eastern Alluvial Secondary Semi-evergreen forest (2B/2S2).
- ii) Very moist Sal bearing forest 3C/C1.
- iii) Eastern Terai Sal Forest 3C/C1/1C.

- iv) East Himalayan Moist Mixed Deciduous forest 3C/C3/3B.
- v) Moist Sal Savannah 3C/DS1.
- vi) Khair Sissoo forest 5B/IS2.
- vii) Secondary dry Deciduous forest 5B/2S1.
- viii) Eastern Himalayan Sub Tropical Wet hill forest 8B/CI.

300 species of trees, 250 species of shrubs, 6 species of cane, 4 species of bamboo and 100 species of grass, 130 species of aquatic flora and more than 160 species of other monocotyledons and ferns have been reported from the Reserve [EDP-3].

Fauna: Some of the important species of mammals found in the Reserve are the Tiger, Leopard, Clouded leopard, Jungle cat, Leopard cat, Fishing cat, Sloth bear, Yellowthroated marten, Himalayan palm civet, Indian tree shrew, Elephant, Sambar, Chital, Barking deer, Wildboar, Guar, Goral, Rhesus macaque, Hanuman langur, Black-naped hare, Malayan giant squirrel, Particoloured flying squirrel and a score of bats and rats. [ZSI 1993]. Elephants are reported to migrate between the Reserve and forests in Bhutan and Assam. Wild dog (*Cuon alpinus*), believed to have been locally exterminated from the area earlier, have recently been repeatedly sighted. [Anon. nda]

More than 185 species of birds have been recorded from this Reserve. These include the Great pied hornbill, Indian pied hornbill, Goshawk, Sparrow hawk, White-eyed buzzard eagle (7 spp.), egrets (3 spp.), storks (2 spp.), Indian peafowl, Spur fowl, Red jungle fowl, pittas, woodpeckers, larks, pipits, wagtails, warblers, Fairy blue bird, ioras, munias, finches etc. [ZSI 1993]. In December 1992, the extremely rare Blacknecked crane was sighted near Bhutanghat, inside the Reserve.

Among reptiles, Rock python, Water monitor, Bengal monitor, Indian cobra, Kraits, Vipers etc., have been recorded. [ZSI 1993].

Among invertebrates, 10 species of Dragonflies, 12 species of Butterflies and Moths, 13 species of Beetles, four species of Spiders and 23 species of Earthworms are reported from the Reserve. Of these, two species of Earthworms constitute new records from West Bengal. [ZSI 1993].

There are seven species of mammals, five species of birds and three species of reptiles that are endangered and included in Schedule I of the Wildlife Protection Act. [ZSI 1993] The endangered species are; Tiger, Leopard, Clouded leopard, Leopard cat, fishing cat, sloth bear and Elephants among mammals, Great pied hornbill, Indian pied hornbill, Sparrow hawks and Blacknecked cranes among birds, and Rock python and Bengal Monitor among reptiles.

Climate and Rainfall: The monsoon arrives in the month of May and is accompanied by very heavy rainfall until August. Rains begin to subside by September and disappear altogether by October. Average annual rainfall is about 4100 mm [Anon.ud.d]. The highest point of the Reserve is 1750 msl.

1.4 Population: There are 37 forest villages inside the Reserve (8 inside the sanct.), covering an area of 1337.9 ha., with a population of 13236 persons. These people are also reported to maintaining 18,854 heads of livestock [EDP-3], besides carrying on agriculture as their primary occupation. An estimated 43,500 heads of livestock (27,000 NP/16,500 Reserve) are reported to graze in the Reserve [Pundarikakshudu 1987b].

1.5 Land Use:

1.5.1 Forestry operations: Exploitation of the Buxa forests, primarily for sal wood railway sleepers, began in c.1874, with the commencement of the First Working Plan for Buxa Forest Division (1874-75 to 1905-06). The Third Working Plan (1920-21 to 1924-25), prescribed the clear felling of natural forests and the establishment of sal and teak plantations under the taungya system. [edp:1]. This was practiced till the expiry of the Seventh Working Plan in 1984-85. From 1985 onwards only mature artificial plantations were being clear felled. 500 ha. were clear felled in 1985, which was subsequently reduced to 100 ha. These operations used to provide upto 100 days employment annually to local people. In 1983, forestry operations generated 5,94,000 person days of employment as against only 2,77,500 person days in 1991. This non-availability of employment has caused much antagonism towards the Reserve. [Roy 1993:11 and Anon. ud. a].

Plantations cover 21056 ha. or 28% of the forest. 8th working plan has prescribed "analogue" model for plantation works. Presently clear felling of plantations (122 ha) and thinning (200 ha). is carried on. Boulders are allowed to be collected for PWD, Irrigation and Railway Departments. The amount collected during 1992-93 is 14,980 cubic meters [EDP-3].

1.5.2 Mining: At the time of the declaration of Buxa Sanctuary in 1986, five companies were involved in limestone and dolomite mining on a total area of 1,678 ha.. None of these companies had clearance under the Forest Conservation Act, 1980. Three of the companies are reported to have ceased operations after intervention by the Forest Department [Anon.ud:a]. An area of 12 ha. in the sanctuary [EDP-3], was being exploited for dolomite by M/S N.B.D.L. on behalf of the West Bengal Mineral and Trading Development Corporation. The area lies in the Phankshowa and Hatipotha Forest blocks [edp:1 and Anon. ud. a]. No studies have been undertaken to assess the impact of mining on the habitat and wildlife. However, tea estates adjacent to the mining areas have reported low yields due to the presence of dolomite dust and soil erosion. In addition, a team of scientists from SAIL have also visited the area to assess the impact of mining. [Anon. ud b].

1.5.3 Fixed Demand Holdings: There are five Fixed Demand Holdings, established during British administration for opening small shops to cater to the needs of the staff of FD in the then remote places. These holding have a total population of 2373 and are inside the Reserve[EDP-3].

1.5.4 Roads: An extensive network of P.W.D., Forest Department, tea estate and zilla parishad roads exist inside the Reserve. The hilly regions to the north of the Reserve are accessible by bridle paths. However, most of the roads have been damaged as a result of the floods in 1993.

1.5.5 Habitation and Agriculture: In the 37 forest villages inside the Reserve (both sanctuary and Tiger Reserve), farmers generally raise a rainfed crop

of paddy, besides cultivating maize and vegetables during the winter months. 200 ha is taken up for orange orchards, in the hilly north western part of the Reserve, by some of the Forest Villages.

- 1.6 Staff and Equipment: The Reserve is currently being headed by a Field Director of the rank of Conservator of Forests, assisted by one Deputy Field Director of the rank of Divisional Forest Officer. In addition, there is one Deputy Field Director, one Assistant Field Director and an Assistant Forest Officer. There are 18 Forest Rangers, 103 Deputy Rangers/Foresters and 289 Forest Guards, besides other miscellaneous staff. The total field and office staff strength for the Reserve is 598.

The Reserve possesses one truck, five vans, four jeeps, one car, four motor cycles, apart from other equipment. A radio communication net work has been installed. A fully equipped veterinary laboratory also exists.

- 1.7 Management Plan: The first Management Plan for the Reserve was prepared for the period 1983-84 to 1989-90. The second Management Plan for the period 1990-91 to 1999-2000, has also been prepared and is currently awaiting approval. [Anon.ud.a]

- 1.8 Major Management Issues: The major management issues of BTR are:

- 1.8.1 Forest Villages in the sanctuary and the 'Unregistered' population in forest villages: Chunabhati, Santrabari, Bhutiabusti, Lepchakhawa, 28th Mile, 29th mile, Sankosh, Kumargram and Newlands forest villages are located inside the Sanctuary. These villages and their livestock are serious detriments to sustenance of biodiversity and conservation values of the core area. The original settlers of these FVs had certain rights like land for homesteads, land for cultivation and usufruct rights in clear felled timber and NWFP collection. Now their population has increased in number and the new households are demanding new lands and concession. This has led to conflicts with the FD.
- 1.8.2 Timber Poaching: There are 26 saw mills, four Veneer units and 70 furniture and carpentry shops near the Reserve, which largely depend on timber sale from these forests. With gradually dwindling timber harvests by the FD, their livelihood is in jeopardy. Timber theft is mainly in the riverine tract. 1200 m³ of timber per annum is illegally removed, out of which 60% is intercepted and seized.
- 1.8.3 Commercial demand for fuelwood: There are 287 recognised firewood dealers around the Reserve. Numerous tea estates in the adjacent area also meet their fuelwood requirements from the annual felling of the forests. Supply of timber and fuelwood to these agencies has been drastically reduced since 1985. Fuelwood is collected by local people both for their own consumption as well as for sale. [EDP-3]. Illicit removal of fuelwood by headloads and vanloads, and timber felling is also reported to take place [EPD:2]. A sample study has revealed that fuelwood consumption by these villagers is 5.8 quintals per capita, per annum, of which 4 quintals is drawn from the neighbourhood forests. Annual removal on this account is therefore 33,800 m.t. and 8% of this quantity is collected from the NP and Sanctuary [EPD-3].
- 1.8.4 Excessive livestock grazing: There are approx. 1,05,000 heads of livestock in and around the area of the Reserve. Most of these have low milk yields but are kept more for their dung and meat value. [EDP-3]. Illicit grazing and lopping of trees for fodder is also reported to take place [edp:2].

1.8.5 Non-wood Forest Produce (NWFP) : NWFP collected from inside the Reserve includes medicinal plants, bamboo, cane, fruits, seeds, Simul floss, Dioscoria tubers, edible and decorative mushrooms, resin, gum, honey etc. Alipurduar town is reported to be the biggest market for NWFP adjacent to the Reserve. Subsidiary markets are also located at Kalchini, Hamiltonganj, Hashimara, Barobisha, Kamakhyaguri and Jorai. [EDP-3].

2. THE PROTECTED AREA SURROUNDS

2.1 Population: Except for the northern boundary of the Reserve, which is contiguous with the international boundary between India and Bhutan, it is surrounded by villages and tea estates. As per the 1991 census, there are approximately 2,10,249 people residing in 44 revenue villages and 25 tea estates, that have a common boundary with the Reserve. In the tea estates the percentage of scheduled castes and scheduled tribes is 10% and 51% respectively and that in the revenue villages is 36% and 43% respectively. Alipurduar municipal area, with a population of about 26,000, is within 5 km of the Reserve boundary. The people residing in the tea estates own 29,190 cattle and the people residing in the revenue villages own 42,494 cattle.

2.2 Landuse: Tea estates and agriculture villages are the primary forms of land use in the Reserve surrounds. There are 25 tea estates immediately adjacent to the Reserve besides 44 revenue villages. There are also a few small towns such as Alipurduar, Kalchini, Kumargram within 5 km of the Reserve boundary. Reserved Forests controlled by the Territorial Wing exist to the south of the Reserve. NH 31 passes through the adjacent area while the NEFR has a meter gauge railway line running through the region.

People from non-tea estate mouzas are primarily agriculturalists. Some own land while others work as agricultural labourers. In tea garden mouzas, employment is primarily in the estates themselves, either in the form of permanent workers or casual labourers. A certain amount of livestock is maintained by most people. [edp:2]

The main crop grown is rain-fed paddy. During the winter months some maize and vegetables are also grown. In the lower regions, where water availability is higher, jute is widely cultivated. [Roy 1993:2].

2.3 Existing Development Programmes: The Buxa Tiger Reserve started with **EcoDevelopment** work since the year 1991-92. During the last two years the Eco-Development activities consisted of the following types of works.

- i) Arranging minor irrigation facilities.
- ii) Arranging drinking water facilities through ring well, tube well.
- iii) digging of pisciculture pond.
- iv) Arranging Apiculture with Apis mellifera.
- v) Arranging distribution of fruits species including grafts.
- vi) Providing elephant proof electric fencing for local farmers.
- vii) Soil Conservation works.

Development programmes of the government are being implemented with active involvement of the local panchayats. They are as follows:

Minor irrigation

Drinking water

Power: During the last 5 years electricity has been made available at Jainti and a few semi-urban centres like Barabisha, Samuktala, etc.

Health

Veterinary

Education

Cottage Industry: Scheduled Caste and Tribes Welfare Department have established 2 semi-automatic handloom complexes to train and employ tribal people.

3. Local Dependencies on the Protected Area

3.1 Biomass

3.1.1 Grazing: The large number of cattle kept by the people both inside and outside the PA depend on the PA for fodder.

3.1.2 Fuelwood collection: The villagers inside and outside the PA depend on the forests for fuel wood collection. The tea estates require a large amount of fuel wood to supply to their labourers. Besides, the casual labourers employed by them collect fuel wood from the forests.

3.2 Non-wood Forest Produce (NWFP): The landless poor and the tribals depend on the forest for a number of NWFP produce like medicinal plants, fruits, seeds, Simul floss, Dioscoria tubers, edible and decorative mushrooms, resin, gum, honey etc.

3.3 Small timber and boulder: Small timber is collected for house construction and repairs and for making implements. In addition boulders were collected from some river beds for meeting the requirements of PWD, Irrigation and Railway Departments.

3.4 Income (Employment): Forest villagers and a small amount of fringe population are dependent to a large extent on wage employment provided by the FD. Each recognised terst village family used to get about 100 days of employment per year.

3.5 Socio-cultural: There is a considerable emotional dependence on the forest, by tribal groups like Rava, Mech etc, who inhabit the adjacent area.

4. IMPACTS ON/OF PA

4.1 Negative impacts of the people on the PA: The ever-increasing human population in and around the Reserve and the related increase in livestock, demand for fuelwood and fodder, are having a definite impact on the Reserve. In addition, the mining activity is also likely to have had an adverse impact. It is reported that the dolomite mining on the hill slopes have contributed to excessive detritus discharge in the streams and rivers, and disturbances to the ecosystem [EDP-3].

4.1.1 Habitat destruction due to fuel wood collection and timber collection and NWFP collection.

4.1.2 Disturbance due to mining.

4.1.3 Over-exploitation of species like cane for the various cottage industries.

4.2 **Negative impacts of the PA on the people**

- 4.2.1 Property and crop damage by Elephants: During the monsoon and post-monsoon period, Elephants are reported to move down to BTR from the higher reaches of Assam and Bhutan. These herds are believed to be in search for salt, which in its natural state gets leached due to constant rain. While looking for salt, they raid inhabited areas, damage crops and property, and cause loss of human life.

Some compensation is currently being paid which the local people feel is inadequate. [Roy 1993:12].

- 4.2.2 Restrictions on grazing: Restrictions imposed of the grazing of cattle within the PA has caused hardship among the people.
- 4.2.3 Reduction in employment availability The stoppage of forestry operations has deprived people of employment.

5. **ISSUES AND CONSTRAINTS**

- 5.1 There are many major issues related to the PA and the people of the adjacent area which need to be addressed.

- 5.1.1 Unemployment: Forestry operations in the past used to provide considerable employment to the local population, especially in forest villages. With these operations now having been reduced drastically, there has been a steady increase in unemployment, in the absence of any alternate source of employment. Possible solutions are; (1) provide wage employment in bio-mass generation; (2) provide wage employment in forestry operations; (3) provide income generation schemes.
- 5.1.2 Low agricultural productivity: Agriculture in the region is primarily rainfed, though the region is crisscrossed by several perennial rivers and streams. Although some medium to big farmers have the capacity to install pumpsets and construct irrigation channels, for the majority only one crop is taken and land left fallow after the monsoon crop. The solutions suggested are as follows:
- i) Locating wells for irrigation.
 - ii) Minor irrigation schemes like impounding water in small streams.
 - iii) Increasing productivity by imparting extension education in agriculture.
- 5.1.3 Lack of local NGOs: In the immediate vicinity of BTR there is currently no NGO that will be in a position to undertake the codevelopment planning and implementation exercise. The solution is to equip local community groups to take up the tasks ordinarily performed by NGO. Well established NGOs at state level can also be involved.

- 5.1.4 Grazing: An estimated 1,05,000 heads of livestock graze in the Reserve. These are unevenly distributed, leading to a very high livestock density in some parts of the Reserve. The solutions are;
- i) to establish fodder plantation on wasteland.
 - ii) improving quality of livestock and persuading people to stall feed them.
- 5.1.5 Demand for fuelwood: The major pressure on the Reserve is fuelwood extraction for commercial sale. The solutions are;
- i) establish fuelwood plantation.
 - ii) establish JFM of the surrounding forests.
 - iii) discourage fuel demanding industries in the vicinity.
 - iv) ask tea estates to have their own fuelwood plantations.
 - v) introduce fuel efficient stoves.
- 5.1.6 Crop depredation and loss of life and property: At the moment this is the most contentious issue for the Reserve authorities (refer section 4.2.1). The solutions are;
- i) erecting energised fences and placing Saltlicks at appropriate places.
 - ii) giving crop compensation and compensation for human and livestock death or injury.
 - iii) giving a lumpsum amount to the village ecodevelopment committee for crop protection. This amount will cover the wages of watchmen who will patrol village boundaries adjoining the forest. In the event of crop damage these committees will decide the compensation and damages to be disbursed to the affected farmer.
- 5.1.7 Staff Orientation: The BTR staff urgently need to be oriented to handle ecodevelopment projects. This is essential to boost their confidence in interacting with the local people. This problem can be overcome by conducting training programmes.
- 5.1.8 People's participation in Management: People should be increasingly involved in planning for, and managing protecting, the PA. They should develop a stake in the PA and should be partners and not antagonists, in its protection. Appropriate institutional structures have to be strengthened for the purpose.
- 5.2 Support systems: Support systems needed for implementing the planned activities identified in section 5.1 are as below:
- 5.2.1 Human resources development would include various training inputs needed for carrying out the proposed management and ecodevelopment activities. Training for income generation activities will be carried out. Local artisans who are capable of making and selling stoves will be given training, on the principles of fuel efficiency, so that they could use their own innovation for making locally suited and acceptable stoves and sell them. Training for setting up biogas plants will be given.
- 5.2.2 Awareness programmes for both visitors and local people, focused on the value of the PA and its linkages with the regional, national and global conservation efforts, will be started. An attempt to establish an exchange of

knowledge between local persons, especially tribals, and scientists, where the former will share their understanding of local resources, medicinal and other social significance of plants and animals, and the local nomenclature and understanding. The scientist would, on the other hand, share their understanding of the regional and global issues. The activities aimed at developing awareness include inviting school children from the surrounding areas to interpretation centres, screening films, inviting the tribal elders to share their knowledge and arranging day visits to the PA for local people so that they also have an opportunity to enjoy and appreciate the PA. NGOs' help will be solicited for carrying on a campaign to use crop residue better and to improve the livestock situation.

- 5.2.3 Institutional structures: Existing FPCs/EDCs, in future can interact with the BTR authorities and other concerned agencies on implementing and planning site specific ecodevelopment packages.

It is also proposed to identify local NGOs which have been working on rural development issues in the area, so that they can be involved in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

It is proposed to have an institutional mechanism, in the form of village ecodevelopment committees, which would prepare, with the help of the micro-planning teams, the village ecodevelopment plans, and implement them. An Ecodevelopment Cell will be formed at PA Headquarters. This Cell will primarily be responsible for collating data on micro planning.

It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary or, in his/her absence by the Forest Secretary. This would be supported by a district level co-ordination committee, convened by the Field Director, involving the local collector and chaired by Sabhadipati of Zilla Parishad. Such committees will co-ordinate the inputs of the various line departments like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in better co-ordinating protection measures.

It is also proposed to have an institutional mechanism for co-ordinating ecodevelopment and PA management activities with district and forest authorities in West Bengal.

In addition, the BTR authorities should also arrange for some marketing mechanisms which will allow the local people to sell some of their products to tourists visiting the Reserve.

5.2.4 Research:

- Periodic determination of Phyto-diversity values in different forest types.
- Ecological stratification of wild fauna in BTR.
- Determination of Zoo-diversity through the following studies:
 - i) Entomological diversity study.
 - ii) Distribution and status survey of lesser cats, turtles, and birds.
 - iii) Determination of grazing incidence index for different regions of BTR.
 - iv) Occurrence and utilisation of NWFP.
 - v) Markets and marketing prospects for NWFP.
 - vi) Institutions building processes - whether stable, dynamic and effective FPC/EDC are formed with proper motivation.

II. THE PROJECT

1. **Rationale**

- 1.1 Biodiversity value: Buxa Tiger Reserve has an exceptionally high diversity for its size and location. (See section 3, Ecosystems and Biodiversity values). Among 19 tiger reserves in India it has the second highest altitude, after Namdapha Tiger Reserve in Arunachal Pradesh. Although few studies have been done in the area, several threatened species of flora and fauna have already been recorded from the Reserve. Rodgers and Panwar have the following to say of Buxa, "These areas are one of the most important conservation sites in India offering protection to potentially viable populations of several endangered species of national importance..... This network incorporates major elephant migratory routes as well as allowing the development of genetically viable population of species such as tiger".
- 1.2 Threats: At present there are a combination of pressures on BTR through habitation and biomass requirements of local populations. The Project will have to directly address each of these pressures to evolve new, more efficient and less destructive, ways of habitat utilisation to meet local needs. Other threats include mining and timber poaching.
- 1.3 Viability of strengthening management: The existing management capability of the Reserve can be upgraded to ensure better protection. All levels of staff need training and orientation in both wildlife management as well as ecodevelopment. Some additional equipment and infrastructural inputs will also be required.
- 1.4 Viability of ecodevelopment approach: Ecodevelopment inputs have been made in and around the Reserve for the last two years, with some measure of success. It started in the year 1991 (refer on section II, 2.3). Lessons have also been learnt through experience that will ensure a greater degree of success for any subsequent efforts in this direction. However, a review will have to be done of past processes and an evaluation of all ecodevelopment activities undertaken.
- 1.5 Cooperation of State government and Protected Area authorities: West Bengal has been one of the pioneering states in the country for new initiatives in forestry and conservation. Joint Forest Management as a concept was first tried successfully in West Bengal. The ecodevelopment process is not new to the state either. The experience of the Bank- funded West Bengal Social Forestry Project will stand in good stead for this Project as well.

- 1.6 Local community's cooperation: BTR is perhaps one of the few protected areas in the country where ecodevelopment, and participatory management procedures have already been initiated. The Forest Department commands a fair degree of goodwill with the people, more so after the recent floods (1993), when all relief effort was almost exclusively handled by the Reserve authorities.

2. Project Description:

2.1 Strategies for management:

- 2.1.1 Repairing/improving road network. This activity has been necessitated because of the damage caused by the floods of 1993.
- 2.1.2 Soil and Water Conservation
- 2.1.3 Electric fencing against elephants for crop protection.
- 2.1.4 Habitat improvement.
- 2.1.5 Protection against timber poaching.

2.2 Biomass generation

- 2.2.1 Initiate fodder pastures in the multiple use zone. Reduce the number of cattle and improve their quality.
- 2.2.2 Fuelwood plantation in the multiple use zone.
- 2.2.3 Initiate JFM activities in the reserve forests of multiple use zone to supplement the fuel and timber which is currently being procured from the PA. Establishment of community run nurseries.

2.3 Income generation activities:

- 2.3.1 The income generation activities will include mushroom culture, Apiculture, Poultry, duck keeping, pig keeping, Bamboo/cane cottage industry, and handlooms and other cottage industries.

References:

Anon. (undated a) A Note on Buxa Tiger Reserve, mimeo.

Anon. (undated b) Mining in Buxa Tiger Reserve, mimeo.

Anon. (undated c) Important Fauna of Tiger Reserves, Project Tiger, Ministry of Environment and Forests, New Delhi

Anon. (undated d) Important Flora of Tiger Reserves, Project Tiger, Ministry of Environment and Forests, New Delhi

EDP-1 (undated) Eco-development Project : Buxa Tiger Reserve, mimeo. EDP2- Roy, S. (February 1993) Eco-Development Programme in Buxa Tiger Reserve. Project Identification Report mimeo., Department of Forests, Government of West Bengal

EDP3- Roy, S. & Sanyal P. (September 1993) Ecodevelopment Project, Buxa Tiger Reserve, West Bengal, Department of Forests, Government of West Bengal.

Ghosh, A.K. (ed.) (1993) Fauna of Tiger Reserves : An Overview Zoological Survey of India, Calcutta

Pundarikakshudu, T.B. (1987b) Memo. no. 2/TBPK/BTR/87 dated 07.02.1987, from Shri T.B. Pundarikakshudu, Field Director & Ex-officio Wildlife Warden, Buxa Tiger Reserve, to Shri Bittu Sahgal, Member Steering Committee, Project Tiger

Pundarikakshudu, T.B. (1987a) Memo. no.106/28-4/86-87 dated 28.01.1987, from Shri T.B. Pundarikakshudu, Field Director & Ex-officio Wildlife Warden, Buxa Tiger Reserve, to Chief Conservator of Forests & Ex-officio Chief Wildlife Warden, West Bengal

Sanyal, P.C. (1993) Project Document for Global Environment Facility : Buxa Tiger Reserve, mimeo. (draft)

Annexure-A

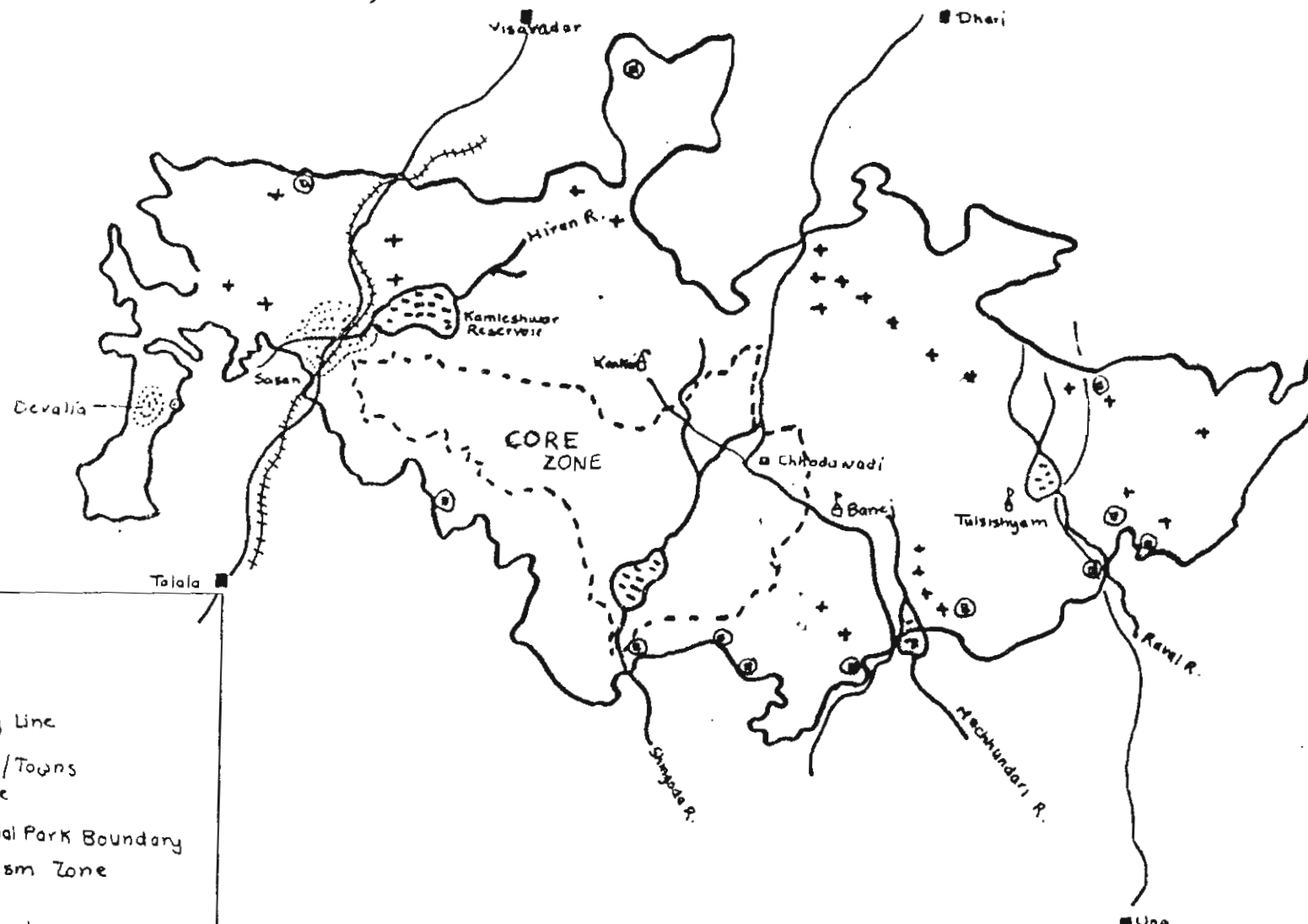
PRA Report

The Regional Centre for the National Afforestation and Eco-development Board, Jadhavpur, have collected detailed secondary data from each village. Sample proformas have been given as annexures in the Ecodevelopment plan by Shri S.Roy, CWLW, West Bengal. Shri A.K.Samatha AFO, BTR has been trained in PRA techniques in WII, Dehradun and has surveyed two villages, Jayanti Bazar and Chipra Forest Village in the North Rydak range.

All the PRA technique like transect line, time line, seasonality, resource and social mapping, and preference ranking of problems, were used.

The most important problem emerging from the survey is the concern the people have regarding floods. The second most important problem identified by the people was unemployment, followed closely by the shortage of drinking water. The lack of medical and educational facilities was also are mentioned. Where agriculture is practiced, the lack of irrigation facilities was identified as a major problem. The main crop is paddy and it requires extensive irrigation.

GIR NATIONAL PARK



LEGEND

- Road
- Railway Line
- Villages/Towns
- Temple
- National Park Boundary
- Tourism Zone
- River
- Reservoir
- Neas
- Forest Settlement Village

GIR NATIONAL PARK

I. THE PROJECT AREA (kindly refer to the attached map while reading the text)

1. The Protected Area

- 1.1 Location and Approaches: The Protected Area (PA) comprises of the Gir National Park which is located in the Kathiawar Peninsula in Saurashtra, Gujarat. It falls within Junagadh and Amreli districts, between latitudes 20° 57' to 21° 20'20" N and longitudes 70° 27' to 71° 12'52 E.

The PA headquarters are within the PA at Sasan Gir. The nearest airport is at Keshod, which is eighty nine kilometres from Sasan-Gir. The closest railhead is at Sasan-Gir. The PA can be approached from Ahmedabad to Junagadh by train or bus (408 km), then on partly through the PA to Sasan-Gir (60 km) by bus or by meter-gauge train.

- 1.2 Legal Status, Area and Zoning: The entire PA is comprised of various Reserved Forests, initially notified by the former states of Baroda and Junagadh, between 1882 and 1945, and by the Government of Gujarat, under the Indian Forest Act of 1927, between 1963 and 1974 [WP].

An area of 1,26,501.72 hectares was declared a Wildlife Sanctuary on 18 September 1965 vide the Gujarat Wild Animals and Wild Birds Protection Act 1962 [Notification No. : GH KH /97-WLP/660/62848 - P]. To this an area of 14,711.43 ha. was added on 16 January, 1974, under Section 18 of the Wildlife (Protection) Act, 1972 [Notification No. AKH/29 -WLP/1073/91126 - P].

Subsequently, part of the Sanctuary was declared Gir National Park vide two notifications - Notification No. GKH - 167A/WLP/2074/92133 - P, dated 21 May 1975, covering 14,040.40 ha. and Notification No. GKH - 97- 78A/WLP/2074/89387 - P, dated 12 July 1978 covering 11,831.02 ha. Thus, an area of 25,871 ha. was declared as Finally Notified National Park

The Government of Gujarat declared intention to constitute the Sanctuary area of 1,15,342 ha. into a National Park vide Notification No. AKH/41-82/WLP -1082- 2 dated 20 February 1982.

This area area of 1,15,342 ha. has been finally notified as a national park vide Circular No. WLP/24(2)/B/4694 - 6770, dated 7 July 1993, issued by the Chief Conservator of Forests (WL), Gujarat State, under Section 35(4) of the Wildlife (Protection) Act, 1972 as amended in 1991.

Date	Area (ha.)	Legal Status	Final Area/Unit (ha)
18 September, 1965	1,26,501.72	Declared Sanctuary	1,26,501.72/Sanctuary
16 January, 1974	14,711.43	Add to Sanctuary	1,41,213.15/Sanctuary
21 December, 1974	14,040.4	Notified Intended NP	1,41,213.15/Sanctuary of which 14,040.40/Int. NP
21 May, 1975	14,040.4	Final notification NP	1,27,172.75/Sanctuary 14,040.40/NP
3 September, 1976	11,831.0	Notified Intended NP	1,27,172.75/Sanctuary of which 11,831.00/Int. NP
12 July, 1978	11,830.6	Final notification NP	14,040.40/NP 1,15,342.02/Sanctuary 25,871.41/NP
20 February, 1982	1,15,342.0	Notified Intended NP	1,15,342.02/Sanctuary of which 1,15,342.00/Int. NP 25,871.00/NP
7 July, 1993	1,41,213.15	Final notification NP	1,41,213.15/NP

Zonation: The PA has no core or buffer zone. In the western part of the PA, around Sasan, 5 main routes have been identified for tourist use. These are:

1. Sasan-Bavalwala Chowk-Valadar-Kamleshwar-Sasan: 12 km.
2. Sasan-Bavalwala Chowk-Khokhara-Sirwan-Devadungar-Sasan: 16 km.
3. Sasan-Ratandhuna-Pilipat-Kadeli-Raydi-Dudhala-Dedakadi-Sasan: 16 km.
4. Sasan-Bhambhafod-Naviraydi-Dudhala-Dedakadi-Sasan: 13 km.
5. Sasan-Ratandhuna-Pilipat-Bhambhafod-Sasan: 10 km.

During the Nature Education camps conducted in November and December, the following trails are used:

1. Adholiya-Talbela-Pilipat-Ratandhuna-Adholiya.
2. Adholiya-Ravanchhel-Bavalvalchowk-Valadar-Dantiya-Adholiya.
3. Adholiya-Dantiya-Valadara-Adholiya.
4. Adholiya-Ravalchhel-Gantalo-Kankainaka-Adholiya.

There are no plans to increase the area of the tourism zone.

In addition, there is an Interpretation Zone at Devalia, twelve kilometres from Sasan, within the PA, comprising of 410 ha of representative Gir habitat. These have been fenced in, enclosing a variety of wildlife.

Administration: The PA is divided into fourteen ranges and thirty eight blocks. The Conservator of Forests (Wildlife) based in Junagadh is the person responsible for matters relating to the administration and management of the PA. He has three Deputy Conservator of Forests (DCF) working under him. For management purposes, the PA is divided into two divisions: Gir West and Gir East. DCF of Gir West is based at Junagadh and that of Gir East at Dhari. The third DCF (Wildlife) is in-charge of matters related to wildlife management and is based at Sasan-Gir and is responsible for both Gir East and West.

The Gir West and Gir East DCF's are responsible for protection work, fire and water-hole management, payment of compensation for

livestock kills and maintenance of roads and buildings. The DCF (Wildlife) at Sasan is responsible for the management of tourism, conducting nature education camps, maintenance of the wireless network and for the capture of lions and leopards outside the PA [RC].

1.3 Description of Ecosystem:

Topography and Climate: The area is "rugged and hilly ... slopes are generally moderate... Hills are of volcanic origin...The prevailing rock is dolomite or basalt (and) limestone is of common occurrence" [WP]. Soils range from lateritic soil in much of the north and east of the PA, to black cotton soil in the south west and along many of the valley floors [RC]. The highest point is 528 m. above msl and the lowest point is 152 m. above msl.

The maximum and minimum temperatures are 44.4° C and 10° C respectively. The summer months are from March to June, with the hottest days being in the month of May.

The monsoon months are from mid-June to mid-October, winter rain being unusual. The maximum and minimum annual rainfalls are 1730mm and 210 mm respectively. The mean annual rainfall is 1000 mm [Q1]. There is a decreasing rainfall gradient on a west to east axis. Data from Kamleshwar reservoir, in the western region, for 29 years (1960-88) and for Raval reservoir, in the eastern region, for 10 years (1979-88) show the average rainfall to be 1013 mm and 633 mm respectively [RC].

Hydrology, Wetlands and Water Bodies: There are eighteen perennial and seven seasonal, artificial, water tanks; seventy five perennial man-made water holes and four perennial irrigation dam reservoirs.

The area is divided into a number of watersheds from where streams originate and feed the five principal rivers - Hiren, Shingoda, Machhundari, Zamri and Raval. These rivers are perennial except in severe drought years. All these rivers flow from north to south.

The area has numerous streams, which are seasonal, and retain water for only a few months after the monsoon. During the dry season, water is a limited resource, restricted to the perennial rivers, the deep rock pools and the reservoirs [RC].

Flora: The PA is the only remaining patch of natural forest in the entire Saurashtra peninsula [RC]. There are 81 common tree species, 48 herb and shrub species, 18 species of climbers and 14 species of grasses, including bamboo, occurring in Gir National Park.

The vegetation of the western part of the PA differs significantly from that of the eastern part. In the west, the predominant forest type is Very Dry Teak Forest (5A/C1(a)) with Teak (*Tectona grandis*) as the dominant species. This occupies about half the area of the PA (approximately 70,000.0 ha.). In the east the main forest types are Dry deciduous Scrub (5/DS 1) and Dry Savannah Forest (5/DS 2) (which are locally known as 'vidis'). These two forest types comprise most of the other half of the PA. The predominant species in both areas is Khair (*Acacia catechu*), Dhavdo (*Anogeissus latifolia*) and other related species. The fodder grasses found in this area are sanjar (*Schinus nervosum*), zinzvo (*Dichanthium annulatum*), moshti (*Iseilema antheperoides*) and dheraf (*Chrysopogon montanus*)

Along the principal rivers and streams one finds dense evergreen growths of species such as Jambu (Syzygium cumini), Karanj (Pongamia pinnata), and Ficus species.

Several plantation schemes were launched in 1961-62 and carried on briefly after the area was declared a sanctuary. These included plantations of Agave (Agave americana), Bamboo (Dendrocalamus strictus) and some (unspecified) fast-growing and soil-conservation species. Teak plantations have also been carried out in the past, but were discontinued in 1974-75. More recently, between 1979-80 and 1983-84, 7812.91 ha. were planted for improving wildlife habitat. Species planted included Khair (Acacia catechu), Babul (Acacia nilotica), Amla (Embolia officinalis), Gorad (Acacia senegal), Neem (Azadirachta indica), Kadaya (Sterculia urens), Sisoo (Dalbergia sisoo), Bamboo (Dendrocalamus strictus), and others [DS].

The forests of Gir have been considerably changed due to past logging, grazing, fire, and other factors. These factors have played a significant role in the successional pattern of the plant communities in the PA. One of the obvious differences is the dominance of thorny species such as Acacia and Zizyphus on the one hand, and fire resistant species such as Acacia catechu, Terminalia crenulata and Diospyros melanoxylon on the other hand [Khan]. In some places these forests have been invaded by weeds, including Lantana camara, Neurocanthus spherostachys, and Cassia tora, however the spread of these weeds is localized [DS].

Fauna: Gir contains the last wild population of the Asiatic Lion (Panthera leo persica), with the 1990 count being 284 lions [RC]. (See Annexure B for details on the lion). The forests of Gir contain 31 mammals, atleast 24 species of reptiles, almost 300 species of birds and more than 2000 species of insects [Note].

Apart from the Lion, some of the other Schedule I and endangered species are Chowsingha (Tetracerus quadricornis), Chinkara (Gazella gazella bennetti), Rusty spotted cat (Felis rubiginosa), Ratel (Mellivora capensis), Pangolin (Manis crassicaudata), Marsh crocodile (Crocodylus palustris), and Indian python (Python molurus).

Disturbance of nesting areas, stealing of crocodile eggs by humans and fishing in the Kamleshwar dam reservoir caused the decrease in crocodile numbers in the early 1970's. A captive breeding programme for the Freshwater crocodile was initiated in 1976-77, to increase the number of crocodiles in the area. An attempt has been made to re-introduce Blackbuck (Antelope cervicapra) into the PA. The Blackbuck became locally extinct in the area within the last forty years. In 1978, some were captured at Velavadar National Park and released into the PA, but they have not survived [DS]. Five or six pairs of Grey Hornbills were also released into Gir, in 1979-80, in an attempt to restart a population that had been exterminated by hunting. They have also not survived.

- 1.4 **Population:** There are 54 nesses (small pastoral settlements of cattle graziers called Maldharis) within the PA. These are inhabited by 2540 people and 9820 livestock [EP].

There are also approximately 65 people permanently occupying the three main temple complexes within the PA. Tulsishyam and Kankai temples have approximately 110 heads of cattle.

In addition, there are 14 forest settlement villages inside the PA with a total human population of about 4494 people and a cattle population of 4241 [EP1]. One of these,

the Sirvan forest settlement village, within the PA and approximately 13 km from Sasan is a settlement of Siddis who are of African origin and are classified as a Schedule Tribe. There are 239 Siddi's in this village [DCH]. For details on the Forest Settlement Villages see Annexure 3.

The data is summarised in the table below.

Human Settlements	Settlements	Population	Cattle Population
Maldhari Nesses	54	2540	9820
Temple Complexes	3	65	110
Forest Settlement Villages	14	4494	4241
Total	71	7099	14171

1.5 Land Use:

Grazing: The Maldhari's, who live in the nesses inside the PA, and the residents of the forest settlement villages, have concessions for grazing their cattle inside the PA, in the area that was till recently a Sanctuary. About 14,171 heads of livestock (including cattle and horses) from the nesses and forest settlement villages within the PA graze inside the PA [EP].

In addition, cattle from villages adjacent to the PA graze within the PA.

Temples: There are three main temples located within the PA - Kankai, Banej and Tulsishyam. Approximately 80,000 pilgrims visit these annually. (For details regarding the temple complexes see Annexure C.)

Tourism: Approximately 45,000 tourists visit the tourism zone within the PA annually [pers. com. Mr. Asari, CF].

Use by Other Government Agencies: The Irrigation Department has control over 1813.64 ha. which is the area of the four reservoirs, namely Kamleshwar reservoir, Tulsishyam reservoir and the reservoirs on the Machhundari and Shingoda rivers.

These reservoirs are used for irrigation and for supplying drinking water to habitations within and outside the PA.

There are four main thoroughfares, viz., Una to Dhari, Kodinar to Amreli, Talala to Visavadhar and Mendarda to Malia, passing through the PA, controlled by the Public Works Department. In addition, there are some "kutchra" (unmetalled) roads within the PA. The Forest Department controls about 3 km of transmission lines. The Railways have a medium gauge track running from Kansia to Sasan which passes through the western part of the PA. Six trains pass through the PA daily.

Land use in the PA, apart from wildlife habitat, is summarised in the table below:

<u>Use/Activity</u>	<u>Extent</u>
Grazing	
Temples (3)	
Tourism	6700 ha
Reservoirs (4)	1813.64 ha
Roads (6)	
Transmission Lines	3 kms approx.
Railway Line	13 kms approx.

- 1.6 Staff and Equipment: There is one Conservator of Forests, three Deputy Conservator of Forests, three Assistant Conservator of Forests, twenty six Range Officers and ninety eight Foresters, two hundred and fifteen Forest Guards, fifty six Naka Guards, forty three Wireless Guards, twenty nine Watchmen, two Cleaners, three Helpers and twenty Drivers [EP1].

The PA has a wireless network with five fixed and two portable sets, fifty four rifles/guns, ten pairs of binoculars and three dartguns [DS].

- 1.7 Management Plan: A 'Working Plan for Gir Forests', oriented towards wildlife conservation and therefore as a management plan for the PA, was written and approved in 1975 [WP]. It was applicable from 1976-1985. It has not, so far, been replaced by a new plan [FV]. The present management of the PA is based on the annual plans. The annual plans include mainly development activities and protection programmes for the area. The management plan has not yet been prepared for the PA [EP1]

1.8 Management Problems:

- 1.8.1 Habitation within the PA: There are 54 Maldhari nesses and 14 forest settlement villages within the PA. The FSV are mainly along the boundary of the PA.

- 1.8.2 Grazing and Fodder Extraction: Approximately 14,180 heads of livestock from the nesses and forest settlement villages within the PA, graze within of the PA. In addition, 94,582 cattle from villages within a 6km radius of the PA graze within the PA and are dependent on the PA for fodder. The livestock of the nesses within the PA graze all year round in the PA. The forest settlement villages and villages in the 6 km radius are dependent on the forest for about eight months and four months (during the monsoon), respectively [EP1].

The requirement for grass, from the PA, for the PA cattle and cattle within the 6 km radius works out to 3,22,518.86 metric tonnes annually [EP]. Grazing has modified the habitat. Most Maldhari nesses are located close to rivers, and the composition of the riverine habitat is gradually changing due to domestic livestock. Acacia and Zizyphus species have established themselves in the shrub layer of the habitat [Khan]. Due to excessive grazing there has also been a spread of the weed Lantana camara.

- 1.8.3 Temple Complexes: There is a legal problem associated with the Kankai temple trust. The temple trust has 50 acres of land leased to them by the Forest Department, to whom they pay an annual rent of twenty five rupees. There is a dispute regarding the lease, as the original lessee has passed away and the temple trust has taken over the lease. However, this is said to be illegal as the terms of the lease reportedly state that the land can not be transferred/leased/ or sold to another person. This land has not been denotified from the PA.

The Tulsishyam temple owns 1217.1 ha. of land within the PA. This land has been denotified from the PA [WP].

There is also one more temple, Banej, within the PA. The area occupied by Banej temple has not been denotified from the PA.

- 1.8.4 Thoroughfares: The PWD roads that pass through the PA are heavily used by tourists, pilgrims, inhabitants of the nesses and forest settlement villages within the PA and by the inhabitants of villages adjacent to the PA.

The Malia to Mendarda road and the Talala to Visavadhar road are used to get to Sasan. The Kodinar to Dhari road, via Chhodavadi, is used to get to Kankai and Banej temples, and the Una to Dhari road is used by pilgrims to get to Tulsishyam temple. The vehicles using the Kodinar to Dhari road are made to pay a fee. The Una to Dhari road is used by pilgrims to get to Tulsishyam temple. No heavy vehicles other than tourist buses are allowed to use this road.

There are regular bus routes along these roads. The impact on the PA is in the form of noise and air pollution, accumulation of litter along the roads, fires caused by carelessness, and disturbance to animals. In addition, people often leave their vehicles and wander off the road into the forest.

- 1.8.5 Railway Line: The trains that pass through the PA are powered by steam engines and, often, live coal embers from the engines cause fires. Various animals, including lions, are killed on the tracks.
- 1.8.6 Fuelwood Extraction: Temple complexes, forest settlement villages and Maldhari nesses within the PA are dependent on the PA for fuelwood. Villagers along the boundary of the PA depend almost exclusively on the PA for fuelwood needs.

The fuelwood requirement for nesses/villages in and within the 6 km radius of the PA is 1,54,050 kg. daily and 56,228.25 metric tonnes annually [EP1].

Firewood is for personal use as well as a source of income. Siddi women from the Sirvan forest settlement villages within the PA have been observed headloading [pers. com. N. Pandya].

Occasionally, unemployed youth enter the PA and collect headloads of fuelwood to sell in the nearby market [EP1].

- 1.8.7 NTFP Extraction: The following NTFP are collected: thorns and fruit of rayan (Manilkara hexandra), karamdi (Carissa carandas), amla (Emblica officinalis), bor (Zizyphus mauritiana) and aritha (Sapindus trifoliatius). Honey and wax are also collected. The Maldhari's also collect various plants for their own use as medicine.
- 1.8.8 Shortage of Water: There is a shortage of water during the summer months in villages adjacent to the PA. During the dry season, within the PA, water is restricted to the perennial rivers, deep rock pools and the reservoirs. Cattle from villages adjacent to the PA are brought to perennial water sources within the PA during the summer months. The cattle occupy the water sources for the entire day, thereby restricting access to wildlife. Also, the presence of cattle within the PA could cause the spread of diseases, such as foot and mouth and Rinderpest, to the wild herbivores.
- 1.8.9 Crop Damage: Wild boar, Nilgai, Langur and Chital do a lot of damage to the fields within the PA and adjacent to the PA. Crops such as groundnuts and sugarcane are favoured by Wild boar and Nilgai. No crop compensation is paid.
- 1.8.10 Fire: The incidence of forest fires is an annual feature in the PA. Usually these are ground fires and the Forest Department is able to control them. At times the fires burn extensive patches of the forest, depleting fodder availability and altering the vegetation in the area. These fires are both accidental and intentional.

- 1.8.11 High Density of Lions within the PA: A report on the lions of the PA, by Ravi Chellam, states: " Radio tracking of the beasts' home range showed that each animal required about 100 sq. km . Within an area of 1400 sq. km the Gir forests are capable of supporting only between 170 to 200 lions. Yet by last year their numbers had burgeoned to an ecologically unsound 284" as quoted in Chengappa , 1993].

The increase in lion numbers has resulted in a severe shortage of dispersal area for the subadult animals. Dispersing and displaced animals (pre and post prime animals) are forced out of the PA and they exist in the agricultural fields, or in very small patches of natural vegetation and scattered forest plantations, adjacent to densely populated human settlements. This leads to frequent encounters between lions and humans. A few lions have moved into a coastal plantation about 40 km west of the PA [EP1].

- 1.8.12 Attacks on Humans by Lions: In the last three years, 120 people were attacked, 20 of them fatally [R. Chengappa, 1993]. The presence of lions in revenue (private) lands surrounding the PA had long been considered an acceptable consequence of living near the PA. More recently, however, the increase in the attack rates following the drought and the qualitative shift in the attack behaviour, from exclusively mauling to incidences of direct predation, represents an alarming shift in the intensity and dimensions of lion-human conflicts in the region [Saberwal et. al., in press].

Villagers have expressed hostility towards the lions owing to the threat of personal injury and death posed by lions, and the economic costs associated with livestock losses due to lions. Lions also compel villagers to curtail their movements at night.

- 1.8.13 Livestock Kills: There were 1648 cases of livestock lifted from within the PA and 3322 lifted from adjacent areas in the period between 1979-80 and 1983-84 [Q1]. According to a study carried out by Ravi Chellam, the species composition of prey killed by lions within the PA (excluding the kills collected during the influx of livestock, July-December 1987 - drought period) from 1897 to 1990 showed that 64.8% of kills were wild prey and 35.2% were livestock. Of the 35.2%, 33.9% were cattle and 1.4% were camel kills [RC].

Leopards also prey on livestock within and outside the PA. In a study carried out in the PA, it was found that 86% of the villagers talked to complained that the compensation for livestock kills was too low. And 81% complained that there were extreme procedural problems associated with filing claims for compensation [Saberwal et. al.]. The lions that have dispersed out of the PA are totally dependent on livestock for their survival, because of the lack of wild prey.

- 1.8.14 Weed Infestation: There is a problem of Lantana camara and Neurocanthes spherostachys infestation in certain areas adjacent to nesses and FSV in the PA.

2. The PA Surrounds (6 km radius from the boundary of the PA)

- 2.1 Population: There are 97 villages within a six kilometre radius from the boundary of the PA, with a total population of 1,31,087 people and a cattle population of approximately 94,600 [EP1].

- 2.2 Land Use: A majority of the people living within the 6 km radius are cultivators. The main crops are groundnut, sorghum, sugarcane and cotton. There are also Mango

(*Mangifera indica*) and Chikoo (*Achras zapota*) orchards. Within the surrounds, which 17770.63 ha is forest land, 62,317.81 ha. is farm land (irrigated and un-irrigated) and 17541.57 ha is cultivable wasteland (including gauchar and groves) [DCII]. Villagers have mentioned that there has been a decline in the groundwater level adjacent to the PA.

- 2.3 Existing Development Programmes: Since 1992-93, the Government of India has sanctioned a component for eco-development activities around the PA. In addition, the State Government has a scheme for the development of forest settlement villages, which is implemented by the Forest Department. The State Government has also undertaken Nature Education Programmes, mainly for school children.

There are also some development programmes implemented by District Panchayat and the Integrated Rural Development Programme (IRDP) Agency. They are mainly integrated schemes for the villages, related to agricultural, horticultural and animal husbandry activities. Training of Rural Youth for Self Employment (TRYSEM), Development of Women and Children of Rural Areas (DWACRA), and the Jawahar Rojagar Yogana (JRY) are active around the PA [EP1]. The Aga Khan Rural Support Programme (AKRSP) covers two villages - Jalandar and Hiranvel within the surrounds. They have an integrated programme with farm forestry, afforestation, water resource development, biogas and animal husbandry components. With the help of AKRSP, Gram Vikas Mandals and Mahila Mandals have been set up in these two villages.

The Forest Department has initiated Joint Forest Management in Hiranvel, in association with AKRSP. They have also undertaken soil and water conservation projects in several villages.

3. Local Dependencies on the PA

- 3.1 Biomass: The people from within and around depend on the PA for grazing their cattle, for fodder, fuelwood and NTFP. They also depend on the PA for small timber and for soil, which is added to livestock dung for use as fertilizer.
- 3.2 Income: People living in and around the PA collect headloads of fuelwood for sale. They also get employment in the Forest Department and in tourism related activities.
- 3.3 Routes: Roads within the PA are used by residents of the PA, as well as by people of surrounding villages, tourists and pilgrims.
- 3.4 Socio-cultural: The temple complexes within the PA attract pilgrims from adjacent areas as well as from all over India.
- 3.5 Water: Water from the reservoirs within the PA is utilized by the inhabitants of the PA as well as by people in adjacent villages. Waterholes within the PA are used by livestock from within the PA as well as from adjacent villages during the summer months.

4. Impacts on/of PA

4.1 Negative Impacts of the People on the PA:

- Degradation and alteration of the ecosystem due to grazing.
- Destruction of habitat due to forest fires, both accidental and intentional, started by people collecting NTFP, and by trains.
- Air and noise pollution due to traffic on thoroughfares.
- Disturbance to animals due to the large number of pilgrims and tourists within the PA.
- Accumulation of solid waste around temple complexes, Maldhari huts and forest settlement villages.
- Degradation of forest due to removal of fodder and small timber.
- Change in the behaviour and diet of the lions due to the availability of a large number of livestock prey within the PA.

4.2 Negative Impacts of the PA on the People:

- Shortage of biomass due to restrictions on use of the PA for grazing, removal of fuelwood, NTFP and fodder.
- Decrease in income due to restrictions related to collection of fuelwood.
- Socio-cultural deprivation because of restriction on the activities and movements of pilgrims within the PA.
- Restriction on use of certain thoroughfares and payment of fees for the use of certain roads.
- Crop damage by wild animals.
- Cattle depredation by wild animals.
- Injury and loss of human life due to attacks by wild animals, especially by lions and leopards.
- Restriction of people's movements, especially at night, due to danger of attack from lions and leopards.

5. **Issues and Constraints:** Of the management issues listed above, in section 1.8, the following are being addressed under this project:

5.1 Grazing and Fodder: The options for managing the grazing pressures on the PA are:

- a. To develop fodder pastures on village wastelands, outside the PA, where these are available (PRA).
- b. To provide the grass cut from firelines to the villagers for fodder (PRA).
- c. Where possible, to upgrade the cattle to high yielding varieties (PRA).
- d. To encourage stall feeding and use of commercial cattle feed (PRA).
- e. To try and wean people away from cattle rearing and provide them with other suitable employment. Neither one option would be adequate, depending on the area, various options could be implemented.

5.2 Cattle Kills: The solution for this problem is to adequately compensate people for their livestock, where livestock has been killed outside the PA, and reduce the procedural problems related to claiming compensation. Safe livestock holding pens need to be developed in the villages.

5.3 Crop Damage: The following solutions can be attempted:

- a. Crop protection measures such as live fencing, trenches, etc.
- b. Participatory patrolling of fields by local people.
- c. Crop insurance.

A package consisting of all of the above should be implemented.

5.4 Fuelwood Collection: The options for managing the pressure on the PA for the collection of fuelwood are:

- a. To develop fuelwood plantations on wasteland, outside the PA.
- b. Alternative energy sources such as biogas plants, windmills and solar energy, and introduce energy conservation measures (PRA).
- c. Alternative sources of income generation for the people dependent on headloading as a source of income.
- d. To encourage people to grow fuelwood species on their own land, outside the PA, to meet some of their own fuelwood needs.

Option a. will be feasible for villages that have sufficient land. Options b., c., and d. seem most feasible. Biogas plants have already been established within the PA and in the surrounds, and these have proved satisfactory. There is scope for expansion in the number of plants. Solar energy has been tried but has not been successful mainly because of the lack of training for the user and no follow up on maintenance of the solar plants [pers. com. Ismailbabu and other villagers].

Providing alternative sources of income for the villagers dependent on head loads would be feasible. Neither one of the options would be adequate by themselves, and all three should be tried.

5.5 Thoroughfares: The following options are suggested for minimising the deleterious impact of road traffic.

- a. Restrict the use of roads as thoroughfares by vehicles, the roads outside the PA can be used instead.
- b. Provide transport for the residents of the PA to take them to the local markets or link them to the nearest bus route outside the PA (could use battery vans).
- c. Use of the roads restricted to the daylight hours.
- d. Restrict heavy vehicles on the roads.
- e. Maintain regular patrols and check posts on the roads to monitor traffic and ensure that there is no speeding.
- f. To provide special battery buses that take the pilgrims from the boundary of the PA to the temples, along specified routes.

A combination of all these the options should be attempted. Option a. should be adopted and vehicles using the PA roads, as thoroughfares, should be stopped. There are roads outside the PA linking taluka headquarters and other towns, which they can use. The distance would be greater, but the roads outside the PA are in a better condition than those inside. Along with Option a., Option b. should be implemented. Residents of the PA, who have up to now been dependent on the local buses, should be provided with transport to the nearest bus stop or roadhead outside the PA. Wherever possible, battery vans should be used.

Use of all roads within the PA should be restricted to daylight hours and to light vehicles. Option f. should also be implemented. Special transport, at regular intervals from the boundary to the temple complexes and back should be started.

Policing and monitoring of the area should also be done, by special staff recruited by the Forest Department.

- 5.6 Temple Complexes: The temple complexes are fairly self-sufficient and meet their needs within the area allotted to them. If they continue to remain so, and the number of temple staff and cattle do not increase, the temples in themselves do not pose a threat to the PA. The temples have been within the PA for a long time and could be allowed to remain.

Restriction on the number of livestock and permanent staff should be placed. The use of alternative fuel sources should be encouraged. Existing biogas plants should be maintained and where there is capacity for more plants, they should be established. Solar energy devices should also be encouraged. On the land available to the temples, plantation of fodder should be started, so that the temple cattle can gradually be shifted over to stall feeding.

Continuous monitoring of pilgrims is necessary. Guards could be hired to see that the pilgrims do not move out of the temple complexes. One cannot prohibit entry to these temples. The legal problems related to the Wildlife Protection Act and habitation within a national park will have to be sorted out in the case of Kankai and Banej temples. This could be done by creating enclaves.

- 5.7 High Density of Lions within the PA: Certain management policies have been suggested:

- a. The lions should be given or sold to Zoological Parks in India or abroad. [Saberwal et al]
- b. The lions should be culled; by selling shooting rights to sport hunters, overt shooting by state officials, euthanizing the animals [Saberwal et al.].
- c. Translocation of the lions to another suitable habitat. The following sites have been identified:
 - Kumbalgarh Wildlife Sanctuary - Rajasthan
 - Desert Protected Area - Rajasthan
 - Sitamata and Jaisamand Wildlife Sanctuaries - Rajasthan
 - Palpur Kund (Kuno) Wildlife Sanctuary - Madhya Pradesh.

Option c. is the only acceptable solution. All the above sites have conservation problems which have to be overcome before the actual translocation of the lions can be undertaken. Moreover, these sites need to be intensively surveyed to assess the extent of potential habitat, the prevailing ecological conditions and the feasibility of conservation action for making the habitat more suitable for the lions, including the scope for increasing prey biomass [RC 1].

Wildlife Institute of India is studying the alternate sites for the translocation of lions. The translocation of lions to another site will establish a second free ranging population of lions.

- 5.8 Weed Infestation: A weed eradication programme should be initiated. Lantana camara can be used to make chipboards. This would finance the eradication programme.
- 5.9 Water Shortage in the Project Area: During the summer months the cattle enter the PA to use the waterholes. The solution to this is to develop water harvesting and conservation structures in the villages and to reduce the number of livestock.

- 5.10 Declining Ground Water Table: The villagers in the project area have noticed the drop in ground water levels. Soil and water conservation projects for enhancing water recharge should be undertaken. Also agricultural and other water use planning should be initiated.
- 5.11 Fire: There should be increased coverage of firelines and construction of additional fire watchtowers. Local communities should be involved in fire prevention. Steam engines should be banned on the railway line within the PA. Alternate sites for NTFP or alternatives to NTFP should be developed.
- 5.12 NTFP Collection: Alternative income generation activities should be provided to people dependent on NTFP collection as a source of income. Certain NTFP species could be cultivated outside the PA.
- 5.13 Disturbance from Railway Line: An alternative alignment for the railway line should be developed. In the interim, steam engines should be banned and trains should reduce speeds within the PA.

III THE PROJECT

1. **Rationale**: The rationale for this project is the protection of an area which is of great biodiversity value. The PA is the only remaining patch of natural forest in the entire Saurashtra peninsula. The forests form a vital watershed for the semi-arid region. The last remaining free ranging population of the Asiatic lion is found here, along with other endangered species such as the Rusty spotted cat, Leopard and Striped hyena. In many parts of the world it is the semi-arid regions with their dominant grass and palatable shrub layers that achieve some of the worlds highest wildlife biomasses. Gir can show exceptionally high ungulate densities when protected from exploitation by domestic livestock [Rodgers & Panwar].

The area has medium pressures, which could be alleviated with successful ecodevelopment and PA management .

2. Project Description

- 2.1 PA Management : The following steps are being recommended for PA management under this project:
 - 2.1.1 To minimize the impact of the pilgrim tourism on the PA by regulating the thoroughfares and restricting use of certain roads by private and public transport. To impose restrictions on usage during night hours and by heavy vehicles. To provide regulated transport (possibly battery vans) for the pilgrims to take them to the temple complexes. To provide regulated transport to the residents of the PA.
 - 2.1.2 To try and minimize the use of forest resources at the temple complexes, by providing alternate energy sources such as gobar gas plants and solar energy, and by introducing energy conservation devices. To sort out the legal aspects related to the temples located within the PA.
 - 2.1.3 To translocate lions to suitable protected habitats to reduce their numbers within the PA. The translocation would also establish a second free ranging population of Asiatic lions.

- 2.1.4 To minimize the effect of fire by maintaining and increasing firelines, constructing more watchtowers and employing fire watchers during the fire season.
- 2.1.5 To realign the railway line within the PA and in the interim ban steam engines and reduce speed of trains within the PA.
- 2.1.6 To ensure that the local people are the primary beneficiaries of incomes from the PA, especially through tourism and employment generated through forest department work.
- 2.1.7 To provide adequate compensation for cattle killed outside the PA. To simplify the compensation procedure.
- 2.1.8 To provide grass cut from firelines to the villagers for fodder.
- 2.1.9 To start a weed eradication programme.
- 2.1.10 To provide extra staff, staff training, equipment and buildings.
- 2.1.11 To assess whether crop insurance would work in the project area, and to undertake other crop protection work.
- 2.2 Ecodevelopment: The following steps are proposed to be taken for ecodevelopment under this project:
 - 2.2.1 To minimise the dependency of the local people on the PA for fuelwood, by providing alternate energy sources such as biogas, windmills and solar energy, and energy conservation measures, such as fuel efficient chullahs and funeral pyres .
 - 2.2.2 To reduce grazing pressure on the PA by establishing fodder plantations outside the PA and promoting stall feeding and upgrading of livestock. Also to provide cattle rearers with alternative income generation activities.
 - 2.2.3 To provide alternate income generating sources for people to reduce their dependency on the PA for fuelwood collection and NTFP collection. These activities include:
 - 2.2.3.1 Cottage Industries: This would include activities such as embroidery work, tailoring, diamond cutting and polishing and papad making.
 - 2.2.3.2 Cultivation of Medicinal Plants: The Maldhari's and Siddi's have traditionally used plants from the PA for medicinal purposes. The Agricultural University, Junagadh, has undertaken a project to cultivate these herbs. These plants could be cultivated, outside the PA, and used by the Maldhari's and Siddi's and sold commercially.
 - 2.2.3.3 Tourism Co-operative: The co-operative could set up lodgings, outside the PA, provide nature guides for the PA, and the Interpretation area and maintain other visitor facilities around the PA.
 - 2.2.4 Moisture and soil conservation projects will be undertaken. The measures would include check dams, van talavdi (percolation tanks), gully plugging etc. Desilting of lakes, check dams etc. will also be undertaken.

- 2.2.5 Check dams, tube wells, drip irrigation and other water conservation and harvesting structures like tanks and "bunds" will be established to meet the irrigation and drinking water needs of the villagers.
- 2.2.6 Planting of local fruit and fuelwood tree species on 'bunds' of private lands outside the PA will be undertaken.
- 2.2.7 The immunization of cattle against Rinderpest and Foot & Mouth disease will be undertaken, so as to form an 'immune belt' around the PA.
- 2.2.8 To provide crop protection measures such as fencing, lights, watchmen etc. The villagers have asked for community development, which would include link roads.

3. Support Systems:

- 3.1 Human Resources Development and Awareness: To provide training inputs to the people who will be involved in the PA management and in the ecodevelopment activities. To promote awareness of the value of the PA and to actively involve the local people in its protection, this could be done by starting village level nature clubs and forest protection committees. Training will be organised for various income generation activities.
- 3.2 Institutional Arrangements: To set up an appropriate process and mechanism whereby the local people will be involved in the protection and management of the PA.
- 3.3 Research and Monitoring: Some research topics include:
 - To study effective crop protection measures.
 - To study the role of fires in Gir.
 - To study the effect of the Maldhari cattle on the Gir ecosystem.
 - To monitor the effect of the outside cattle on the Gir ecosystem.
 - To study the evolution of the habitat and factors affecting it.
 - To study the impact of habitat changes, isolation, population growth and other relevant factors on the ecology and behaviour of the lions.
 - To study the ecosystemic and management requirements for establishing successful alternate lion populations.

Annexure A

PARTICIPATORY RURAL APPRAISAL EXERCISE

The Participatory Rural Appraisal exercise for Gir National Park was carried out by the National Nature Education Foundation, a non- government organization based in Junagadh, Gujarat. The team consisted by 15 members five of whom were female

Methodology: A background literature survey of the area was undertaken. Data from sources like Taluka Panchayat records, district revenue records, forest department records, government gazettes etc was also collected.

52 villages, 10 nesses and 4 forest settlement villages were covered in the PRA exercise. Two days were spent in each village. A door to door survey as well as village level discussions were conducted in each village. During the village discussions, representatives of the Forest Department and Taluka Panchayat were also present. Discussions regarding water, fodder, fuelwood, public amenities and forest-related problems were held.

Main Finding and Strategies

- (1) Water: The village realized the importance of conserving the forests and their relationship with water availability. In villages in Visavadhar taluka, the water table has gone down and the area is facing severe water scarcity.

In Talala, Mendarda and Maliya taluka villages, water conservation work is being carried out by the Forest Department, AKRSP and BAIF.

The local people have asked for water and soil conservation works in their area. The PRA team suggested that villagers could be employed in the soil and water conservation projects during the summer months when they have no other employment.

- (2) Change in Agricultural Pattern: In most villages in Talala and Mendarda taluka, the villagers have converted their agricultural land to orchards. They receive a higher remuneration from the orchards. The change has decreased the number of people that are employed as agricultural labourers.

- (3) Fodder: Most villagers are dependent on the PA for Grazing their livestock. Villagers were demanding that they should be allowed to cut grass from within the PA, to use as fodder for their cattle. If they are allowed to do this they would not enter the PA, for grazing, in Dhari taluka. The villagers suggested that they should also be allowed to cut fodder grass from the firelines.

As "Gauchar" lands are either not available, or are in a degraded condition, development and improvement of pasture lands was identified as a high priority.

- (4) Fuelwood: Most of the forest areas adjacent to the villages surveyed are in a degraded condition. Villagers, especially the women, have asked for biogas plants. The existing biogas plants are working and in good conditions. The success of biogas in these areas is mainly due to the fact that people are involved in the construction of the plant and are able to undertake minor repairs on the plants.

There is a shortage of wood for funeral pyres. Some villages have constructed improved funeral pyre sheds.

Annexure B

The Asiatic Lion (*Panthera leo persica*)

The Asiatic Lions range of distribution covered Mesopotamia, Arabia, Persia and the Indian sub-continent where it was fairly abundant upto the end of the eighteenth century A.D. The lion entered the Indian sub-continent from Persia, along the north-western passes about 6000 years ago [Rashid].

In India, lions were found over the entire Indo-Gangetic plain extending from Sind in the west to Bengal in the east and from the Himalayan foothills in the north upto the Narmada river in the south. Outside the Kathiawar peninsula, lions disappeared from western India around 1840. They were last seen in Haryana in 1834. In eastern India the last lion was seen near Palamau, Bihar in 1814 [Rashid].

In Saurashtra region, lions were found in Dhrangadhra, parts of Jasdan, Chotila, Alech hills, Barda hills, Girnar and Gir. Later they disappeared from northern parts of central Saurashtra and were found in the forest tracts of Gir, Girnar, Barda and Alech hills. Much of this area was cultivated, and the forest tracts of Gir, Girnar, Alech and Barda hills became separated, until the lions habitat shrank to the Gir forests, though as late as end of the century some animals were noticed in Barda hills and some animals were recorded in Girnar Forests [WP].

The survival of the Asiatic lion in Gir was made possible by the timely protection afforded to it by the then Nawab of Junagadh, beginning from 1900. From 1911, a complete ban on the shooting of lions was enforced by the British Administration. Since 1965, the government of India has placed a total ban on the killing of lions [RC].

Riverine forests and reservoir beds are crucial hunting habitats for the lions, especially during the dry summer. The distribution of water governs the distribution of prey, especially for species like Chital and Sambar. During the drier parts of the year as naturally occurring water is restricted to riverine tracts and reservoir beds, lions seem to be concentrating their hunting in these two habitats [RC].

Annexure C

Details of Tulsishyam, Kankai and Banej Temples

The Tulsishyam temple complex owns 3500 ha. of land within the PA. Eighty 'bigas' of this land have been cultivated for fodder. They have 60 buffaloes and 75 cows. There is a 'gaushala' and 'panjrapol' within the complex.

Within the complex there are five wells and a hot spring. They also have electricity. They have one gobar gas plant. Fallen wood from their land is used as fuel. A solar electricity plant was put in, but fell into disrepair. They have a solar battery operated telephone.

Approximately 500 pilgrims visit the temple daily. There are regular bus routes to the temple, the access road being the Una-Dhari road. No heavy vehicles, other than buses are allowed and the road is closed to traffic at night. The temple runs a dharamshala and there are also dharamshalas run by a private individual and operated by Gujarat Tourism. There are 40 permanent temple staff [pers. comm. temple priest].

The Kankai temple is run by a trust. The temple trust has 50 acres of land leased to them by the Forest Department, to whom they pay an annual rent of twenty five rupees. There is a dispute regarding the lease, as the original lessee has passed away. The terms of the lease stated that the land could not be transferred/leased/or sold to another person. The Forest Department has started legal proceedings against the temple trust.

Of the 50 acres of land, approximately 3 acres is under cultivation, mainly for fodder. The temple has 35 cows, 14 of them milch animals. Their animals are grazed in the 50 acres and are stall fed in summer.

Approximately 300-400 devotees visit the temple during festival days, the numbers being slightly less on other days.. The pilgrims are given free food. For eight months of the year, five bus routes bring pilgrims from Amreli, Junagadh, Visavadar and Bapunagar.

The temple has a well. A diesel operated pump supplies water to the 3 acre cultivated plot. The generator is run from 7 am to 9.30 pm. Fallen wood collected from their land is used for fuel. A biogas plant has been set up recently but isn't operational as yet. There are 20 staff permanently at the temple [pers. comm. temple priest].

The Banej temple has four acres of land. They keep no cattle. There is a ten room dharamshala in the complex. They used kerosene and fallen wood for fuel [pers. comm. temple priest].

REFERENCES

- Berwick, Marianne. The Ecology of the Maldhari Graziers in the Gir Forest, India. In Conservation in developing countries: Problems and Perspective. Proceedings of the Centenary Seminar of the Bombay Natural History Society. 1990
- Berwick, Stephen. The Gir Forest: An Endangered Ecosystem. American Scientist vol. 64, No. 1; 1988
- Chavan, S.A. Distribution and Conservation of Crocodiles in and around Gir Wildlife Sanctuary. Indian Journal of Forestry vol. 2, No. 3; 1979
- Chellam, Ravi. Ecology of the Asiatic Lion. April 1993 [RC]
- Chellam, Ravi. A Note on the Translocation of the Asiatic Lions. Submitted to the Minister of Environment, Forests and Wildlife. June 1993. [RC 1]
- Chellam, Ravi., and A. J. T. Johnsingh. Management of Asiatic Lions in the Gir Forest, India. Paper presented at the Symposium "Mammals as Predators" organized by The Zoological Society of London and The Mammal Society, held at London, 22-23 November 1991. [R.C. et al]
- Chengappa, R. Taming the Roaring Surplus. India Today, January 31,1993. [Chengappa]
- Joslin, Paul. The Environmental Limitations and Future of the Asiatic Lion. J. Bombay Natural History. Society. vol. 81, No. 3; 1984
- Khan, J.A., Rodgers, W.A., Johnsingh, A.J.T., and Mathur, P.K. Gir Lion Project: Ungulate Habitat Ecology in Gir. Unpublished project completion report for the Wildlife Institute of India; 1990 [Khan]
- Oza, G.M. The Asiatic Lion and its Habitat Faces Ecological Crisis. Environmental Awareness vol. 3, No. 2; 1980
- Patel, A. Impressions of Gir. Report submitted to the Indian Institute of Public Administration. December 1983 [A. Patel]
- Rashid, M.A. The Gir (Asiatic) Lion. Chetana vol. 24, No. 3; 1988 [Rashid]
- Saberwal, Vasant K., Gibbs, James P., Ravi Chellam, and Johnsingh, A.J.T. Biological and Social Dimensions of Lion-Human Conflict in the Gir Forest. In press. [Saberwal et. al.]
- The Gir Lion Sanctuary Project. Government of Gujarat; March 1972
- Gir: Last home of the Asiatic Lion. Forest Department, Government of Gujarat [FD]
- Directory Sheet: Draft directory sheet from Directory of National Parks and Sanctuaries in Gujarat, IIPA, Mimeo, 1991
- Questionnaire 1: All India Survey of National Parks and Sanctuaries; 1984. Filled in by Shri K. R. Ladwa, C.F. dated 12 June, 1984 [Q1]

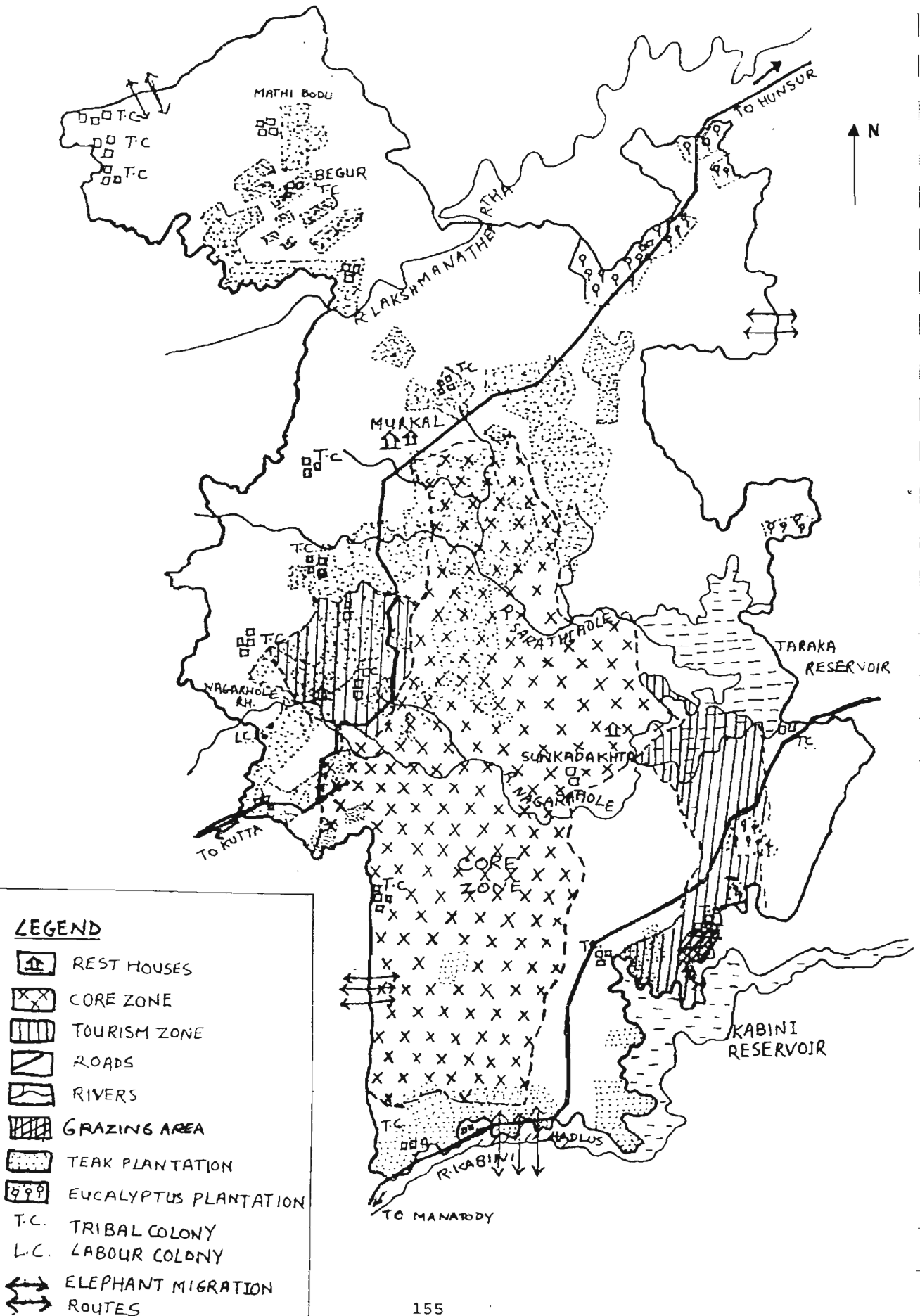
Ecodevelopment Plan For Gir National Park. Government of Gujarat [EP]

Ecodevelopment Project for Gir National Park, Forest Department, Gujarat State. 1993 [EP1]

Working Plan for Gir Forests. Government of Gujarat. 1976 [WP]

District Census Handbooks for Junagadh and Amreli talukas, Gujarat. 1981 [DCH]

NAGARAHOLE NATIONAL PARK



NAGARAHOLE NATIONAL PARK

I. THE PROJECT AREA (NAGARAHOLE NATIONAL PARK) (Kindly refer to the attached map while reading the text)

1. The PA Area

- 1.1 Location and Approaches: Nagarahole National Park¹ is situated partly in Kodagu and partly in Mysore districts of Karnataka state. Latitudinal extent is from 11°51'20" N to 12°15'37" N and longitudinal extent is from 76°0'2" E to 76°17'13" E. To its southeast Nagarahole National Park is contiguous with Bandipur National Park, but is separated by the Kabini Reservoir, while the Wynad Sanctuary of Kerala adjoins the southwest boundary. To the west, coffee plantations separate the Park from the Brahmagiri Sanctuary. The entire block forms a part of the Nilgiri - Biosphere Reserve (see Annexure - B).

The Park can be approached by all-weather roads from Mysore (95 km) and Medikere (90 km), besides several other towns like Hunsur, Heggedevana Kote, Gonikoppal and Thithimathi. Nearest railhead is Krishnaraja Sagar (70 km) and Mysore (94 km). Public transport buses ply on Kutta-Hunsur and Manatody- Mysore roads which pass through the Park. Southern parts of the National Park can also be approached by coracles (small leather boats) and boats from Begur and Pulapally (Kerala), after crossing the river Kabini.

- 1.2 Area, Zoning and Legal Status: Total area is 64,339.261 ha. (643.39 sq. km). The area of the Sanctuary, till 1975, was 28,416 ha. (284.16 sq. km). The area subsequently made into a National Park was 57,155ha. (571.55 sq. km). Again this area was increased to 64,339.261 ha. (643.39 sq. km.) in 1988 and a notification was issued (see below). The Park has a core zone of 19,200 ha (192 sq. km), a buffer zone of 45139 ha. (451.39 sq. km.), out of which has been demarcated a tourism zone of 11000 ha. (110 sq. km.) in two parts. There is also a restoration zone of 12000 ha. (120 sq. km.) in the eastern periphery. The restoration zone comprises of those areas that are degraded and need complete protection [Dir].

The initial notified area of 28416 ha., which was a royal hunting preserve of the Maharaja of Coorg, was declared a sanctuary on July 2, 1955, vide notification No 44-6118/R. DIS. 339/54. Intention to constitute the area into a national park, was declared on February 4th, 1975, vide notification No. FD.14. FWL. 73 (notif). An extent of 57, 155 ha. had been declared as National Park in terms of section 35 of the Wildlife Protection Act 1972, vide Notification No. AFD. 14.FWL.73 dated 4.2.75. Again this area was increased to 64,339 ha. and revised notification for an intended national park was issued vide No. AHFF. 91.FWL.87 dated.8.12.1988. To mark the first death anniversary of late Sri. Rajiv Gandhi, this park was renamed as Rajiv Gandhi National park vide notification No. AHFF.134.FWL/92 dated. 13.5.1992.

¹ As of May 1992, the new name of this protected area has been changed to Rajiv Gandhi National Park. However, in this report, the old name, Nagarahole National Park, is being used.

Date	Area	Legal Status	Final Area(ha)/unit
2.7.1985	28,416 ha. (284.16 sq. km)	Sanctuary	28,416/Sanctuary
4.2.1975	28,416 ha. (284.16 sq.km.)	Intended National Park	28,416/Sanctuary and Intended National Park
4.2.1975	57,155 ha. (517.55 sq.km.)	Increase in area of intended National Park	28,416/sanctuary 57,155/Intended National Park
8.12.1988	7,184 ha. (72.84 sq.km.)	Increase in area of intended National Park	28,416/sanctuary 64,339/Intended National Park
1992	64,339 ha. (643.39 sq.km.)	Final notification of National Park	64,339/National Park.

1.3 Ecosystems

Topography and climate: Altitude varies from 701 m to 959 m. The highest point is Masal- betta 959 m in the extreme south, and the lowest, at 701 mts., at Kabini river. (NNP-KSFD) Mean annual rainfall is 1778 mm at Nagarahole decreasing to 1270 mm on the eastern fringe of the Park. No records of temperature are available. The temperature ranges between 17° C to 30° C with a mean value of 24°C [MP].

Water Resources: The major water bodies in the Park are Lakshmanathirtha, Sarathihole, Nagarahole, Ballehalla and Kabini rivers. In addition, there are four perennial and 47 seasonal streams. The extensive Kabini Reservoir and Taraka Reservoir on the east are also major sources of water. There are 41 tanks inside the Park; 23 are artificial and perennial, remaining 18 are artificial and seasonal.(MP)

Forest types: The dominant natural vegetation is of deciduous forests. The various forest types found in the Park are:

- i) Southern tropical semi evergreen (2A/C2). These type of forests occur only in patches and pockets along the western boundary of the National Park adjoining Kerala state. The species found are the same as that of moist deciduous type. "Being intermediate between tropical ever green and moist deciduous forms but usually including groups or patches fairly typical of both" [C&S]. Species found are Adina Spp., Pterocarpus spp., Terminalia spp. and Dalbergia spp.
- ii) Southern Tropical Moist Mixed Deciduous Forests (3B/C2). This is a dominant type of natural climax vegetation of the National Park. This type of forest occurs in Kakanakote S.F., Western part of Metikuppe S.F., Nalkeri R.F., Hatghat R.F., Arkeri R.F. and parts of Kachuvanahalli S.F. "In the top canopy it is generally associated with Terminalia spp., Pterocarpus spp., and Lagestroemia spp. Adina is often present though tending to indicate drier conditions and Dalbergia latifolia is characteristic; Schleichera and Careya are common, mainly in the second storey. Typical bamboo is Bamboos arundinacea, Dendrocalamus strictus only appearing at the dry end as noted, however bamboos are not invariably present. In the non-teak bearing type a variety of moist and occasionally evergreen species occur in mixture". [C&S]
- iii) Southern Tropical Dry Deciduous Forests (5A/C1): Found in the eastern part of Mettikuppe S.F. (east of Sunkadakatte) parts of Veeranahosahalli Kachuvanahalli and Muddenahalli S.F., a sizable part of the core area is also of this type.

- iv) **Scrub Forest (5A).** This type of forest is found in the low rainfall regions of the eastern edges of the forest, which have been subjected to heavy pressure from grazing fires and hacking. The scrub type species found include Shorea talrus, Santalum album, Terminalia chebula, Anogeissus latifolia, Chloroxylon sweetenia, Zizyphus sp.

Swamps: The Swamp is an edaphic climax found in low lying patches. Locally known as 'Hadlus' it consists of deep clayey soils which get water logged during rainy season. There is usually lush green growth of grasses in these swamps, even when the surrounding forests dry up in summer. Patches of swamps occur in moist-deciduous forests and some are found in dry deciduous forests also. The best swamps occur now in Nalkeri, Hatghat and Arkeri R.F. The hadlus play a unique ecological role and are highly beneficial to wildlife as a storehouse of food during dry seasons, besides being important for regulating water flow in the numerous streams draining them. Some of the hadlus in Arkeri R.F., which were occupied by encroachers, have been cleared in 1979. The swamps have been planted with eucalyptus. [MP]

Fauna: The threatened mammals (listed in Schedule I of the Wild Life Protection Act of 1972, as amended upto 1991, and presumed threatened in India as a whole) reported from this Park are Fourhorned Antelope, Sloth bear, Indian elephant, Leopard, Slender loris, and Giant squirrel. Gaint squirrels are found in the better wooded parts of the Park. Since they are highly susceptible to poaching pressure and very much dependent on dead and decaying trees for nesting, they are generally found only in well protected areas.[MP]

Elephants occur in the better forests of the Park in great numbers. Seasonal movements of elephant herds within and outside the Park boundaries have been observed. The replacement of natural forests by teak, disappearance of village forests, fragmentation of habitat, disruption of corridors, and poaching have been instrumental in the decreasing population. According to the management plan (1989), with strict vigilance now, the condition has improved.

Fourhorned Antelope are found only in parts of Metikuppe SF and prefer generally open forest with stunted tree cover. They are usually solitary or in pairs and seem to be shy of human activities like tourism. They are not found in well protected dense forest.

The mouse deer are also common in the Park. They are nocturnal and small in size and hence not easily sighted.

Gaurs are another common species in the Park. The best gaur habitat is Arkeri S.F., which has a good number of hadlus. Gaur population decreased in 1968 due to an outbreak of rinderpest caused by domestic cattle. But they have shown rapid recovery in recent years.

The threatened species of birds found in Nagarahole National Park include the lesser whistling teal, Adjutant stork, Osprey, Shahin falcon, Spoonbill, Malabar grey hornbill and Malabar pied hornbill. The waters of Kabini and Taraka reservoirs are excellent refuge for water fowl, with many trees suitable for nesting. Adjutant storks are occasionally reported from Bisliwadikere and Kabini river areas. Ospreys can be found in Kabini reservoir area. Among the reptiles found in schedule 1 of Wild Life Protection Act of 1972, is the marsh crocodile found in the Kabini river and the Lakshmanathirtha river. Their population had dwindled due to poaching and dynamiting in the past. Presently, the increased protection has built up this population. Rock Python is also found in the Park [MP].

- 1.4 Population: There are 54 tribal settlements inside the Park, with a total population of 6145 (Q 93). There are 5 families of non-tribals living in the Park, cultivating about 10 ha [MP]. The tribals inhabiting the Park are Jenu Kurubas (Honey gatherers), Betta Kurubas (Hill Kurubas), Hakki - Pikki (Bird trappers) and yeravas. None of them own cattle. They are permitted to cultivate 40 to 50 ha. of land, and to collect firewood. But collection other NWFP is banned, as much of what is collected as NWFP is also required by wild animals as food. There are 250 families of Odigas who are leased 250 ha. of land, for cultivation, in the swamps.
- 1.5 Land use: Extensive teak (Tectona grandis) plantations covering 90 sq. kms were carried out by the forest department between 1868 and 1982. No subsequent plantations have been raised, though some silvicultural operations are undertaken in the existing ones. Small patches of Eucalyptus had also been planted much before the Park was constituted. Ragi Eleusine coracana and paddy Oryza sativa are cultivated raised by the tribals, in the Park, in the 40 to 50 ha made available to them. The weeds Lantana and Eupatorium, Chromolaena odorata are proliferating in the area [Dir].

Some restoration and plantation work is going on in the Park, in 12,000 ha. The core zone is left undisturbed, and this work is being carried on along the eastern periphery of the park. The area is being planted with only those native species which are useful for wild animals, and not with industrial species like teak. In the outer periphery of Kakanakote S.F., and Metikuppe S.F., a 50 mt wide and 5 km long strip of plantation has been raised, with barbed wire fencing to protect it. This, it is hoped, will protect the natural forest inside from grazing pressure.

There are approximately 200 kms of PWD roads in the Park. The education department runs several schools inside the Park, and about 162 ha of the Park are occupied by transmission lines of the Karnataka Electricity Board [Dir]

Table - 1 : Land use in PA

Agriculture	40 ha.
Teak Plantation - Monoculture	9000 ha.
Mixed Plantation in the eastern periphery	250 ha.
PWD road	200 km.
Electricity Transmission lines	162 ha.

Total	9652 ha.

- 1.6 Staff and Equipment: The Deputy Conservator of Forest, Wildlife Division, stationed at Hunsur, is in charge of the Park. He is assisted by one Assistant Conservator of Forest, also stationed at Hunsur, and seven Range Forest Officers. Besides them, there are 29 Foresters, 98 Forest guards, 14 Forest watchers, 51 Elephant mahouts, 52 Elephant kavadis and 1 Elephant Jamedar.

The Park has 20 Wireless sets, 2 Binoculars, 14 Rifles, and 24 Guns. The vehicles available in the Park are 6 jeeps, 1 car, 3 Vans and one bus. [DIR]

- 1.7 Management Plan: For efficient management of the Park, the Park has been demarcated into a core zone of 19,200 ha, a buffer zone of 45,139 ha, a tourism zone in two part of 11000 ha., and a restoration zone. The restoration zone is supposed to comprise of those areas which have been totally degraded and need complete protection. A plan for the period 1990-95 has been prepared in December 1989 by DCF wildlife, Mysore and has been sent for approval.[DIR]

- 1.8 Major Management Issues:

- 1.8.1. Tribal habitation within the PA: A major problem confronting the park authorities, is the habitation of, and cultivation by, the tribals within the PA. The constitution of a national Park necessitates the removal of all disturbance. These tribals have already been resettled from the core zone to their present hamlets, during the formation of the national Park. The lands cultivated by them earlier have regenerated into swamps (hadlus).
- 1.8.2. Encroachment: Along the Kabini river the swamps (hadlus) have been leased out by the Forest Department (FD) to the adjoining villagers, on an annual basis. Presently, the FD wants them to vacate the hadlus as they are good habitat for gaur, and are near the core zone. They also form a corridor through which elephants migrate and poachers enter. But the farmers are reluctant to vacate.
- 1.8.3. Poaching: This is causing concern to the Park authorities as elephants are being poached, for ivory, by organised gangs. Since 1991, 22 cases of illegal hunting have been recorded. Certain areas of the park, especially along the western boundary, are extremely susceptible to poaching.
- 1.8.4. Grazing: According to the park authorities, 27,000 cattle graze on the eastern fringe.
- 1.8.5. Fuelwood extraction: About 500 people headload from the forests. Though some of it is for personal consumption, some is also for sale. The tobacco cultivators in the project area encourage headloaders, as large quantities of fuelwood are required for curing the tobacco.
- 1.8.6. Weeds: Weeds are spreading, especially around the eastern periphery of the Park. This is mainly due to grazing and other biotic pressures.
- 1.8.7. NTFP collection: The leaves and fruits of trees like tamarind and mango, which are also food for elephant, are collected by the tribals. Honey collected by them is also sought, as food, by Sloth bears. Thus, there is competition between the people and the animals, for the same resources.
- 1.8.8. Staff and equipment: The management does not have sufficient staff for forming antipoaching squads and for working as fire watchers. They require shelters to be built for these people, when they stay inside the PA. They also require additional fire arms and wireless equipment. There is a need for audio visual equipment for the interpretation centres.

2. The PA surrounds

- 2.1 Population: According to the management plan, there are 238 villages in the adjoining areas, with a population of 2,26,435. However, the project area is larger, as a 5 km radius has been taken as the zone from which impacts on the PA emanate. The concentration of villages is in the H.D. Kote taluka to the east. During the construction of the Kabini reservoir in the south east, several thousand people were ousted from the submergence zone. To resettle them, over 5000 acres of forests were cut adjacent to the reservoir area, on the Park's eastern boundary [FV 86]. There is a concentration of habitation there. On the western boundary, a number of coffee plantations of Kodagu district are found. Human habitations is much less on this side.
- 2.2 Landuse: In the western periphery abutting Kodagu district, paddy and coffee cultivation are carried on. In the eastern periphery, dryland crops like Ragi, Maize and tobacco are cultivated. The adjoining area on the eastern side of the park is densely cultivated.

Kodagu district has some dense forests in between plantations. Most of the forest lands in Mysore district are either scrub land or are encroached.

- 2.3 Existing Development Programmes: All the adjacent area villages falling in H.D. Kote taluka are covered by Myrada (a Bangalore based NGO) under the land improvement scheme, which includes gully plugs and other soil conservation measures. Besides this, there are a number of government sponsored development programmes in Mysore and Kodagu district.

The department of agriculture supplies seed, zinc sulphate and weedicide on subsidised rates. It undertakes soil testing and runs a national project on bio-gas development. There is a Tribal sub plan under the department, for tribal farmers.

The department of Sericulture supplies mulberry cuttings and silk worm rearing equipment, and supplies free disinfectants to control plant diseases. It provides training programmes for both men and women. Marketing network for buying silk fiber is well established all over Karnataka, but is not as yet functional in the project area. The Horticulture Department provides training in raising fruit trees, and supplies subsidised plants.

The department of Mines and Geology is rendering extension service for digging open wells and for sinking borewells. The department of Animal Husbandry runs the veterinary hospitals and rural centres. It undertakes artificial insemination of animals, supplied under IRDP. Poultry rearing and pig keeping are supported and extension services are rendered. Fisheries department has started popularising pond fisheries for small farmers. Bee keeping co-operatives are being set up, especially in Virajpet, in Coorg.

3. Local dependencies on Park

- 3.1 Grazing: There is heavy grazing pressure with 27,600 livestock grazing inside the park. People from adjacent villages take their livestock for grazing to the eastern fringe. The field visitor's report gives instances of sighting cattle well inside the buffer zone.
- 3.2 Fuelwood: The tribal families inside the forest are allowed to collect fuelwood, but headloading by the villagers, (who do not enjoy such rights) seems to be a regular feature. Friction develops frequently between foresters and villagers, over this issue. 585 people from villages within and adjacent to the Park, collect firewood from the Park, [Q 91]. The fire wood required for curing tobacco leaves is also collected, by head loaders, from within the park. Apparently the ITC is giving loans and other incentives to the farmers to grow tobacco in the area.
- 3.3 Food: Poaching is done for meat, mostly of herbivores and, rarely, of big cats and gaur [fv 1986]. Some illegal bird trapping by tribals is also reported [MP].
- 3.4 NWFP: Local people collect NWFP species, especially fruits, leaves tubers, honey, for food, medicines, and other uses.
- 3.5 Traffic: Local people use the roads for daily activities. Also, since the State highway passes through the Park, the buses need to use the road from Manantody in Kerala to Mysore. The Kutta-Hunsur road passes through the Park, but is open for traffic only between 6 a.m. and 6 p.m.. All the users of these roads need to pass through Veeranhosahally forest. From March to May there is heavy traffic.
- 3.6 Emotional dependence: The Kurubas are a hunting and gathering tribe. They feel strongly attached to the forest. Though presently many of them have taken to some

settled cultivation, they are still very reluctant to shift to areas outside the forest. NWFP collection and forest wage-labour is what they still look forward to.

4. Impact on/of PA

The negative impacts which the people have on the PA are as follows:

- Graziers entering with large number of cattle in the degraded eastern fringe, and fuel wood collection, mainly head loading, particularly for tobacco cultivators. This has led to the following negative impacts on the park
- Forest degradation
- Shortage of grass
- Weed infestation and other disturbances due to grazing.
- Poaching for ivory, meat and sandal wood has led to the depletion of fauna and flora.
- Encroachment of the hadlus has led to loss of a very valuable habitat.
- Over exploitation of NWFP, by the tribals living inside the forest, for commercial gains, leads to competition with wild animals.

The negative impact of the PA on people.

- Loss of bio mass due to closure of the PA.
- Loss of income to the tribals due to restrictions on collection of NWFP, and on cultivation.
- Loss of income to the landless poor and the marginal farmers
- The forest was a large Common Property Resources (CPR) for all landless poor who needed grazing land and fuelwood. The closure of the forest has deprived them of both. Now they need to restrict the number of cattle and buy fuel wood. Subsequent stoppage of forestry work has also deprived them of a source of income.
- Better protection of the PA has resulted in the increase in wildlife. Consequently, crop damage, especially by elephants, has increased.

5. Issues and Constraints:

5.1 There are many major issues related to the PA which need to be addressed.

5.1.1 **Poaching** : is causing much concern to the Park authorities. Elephant poaching for ivory is carried on by the poachers entering Nagarhole from Wynad Sanctuary, across the Kabini river. The coffee planters of Coorg possess arms (they are allowed to keep arms as a traditional concession), which they lend to their employees. With the help of these arms, the poachers shoot small animals and occasionally even large animals. This has led to problems in the past. In March, 1992, a poacher was killed inside the park, and this sparked off violence, in which the park was set on fire by the villagers living on the western periphery of the PA. From 1990-93, the poaching cases recorded included two elephants (92-93), one Bison (90-91), and one Tiger (1993) and eight poachers were arrested, along with their guns, inside the park.

The park management has already set up anti poaching squads, employing mostly tribals. The number of personnel have to be increased and some shelter huts have to be built. Infrastructure like wireless and fire arms, have to be provided. Poaching is carried on by people from outside the park. Ivory poaching in is being carried on by people from other states. There is no option but increased vigilance. The tribals, with their intimate knowledge of the forest,

would be useful in anti-poaching operations. Policing the park is the only solution to this problem.

- 5.1.2 Fire: is another issue which confronts the Park. A majority of the forests are dry deciduous. They catch fire very easily, especially during the dry season. Besides, poachers and NWFP collectors also start such fires for collecting antlers. The villagers and tribals living on the eastern and southern boundaries of the park burn the forests in the dry season, to promote grass growth for their cattle. The park authorities have to employ more men as fire watchers, during the five dry months, to overcome this problem. Fire watchers have to clear fire lines during the onset of dry months. They are required to burn the grass and clear the ground. The park authorities will have to employ men and women for such activities, after giving them some initial training in spotting the locations of fire from watch towers, and in fire fighting operations.

- 5.1.3 Disturbance due to Tourism: A huge complex of buildings have come up at Murkal, which are proposed to be developed as a five star hotel. Already, the park authorities are running a tourist lodge, with various types of accommodations, in the adjacent area at Murkal. Also, on the Kabini reservoir, the Karnataka Government runs the posh Kabini Lodge. Any more tourist facilities will add to the disturbance. The tribals also feel sore that, while they are asked to shift out, many outsiders are welcomed, even if temporarily, into the forest.

Options are to recruit tourist guides from among the local people, preferably tribals, as their knowledge of the PA is vast. Initial training could be given to them for this activity.

A small additional levy for the entry of tourist and other vehicles could be made and the funds so generated, used for ecodevelopment.

No further tourist facilities should be allowed inside the Park.

- 5.1.4 Grazing: This is a major issue. The PA surrounds do not have the requisite amount of land to develop fodder pastures. The park authorities estimate that about 27000 cattle graze inside the park. The villagers keep a large number of unproductive cattle, purely for manure. They sell manure to Kerala on a large scale and, during 1992, 1270 lorry loads of manure passed through a single check post within the park. The value of the same is about Rs. 31,75,000/-. Some studies done in Karnataka estimate 25.75 quintals as the fodder requirement per household of poor households in backward villages. From the above figures one can estimate the quantity of fodder required. Other studies conducted by fodder research institutes and agriculture universities have estimated that dry land can support 1.7 cow unit per ha. and irrigated land can support 3.5 cow units per ha. The 27,000 cattle grazing in the PA, would require approximately 9000 ha. for sustainable fodder production. This is not possible as such a large area of waste land is not available, due to encroachments and other problems. About 5000 to 6000 ha. of plantations can be raised by the end of the project. This would support only 20,000 of the cattle which at present graze inside the PA. The cattle numbers will have to be reduced by at least 7000. The options open to tackle this issue are as follows:

- i) Develop fodder pastures where land is available
- ii) Start JFM where reserve forests exist.

- iii) Propagate the idea of reuse and recycling of crop residue, locally, as fodder. Ragi and rice are grown in the project area, are cotton is the cash crop. Ragi and rice straw should be used for local cattle, and the use of cotton seed concentrate feed should also be encouraged. The present system of selling all the seed and straw and depending solely on forest grazing, should be discouraged.
- iv) Rationalisation of the boundary: The boundary of the national park has to be reconsidered. The whole area has been declared a national park and is now closed to all human activities. There is no buffer zone, in the form of sanctuary or forest land. A buffer needs to be developed, to meet the people's demands at least till viable alternatives are established.
- v) The animal husbandry department should take up, on a priority basis, the improvement of stock and reduction in the number of scrub cattle. All domestic livestock around the PA should be vaccinated. Since neither enough land nor enough reserve forests are available, all the options should be exercised depending on the available resources.

5.1.5 Fuel: The park authorities estimate that over 500 people collect fuel wood from inside the Park each day. H.D. Kote taluka has a number of tobacco cultivators. The farmers can sell the tobacco only after it is cured. This requires fire wood and the Park is the main source of firewood for the farmers. The following options are possible for mitigating the problem of lack of fuelwood:

- i) Grow fast growing fuelwood species along village paths and bunds in areas where there is a dearth of CPRs.
- ii) Crop residues like cotton stalk and mulberry stalks can supplement fuel availability, to some extent.
- iii) Install more gohar gas (bio-gas) plants. Introduce fuel efficient stoves.
- iv) Tobacco growers should have their own fuel wood plantation in a small portion of their land. They should be gradually persuaded to give up tobacco cultivation and take up cultivation of other cash crops. Sugar cane, which is a cash crop, and is found in some places, needs careful investigations, as sugar cane cultivation has sometimes led to water logging of land. More land should not be brought under cotton cultivation than at present, as this crop requires heavy pesticides input.

All options should be exercised as per availability of resources. Improved stoves should have certain features like taking note of local conditions and architecture, being fabricated locally by local artisans. It will be more useful to the households and better welcomed by them, if the artisans can be trained by the government and helped to set up local production centres. These products could thereby be better marketed, serviced and monitored. The designs can be adjusted by the local artisans to suit local conditions.

5.1.6 Crop depredation by animals: The main depredation is by elephants. In many areas elephant proof trenches (EPT) have been put up by the park authorities. So far they are successful, though they require seasonal maintenance. They also help to keep the cattle out of the PA. Consequently, local people sometimes fill it up in order to let their cattle into the park, thereby once again allowing elephants to come out and feed on crops. The trench is also broken in places where the streams flow out of the park. The options available to the park authorities to make the people cooperate in maintaining the E.P.Ts are,

- i) To ask the people or village ecodevelopment committees (VEDC) to maintain the trench out of the ecodevelopmental funds. The work mainly

involves wage labour and thus helps in income generation. If they do not maintain the trenches, funds given for this specific purpose can be frozen.

- ii) No monetary compensation will be paid in that sector for any crop damage.

Apart from E.P.T., elephant proof fencing can also be tried. This requires the installation of iron posts with spikes, to a height of five feet, with spiked cross bars between two posts. This has the advantage in that it keeps out larger animals like elephants and sambar but, unlike EPT, allows reptiles and small mammals to move freely. Such fences also allow water to flow freely, without themselves getting damaged.

The other options available are crop insurance and traditional methods of using fire crackers and making noise. Preliminary investigation and data gathering is going on to establish crop insurance. Using fire crackers and making noise are practiced, but the animals seem to have lost their fear.

- 5.1.7 Income Generation: The villagers around the park have hitherto been using the resources of the PA for consumption and monetary gain. Wage earning from forestry work has now stopped. NTTP sale is banned and cattle have to be reduced. The landless and marginal farmers are most affected. They impact the park most because they have little else except the resources of the PA. These people need alternate sources of income, to divert them from using the park resources. Some of the means of earning income are;

- i. Wage earnings from management activities like antipoaching squads and fire watchers.
- ii. Wage earnings from biomass generation and land improvement schemes.
- iii. Environmentally friendly schemes for income generation like sericulture, bee keeping, poultry rearing and pig keeping.

- 5.1.8 Peoples participation in Management: People should be increasingly involved in planning for, and managing and protecting the PA. They should develop a stake in the PA and should be partners and not antagonists, in its protection. Appropriate institutional structures have to be designed for the purpose.

5.2 Support Systems: Support systems needed for implementing the planned activities identified in section 5.1 are as below;

- 5.2.1 Human resources development would include various training inputs needed for carrying out the proposed management and ecodevelopment activities. Training for income generation activities will be carried out. Local artisans who are capable of making and selling stoves will be given training, on the principles of fuel efficiency, so that they could use their own innovation for making locally suited and acceptable stoves and sell them. Training for setting up biogas plants will be given.

- 5.2.2 Awareness programmes for both visitors and local people, focused on the value of the PA and its linkages with the regional, national and global conservation efforts, will be started. An attempt to establish an exchange of knowledge between local persons, especially tribals, and scientists, where the former will share their understanding of local resources, medicinal and other social significance of plants and animals, and the local nomenclature and understanding. The scientist would, on the other hand, share their understanding of the regional and global issues. The activities aimed at

developing awareness include inviting school children from the surrounding areas to interpretation centres, screening films, inviting the tribal elders to share their knowledge and arranging day visits to the PA for local people so that they also have an opportunity to enjoy and appreciate the PA. NGOs' help will be solicited for carrying on a campaign to use crop residue better and to improve the livestock situation.

- 5.2.3 Institutional structures : It is proposed to have a co-operative or a society which will have as its members, all the people who are dependent upon the resources of NNP. This co-operative will organise tourist related activities and support services.

It is also proposed to have village level ecodevelopment committees which will interact with the NNP authorities and other concerned agencies on implementing and planning site specific ecodevelopment packages.

It is also proposed to identify local NGOs which have been working on rural development issues in the area, so that they can be involved in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

It is proposed to have an institutional mechanism for enabling the local people to be consulted, and to participate in PA management.

It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary, with the Forest Secretary as the alternative chairman. This would be supported by a district level co-ordination committee, convened by the Field Director, involving the local collector and chaired by a prominent local environmentalist. Such committees will co-ordinate the inputs of the various line departments, like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in better co-ordinating protection measures.

It is also proposed to have an institutional mechanism for co-ordinating ecodevelopment and PA management activities with district and forest authorities in Karnataka.

In addition, the NNP authorities should also arrange for some marketing mechanisms which will allow the local people to sell some of their products to tourists visiting the Reserve.

- 5.2.4 Research: Some of the research studies required in the park are:

- Habitat study of the swamp (hadlus)
- Study of various grasses and herbaceous species
- Sociological study of the tribals and their dependence on NTFP
- Studies on the estimate of fuel and fodder requirements of the project area.

6. THE PROJECT

6.1 Rationale:

- 6.1.1 This area is a part of the Nilgiri biosphere reserve. As has been described in the earlier section, this area comes under the biogeographic realm 5B of Rodgers and Panwar (see Annexure A). They have assigned a zonal conservation priority to this PA as it is a valuable bio-diversity area.
- 6.1.2 There are significant threats to this PA, especially through grazing and fuelwood collection activities poaching degradation of the forests, loss of species, increased tourism, and encroachment of valuable habitats like the swamps (hadlus).
- 6.1.3 Most of the threats can be removed and the other minimised through investments in ecodevelopment, PA management and ecological regeneration in and around the PA.
- 6.1.4 The state government and Park authorities are keen on implementing the project.
- 6.1.5 Appropriate ecodevelopment inputs should earn the goodwill of the local people, thereby making it easier to get support for the PA, and create a sense of ownership towards, and a stake in the protection of the PA.

6.2 Project Description

6.2.1 PA management will involve :

- Forming antipoaching squads and training fire watchers.
- Constructing check dams.
- Regenerating degraded areas.
- Constructing E.P.T.s to contain crop damage.
- Establishing J.F.M. activities.

6.2.2 Ecodevelopment will involve:

- Bio mass generation
- fuel and fodder plantations.
- Supplying fuel efficient stoves/bio gas plants.
- Land improvement schemes
- Income generation activities
- Human resources development in the form of training inputs
- Awareness programme for the people to generate an interest in the protected area.
- Research.

PARTICIPATORY RURAL APPRAISAL

The P.R.A. (Participatory Rural Appraisal) survey in the multiple use zone of NNP was conducted by Shri Durgey Gowda (Range Officer), who was been trained in P.R.A. techniques. 14 villages were surveyed between the first and third week of September, 1993. Basic data from secondary sources were collected and some P.R.A. techniques like transects and preference ranking of problems and solutions were used.

The villages covered were Kachuvinahally, Chikka Hejjur, Veeranahosahally, Dodda Hejjur, Dodda Byranakuppe, Gudatur, Metikuppe, Belathur, Manchanayakanahally Hichally, Hosaholalu, Udbur, Vaddarmadu.

People living upstream of the Kabini Reservoir wanted lift irrigation facilities. Artisan families in the villages asked for a regular supply of raw materials, like bamboo, from the forest. People were willing to take up JFM activities in the reserved forest areas. Irrigation facilities of all categories, including bore wells, dug wells and lift irrigation from the reservoirs were the main demand. The villagers were willing to reduce the number of cattle if they had facilities to hire tractors. Local ponds for fishing and fishing facilities in the reservoir were their other demands. [FDP]

THE NILGIRI BIOSPHERE RESERVE

"In 1986 the Government of India declared the country's first Biosphere Reserve in the Nilgiri Tract of Southern India. This followed the setting up of a national biosphere programme in 1978, on the lines of the Man and Biosphere Programme of UNESCO, aimed at reconciling genetic diversity conservation with human interests in areas of exceptional biological value".
Nagarahole - Bandipur - Mudumalai Region

"The three contiguous protected areas totaling 11767 sq. km contain a population of 1500 elephants, the largest fully protected population in India today, as well as many other conservation values (tiger, leopard, dhole, gaur, sambar, chital etc.). Recent detailed study of the movement pattern of the elephant in this area, shows the need for minor additions of forest land to the PA boundary" [Rodgers and Panwar 1988].

References:

[Dir] - 'Directory of National Parks and Sanctuaries in Karnataka Management Status and Profile'. - prepared by IIPA. (Under print).

[NNP-KSFD] - 'Nagarahole National Park' - Brochure prepared by Karnataka State Forest Department (undated.)

[MP] - Management Plan

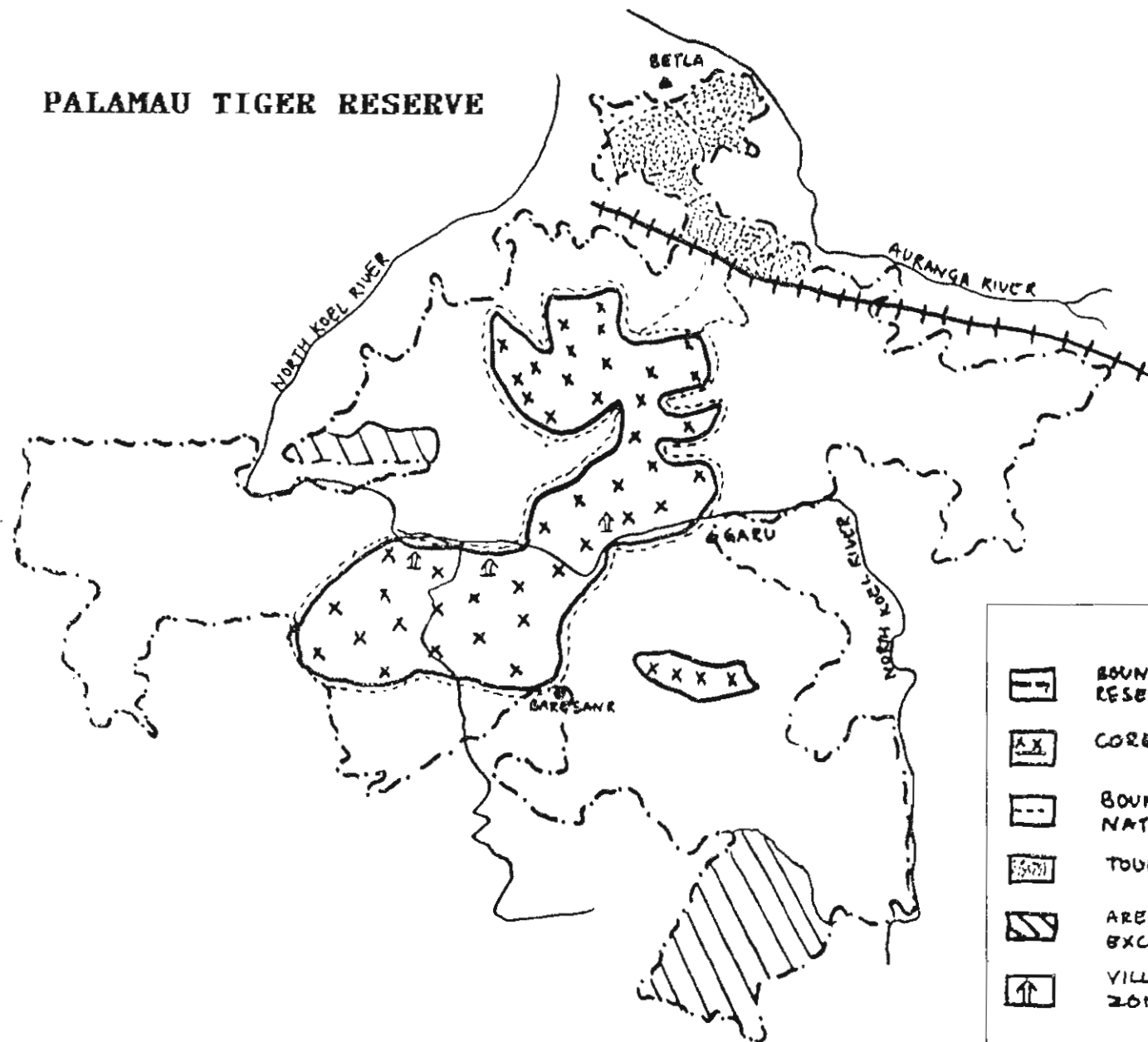
[Q 91] - Questionnaire filled by Park authorities.

[C & S] - 'Forest Types of India' by H.G. Champion and S.K. Seth (1968).








[Rodgers and Panwar] Rodgers W.A. and H.S. Panwar.

"Planning a Wildlife Protected Area Network in India" Wildlife Institute of India Dehradun.

PALAMAU TIGER RESERVE



LEGEND

-  BOUNDARY OF PALAMAU TIGER RESERVE
-  CORE ZONE
-  BOUNDARY OF PROPOSED NATIONAL PARK
-  TOURISM ZONE (existing and proposed)
-  AREA OF THE TIGER RESERVE EXCLUDED FROM SANCTUARY
-  VILLAGES IN THE CORE ZONE
-  RAILWAY LINE

PALAMAU TIGER RESERVE

II. THE PROJECT AREA (PALAMAU TIGER RESERVE) (Kindly refer to the attached map while reading the text)

History: The process of notifying the forests that now constitute the PA started in 1875, but only in 1974 the entire area got constituted either as Reserve forest or Protected forest.

Prior to this, the area was divided into shooting blocks and shooting permits were issued. These shooting blocks were abolished in 1968.

The forests were also subject to jhuming (shifting cultivation), grazing, poaching and forest fires [MP].

- 1.1 Location and Approaches: Palamau Tiger Reserve is situated in the Garhwa, Gumla and southern portion of Palamau District, in south-west Bihar. The Reserve lies between latitudes 23° 25' and 23° 55' North and Longitudes 83° 50' and 84° 36' East. The south western boundary of the Reserve is contiguous with the Madhya Pradesh state boundary. The Headquarters of the Reserve are located in Daltonganj, 25 km from Betla, the main entry point to the Reserve [QI].

The nearest railhead is Daltonganj. Betla is approachable by road from Ranchi, 180 km away, which is also the nearest airport [QI].

- 1.2 Legal Status, Area and Zoning: An area of 1026 sq.km comprising of Reserve forests, Khalsa Reserve forests (A special category) and Protected forests, was declared as Palamau Tiger Reserve on 4th of June, 1974, vide notification no. J.11025/1/72-FRT (WEF). On 17.06.1976, 979.27 sq. kms out of these 1026 sq. kms. was constituted in the Palamau Sanctuary vide notification no. S.O. 1224.

The Tiger Reserve is divided into a core zone of 213 sq. km and a buffer zone of 813 sq. km. A part of this buffer zone falls inside the Palamau Sanctuary [MP].

The intention to constitute a national park (Betla National Park) was declared for 231.68 sq. km of the Tiger Reserve, covering the entire core zone and a part of the buffer zone. This was done on 10.09.1986 vide notification no. S.O. 2/86-4573. However, the area of the intended national park has now been divided into two parts and reduced to 225.37 sq kms. The final notification is still pending.

29 sq. km of the buffer zone of the Reserve, which includes portions of the intended Betla National Park and of the Sanctuary, is being used as a tourism zone. There is an intention to increase the area of the tourism zone to 53.75 sq. km. [MP].

The Tiger Reserve and sanctuary comprise of the forests of the following Territorial Forest Divisions respectively:

Forest Division	Palamau Tiger Reserve	Palamau Sanctuary
Daltonganj South	773.98 sq km	738.96 sq km
Latehar	84.28 sq km	84.28 sq km
Garhwa South	156.03 sq km	156.03 sq km
Ranchi West	15.12 sq km	
Total =	1029.41 sq km	979.27 sq km

Note : The Sanctuary is contained within the Tiger Reserve.

The buffer area falling in Latehar, Garhwa South and Ranchi West division is not under the control of Field Director. The Ranchi West Forest Division and a part of Daltonganj South Forest Division are not included in the sanctuary, though they are a part of the Reserve.

1.3 Description of the ecosystem:

Water Bodies: The Koel river, running from the south eastern portion of the Reserve to the northern side, divides the Reserve into two almost equal parts. The three main tributaries of the Koel are Auranga, Burha and Pandra, all of which pass through the Reserve. The general drainage is from south to north towards the river Sone. The Auranga, Koel and Burha are perennial rivers, but sometimes the flow is subterranean during the height of summer. The rest of the rivulets in the Reserve are seasonal and usually dry up after December [MP].

There are also a few other perennial sources of water, like the Kujrum pond, Kamaldah lake, Barwahi dam, and Harindegwa dam. However, most of these also dry up if the rains are sub-normal for two or three years continuously [EP2].

23 earthen masonry dams and 27 perennial water tanks have been constructed within the Reserve. In addition, there are also 302 artificial water holes [QI].

Forests: The Reserve falls within the Chotanagpur plateau biogeographic realm (6D) [Rodgers & Panwar, 1989]. The forests of this Reserve lie mostly in the deciduous zone, except for the forests in the southern portion of the Reserve, in the valleys of Baresand block, south of the river Koel, and on the Netarhat Plateau and its slopes, which are in the semi-moist zone. Sal (*Shorea robusta*) is the main species mixed with bamboos and other species. Percentage of sal increases as one proceeds towards south of the Reserve and one finds almost pure sal forests on the Netarhat Plateau. The northern part of the Reserve contains mixed forests.

The forest types, as per the Champion and Seth revised classification (1968), found in this Reserve are:

5/B/C1c	Dry peninsular sal
5/B/C2	Northern dry mixed deciduous forest
5/F9	Dry bamboo brake
3C/C2e(i)	Moist peninsular high level sal
3/C2e(ii)	Moist peninsular low level sal
3C/C3/2si	Northern secondary moist deciduous forest
5/B/C1c	Dry peninsular sal : This type is found in many compartments of Baresand and Kumandih Reserved Forests. Some compartments of Saidupe, Rol and Piri Reserve Forests also have sal forest [MP].
5/B/C2	Northern dry mixed deciduous forest : This type occurs almost throughout the area except Netarhat plateau, interspersed with 5/B/C1c [MP].
5/F9	Dry bamboo brake : This type occurs in Betla RF, Kumandih RF, and in compartments of Baresand RF, Surkumi RF. The bamboo species found is <i>Dendrocalamus strictus</i> [MP].
3C/C2e(i)	Moist peninsular high level sal : This is found on the Netarhat Plateau and around the high point of Huluk [MP].
3/C2e(ii)	Moist peninsular low level sal : This is found around Maromar RF and Baresand RF [MP].
3C/C3/2si	Northern secondary moist deciduous forest : This is also found around Maromar RF and Baresand RF, with a very limited occurrence. Part of it (about 400 ha.) has been felled to raise teak [MP].

Aegle forest : This type has a limited occurrence in the dry parts of the PA around Kerh PF [MP].

Grassy blanks: The agricultural fields of some villages which were relocated prior to the declaration of the area as a Tiger Reserve, and some portion of forests previously under shifting cultivation, are still devoid of any trees and form small grassy blanks within the Reserve. The grasses are mostly Saccharum munja, Vetiveria zizanioides, Chrysopogon montanus, Themeda spp., Apluda mutica, Heteropogon contortus, etc. These are the favourite grazing grounds of wild ungulates [EP2].

There are 97 species of trees, 46 species of shrubs, 25 species of climbers, parasites and orchids, 17 species of grasses, bamboo, and agave. There are also 56 important medicinal plants reported from the Reserve [EP2].

Fauna: A large variety of wild animals are found in the Reserve. The mammals are represented by 47 species belonging to 39 genera and 21 families. There are over 100 species of birds found in the Reserve. Some of the species listed in Schedule I are Tiger (Panthera tigris), Indian pangolin (Manis crassicaudata), Indian wolf (Canis lupus), Sloth bear (Melursus ursinus), Leopard cat (Felis Bengalensis), Leopard (Panthera pardus), Elephant (Elephas maximus), Gaur (Bos gaurus), Four horned antelope (Tetracerus quadricornis), Mouse deer (Tragulus memlina), Ratel (Mellivora capensis), Monitor Lizards (Varanus bengalensis), Indian Shikra (Accipiter badius), and Peafowl (Pavo cristatus linnacus).

- 1.4 **Human Population:** According to the 1981 District Census Handbook, there are 72 villages inside the geographical boundary of the Sanctuary², with an area of 458.90 sq km, with a population of 22,370. The total number of households in these villages is 3804. Out of the 72 villages mentioned above, there are 69 villages which are geographically located within the Sanctuary, but legally are not a part of it, since they have been excluded from the area of the Sanctuary, by notification.

Around 80% of the population living within the Sanctuary are tribals [District Census Handbook, 1981]. The predominant tribes are Oraon, Munda, Chero, Kherwar, Birhor and Birjia. One community of Scheduled Castes, Bhuian, are also present in the Sanctuary. All these villagers practice rainfed, marginal, agriculture, keep cattle and are occasionally employed as labourers.

- 1.5 **Land Use:** Apart from conservation, land use inside the Reserve consists of habitation, agriculture and bamboo working. There are plantations on around 75 ha. in the buffer zone, mostly for commercial timber. There are PWD roads which are thoroughfares connecting Betla and Neterhat and a South Eastern Railway line inside the sanctuary, connecting Barwadih to Barkakhana.
- 1.6 **Staff and Equipment:** There is one Field Director of the rank of Conservator of Forest, one Deputy Director and one Assistant Director, in the rank of DCF and ACF respectively, four Range Officers, 13 Foresters, 65 Forest Guards, and various other miscellaneous staff.

² A portion of Palamau Tiger Reserve (Ranchi West Forest Division) and a part of Daltonganj South Division is not included in the Palamau Sanctuary. Since the legal conservation unit is the Sanctuary and not the Reserve, the project area will be determined by taking the boundary of the Sanctuary as a reference point.

The Reserve has four jeeps, one fourteen-seater tourist van, two medium trucks and six motorcycles. There are 16 fixed, five mobile and nine hand held WEBEL wireless sets, and four telephone connections.

The Reserve has some audio visual, photographic, "wildlife viewing" and other equipment, and five rifles and 14 double barrel guns.

1.7 **Management Plan:** The current management plan for the Reserve was prepared by Shri R.C. Sahay, Field Director, and covers the period 1987-88 to 1996-97. An earlier, management plan (1973-74 to 1978-79) was prepared by Shri B.N. Sinha, Working Plan Officer [MP].

1.8 **Management Issues:** Listed below are some of the main management issues in Palamau Tiger Reserve:

1.8.1 **Dual Control Over Buffer Zone of the Reserve:** Out of the four divisions, except for the Daltonganj South Forest Division, three are still under the control of the Territorial Wing of the Forest Department.

1.8.2 **Forest Working:** Forest working, especially timber harvesting, was continuing in Latehar and Garhwa (South) Forest Divisions falling within the sanctuary [EP2]. (According to the Reserve authorities this has been stopped from 1991).

1.8.3 **Commercial Entraction of NTFP:** There is bamboo and other NTFP collection in the sanctuary and non sanctuary buffer zone of the Reserve. The bamboo forests of the Reserve are under long term leases. The Bamboos are being extracted by a Government agency, for supply locally and to paper mills in Bihar and West Bengal [MP]. On an average an area of 250 sq. km. of the sanctuary is exploited and 10,000 tonnes of bamboo removed every year.

1.8.4 **Crop Damage:** For many years now, elephants, have been damaging agricultural crops. A study done in 1969 by J. Mishra estimated the total yearly damage to be approximately Rs. 40,000. The Government of Bihar has sanctioned Rs.100 per acre to be paid for Crop damage. Crop compensation is payable only for crops grown within the Reserve [MP].

There are reports of kharif crop damage by Spotted Deer and Wild Boar. Wild Boar also damage paddy crops [MP]. In 1990-91 Rs. 4,368.00 was paid as compensation for crops destroyed in 43.68 acres of land [EP2].

1.8.5 **Cattle lifting:** Cattle killed by wild animals inside the Reserve was, till recently compensated at the rate of half the market price of the cattle killed. There was, and still, is no compensation payable for cattle killed outside the Reserve. Yearwise cattle killed by wild animals in the Reserve and compensation paid is given below.

Year	Total No. of cattle killed	Compensation paid in Rs.
1991-92	257	1,77,300.00
1992-93	287	2,27,325.00

Source: [EP2]

Recently (1994), however, the compensation paid for a cattle killed has been raised to 80% of the market rate (FD Pers. Comm).

- 1.8.6 **Drought:** Though Palamau District is situated in a drought prone area, in the past three years the district has experienced unprecedented drought. Due to this, the availability of water and fodder in the PA has decreased, which in turn has affected the wildlife.
- 1.8.7 **Tourism:** An area of 29 sq. km in Betla and Dorami protected forest is the tourism zone of this Reserve [MP], which is only 3.7% of the buffer zone [QI]. There is a proposal to increase the tourism zone to 53.75 sq.km. The tourism zone contains a part of the intended National park and Palamau sanctuary. Approximately 34,719 tourists visited the Reserve in 1992 [EP2]. The number of tourists on average per day are generally 100-120. There is a great rush of tourists especially during the period October to March and about 4000 tourists visit during the Durga Puja holidays, which falls in the month of October [MP]. This high concentration of tourists can, if not properly managed, prove a disturbance to the sanctuary.
- 1.8.8 **Villages in the Core Zone:** There are three villages which are situated in the core zone of the Reserve. This zone is also the intended national park. Once the national park is finally notified these villages will become illegal, unless they are excluded from the national park.
- 1.8.9 **Grazing:** Local people have the grazing rights to in the Reserve. Grazing is allowed only in the sanctuary and the non sanctuary buffer zone of the Reserve, on rotational basis, although there is no limitation on the number of livestock and an estimated 30,000 cattle (43,000 cow units) from in and around the Reserve graze in the buffer zone [MP/EP]. The grazing blocks are rotated, and each block is opened only once in four years.
- The major pressure appears to be from villages in and around Betla [MP]. A very small number of goats also graze in the buffer zone [QI].
- The grazing pressure on these forests are greater than their carrying capacity. This has led to a deterioration of the forests. Also, this is aggravated by villagers sometimes lighting forests fires, as they want fresh, tender, leaves for their cattle. There is also danger of diseases spreading from the cattle to the wild animals [EP2].
- There is also grazing in the proposed national park by around 677 cattle belonging to the three villages situated in the core zone of the Reserve.
- 1.8.10 **Fuelwood and small timber:** Headloading of dry and fallen wood is done by the villagers in the sanctuary and non sanctuary buffer zone of the Reserve for their own consumption as well as for sale. Approximately 53500 tonnes of fuelwood is collected annually, and each household requires 60 quintals of fuelwood per annum [EP2]. Villagers also collect bamboo, small wood etc. for repairing their houses.
- 1.8.11 **NTFP:** The local people collect Kendu (*Diospyros melanoxylon*) leaves, Mahulam leaves and sal (*Shorea robusta*) seeds from the sanctuary and non sanctuary buffer zone of the Reserve [QI]. These are bought by the Bihar State Forest Development Corporation. There are 16 Kendu leaf lots which fetch a revenue of Rupees 21 lakhs for the state exchequer [MP]. Approximately 100 tonnes of Mahulam leaves and 500 metric tons of sal seeds are removed every year. An area of 800 sq. km. is exploited for NTFP collection in the sanctuary and non sanctuary buffer. [According to the Reserve authorities, commercial extraction has been stopped since 1992].

Local people are allowed to collect twigs, leaves, tubers, seeds, honey, grass, fruits, and Mahua flowers for their own use from the sanctuary and non sanctuary buffer zone of the Reserve [MP]. The villagers have the right to collect brush wood, grasses, bamboos and edible flower and fruits, roots etc. from some of the forests of the Reserve (excluding core zone) [EP2].

NTFP collection sometimes results in forest fires.

- 1.8.12 **Poaching** : There is no customary tribal hunting in the area. However, there is some poaching in the periphery, especially of ungulates [MP]. Ten people were prosecuted for poaching Chital (Axis axis) in the year 1991-92 [SP].
- 1.8.13 **Encroachments**: Increasing population pressures have resulted in some encroachment in forest areas. These have been primarily for settlement and cultivation. At least three cases of such attempts have come to light, in the last three years [EP2]. These encroachments are mainly by villagers of 13 of the villages to be displaced by the Kutku dam.
- 1.8.14 **Illegal Felling of Timber**: Some amount of illegal felling of timber has been reported from the Reserve [EP]. There are reports of organized felling on the north eastern border of the Reserve. In 1992-93, 24 cases of illicit felling (Sagwan, Gamhar, Karam) has been detected and 37 persons were prosecuted [EP2].
- 1.8.15 **Weeds**: There are two major weeds : Lantana and Flemingia chapper, in the Reserve. Lantana is spreading in open areas and is hampering regeneration and grass growth. Flemingia chapper is found exclusively in Baresand block and is cut back before seeds ripen [EP2].
- 1.8.16 **Fires**: Fires in the Reserve are accidental as well as intentional. Accidental fires are common because of the high human population inside the sanctuary. Villagers sometimes intentionally burn the grasslands in order to take advantage of new and tender shoots which are eaten by their cattle. It is also alleged that sometimes fires are lit deliberately so that the people can earn wages for fire fighting [EP2].

On an average, 1.29% of the total area of the Reserve is affected by forest fires annually. In 1992 and 1993, 11.82 and 3.09 sq. kms of the core zone and 5.48 and 6.04 sq. kms of the buffer zone were burnt respectively.

- 1.8.17 **Kutku Dam Submergence Area Villages**: Twenty seven villages in the Reserve are to be shifted out of the submergence area of the Kutku dam and have to be relocated. So far, however, this has not been done. The authorities fear that if proper relocation is not carried out, the displaced villagers will encroach upon forest land in the Reserve.

2. THE PROTECTED AREA SURROUNDS

- 2.1 **Population**: There are 516 revenue and forest villages in a 10 km radius from the boundary of the sanctuary. However, according to the PA authorities, most of these villages do not have an impact on the Reserve. This is because there are other forests in the immediate surrounds of many of these villages, which are used by them.

Consequently only a one village depth from the boundary of the Sanctuary has been included in the project area, except in the north, where due to a paucity of local forests,

villages upto a 5 km radius from the boundary of the Sanctuary have an impact on the Sanctuary and, therefore, have been included in the project area.

27 of the villages in and around the sanctuary, to the west, are not being included in the project as they will be relocated due to the impending submergence of the area after by the Kutku dam, which is ready.

Consequently, 178 villages [173 inhabited] with a population of 79243 people are in the project area [Census 1981].

2.2 Land Use : The total area of 178 villages is 873.50 sq. km., out of which 482.55 sq. km. (55.24%) is forests, 43.47 sq. km.(4.98%) is culturable waste and the rest (39.78%) is mainly used for agriculture and habitation [Census 1981].

2.3 Existing Development Programmes: A dam has been constructed at Kutku on the river Koel. Around twenty sq. km. of the buffer and one sq. km. of the core will be submerged under the reservoir of the Kutku dam [MP].

Construction of a dam on the river Auranga was approved a few years back, but work has not yet begun [MP].

Most of the government development departments are working in the project area. There is the Palamau District Rural Development Authority which co-ordinates the rural development work being done by agriculture, soil conservation, minor irrigation, animal husbandry, small industries departments of the state government, among others. The development programmes include IRDP, TRYSEM, DPAP, JRY etc. There also are branches of various banks.

In four villages in the area the Chakriya Vikas Prannali is being attempted by Shri P.R. Mishra and his associates.

3. LOCAL DEPENDENCIES ON THE PA

3.1 Biomass: The biomass dependency of local people on the PA gets reflected in their extraction of fuelwood, and fodder, and grazing of cattle.

3.2 Food: The local people extract tubers, leaves, and roots (for example, Gainthi, Kaanda, Chakovar-ka-saag etc.) from the PA. During the past three drought years especially, and even otherwise, these form an important part of the diet of the tribals living inside the Reserve.

3.3 Incomes: The local people extract sal seeds, mahulam leaves, honey etc. for sale.

4. IMPACTS

4.1 Major Negative Impacts of The People on the PA:

- Forest fires, both accidental and deliberate, are caused by local people especially while collecting NTFP and grazing cattle.
- Loss of undergrowth, weed infestation, competition for food with wild herbivores due to grazing.
- Disturbance to wild animals due to grazing and NTFP collection.
- Loss and degradation of biodiversity due to grazing and NTFP collection.
- Deforestation due to illegal felling of trees in Teak plantations, especially around Betla.

4.2 Major Negative Impacts of the PA on the People:

- Crop damage by wild animals, especially elephants.
- Cattle depredation by wild animals, especially tiger and leopard.
- Loss of income and employment due to curtailment of traditional forest related activities.
- Decreased access to forest resources like bamboo, small timber, grass for thatching etc., due to increased restrictions.

5. **ISSUES AND CONSTRAINTS:** Of the management problems listed in section 1.8 above, the following are being taken up for this project:-

5.1 Dual Control: The only solution to this issue is handing over complete control over the entire Reserve to the Wildlife Wing of the Forest Department. This is an essential prerequisite for proper implementation of the project. According to the Reserve authorities, the proposal for this has already gone to the state government and the area will be transferred to the Field Director by March 1994 (Not done till 7 April, 1994).

In fact, for the ecodevelopment Project to be effective, the field Director should have control over all the forest areas in the project area and be involved in co-ordinating land use and other activities in the non-forest areas within the project boundary.

5.2 Crop Damage: The various solutions to this particular problem are as follows:-

- a. Employing local people as crop watcher for keeping elephants away from the agricultural fields in the affected villages.
- b. Undertaking crop protection measures like construction of elephant proof trenches and/or fencing. This has already been taken up in a few villages by the PA authorities.
- c. At present, crop compensation is only Rs. 100.00 per acre, which is very low. A proposal to increase crop compensation from Rs. 100/acre to Rs. 500/acre is pending with the state government. Crop compensation could be increased so that atleast the cost of inputs which have gone into crop production, are recovered. Ideally, the compensation should cover the value of the crops which are destroyed.

Of the above, option a. has only limited feasibility not feasible because the number of personnel needed to cover the whole PA would be very large.

Therefore, the two main options are to compensate crop damage adequately, and provide effective crop protection measures.

5.3 Livestock lifting: Compensation for livestock killed inside the Reserve was being paid at half the market price. Recently the rate has been enhanced to 80% of the market price. In addition, efforts should now be made to ensure that livestock killed outside the Reserve are also compensated for adequately.

5.4 Regulation of Tourism: The following steps can be taken for regulating tourism:-

- a. No new facilities like restaurants or hotels should be provided for tourists.
- b. Existing tourist activities should be increasingly transferred to co-operatives of local people so that earnings from tourist activities can be channelised for eco-development.

- c. The Management Plan states that at a time, not more than five vehicles will be allowed inside the Reserve. This regulation should be strictly enforced even in future.

5.5 Grazing: The following can be considered for managing the grazing problem:-

- a. Since grazing is legally permissible in a sanctuary, the livestock being grazed in the Palamau Sanctuary can be allowed to continue to do so. However, an estimate of the carrying capacity of the ecosystem should be made, so that livestock numbers can be regulated.
- b. To replace cattle dependent income with income from other, sustainable, sources wherever possible.
- c. Fodder plantations can be provided in the villages which have adequate common lands available.
- d. Grazing should not be allowed in the core zone.

5.6 Fuelwood: The following options are available for reducing pressure on the Reserve:-

- a. Planting of Fuelwood on available wasteland or other common lands within the villages (outside PA land).
- b. Providing biogas plants.
- c. Providing smokeless, energy efficient, chulas.
- d. Providing solar cookers.
- e. Joint Forest Management can be considered with villages which are near the reserved forest, outside the sanctuary.

Of the above, option a. can be used wherever there is adequate wasteland or other village commons to be able to meet the fuelwood demand of a village.

In those villages where there is not enough wasteland to be able to meet the existing demand for fuelwood, it must be examined, if by using a combination of options b., c., and d. the village can become self sufficient. However, in order to operationalise all these options, the villagers will need technical and infrastructural support, atleast initially.

5.7 NTFP: NTFP collection is mainly for cash and food. This pressure can be reduced by providing alternative sources of income which are not dependent on the forest resources, like beekeeping, weaving, lac culture, cultivation etc. Also, some species, especially those required for food or other consumption uses, can be cultivated outside the sanctuary.

5.8 Illegal Activities: Illegal activities like animal and wood poaching, encroachment etc., have to be stopped. This can be done through involving local people in the management and protection of the Reserve. Additional staff along with proper equipment can also be provided. Also, the staff needs to be properly trained and motivated.

5.9 Weeds: Eradication of weeds by manually cutting or uprooting can be taken up. This would also provide employment to the local people. Also, the removal of Lantana from the sanctuary can be linked up with the manufacture of high quality chip boards, and handicrafts like basket weaving etc. There is a market for baskets in the nearby coal mining areas. Dry Lantana can also be used as a fuel, especially in improved chulas.

5.10 Fire: Maintenance of fire lines and removing grasses and weeds from road sides before the onset of the fire season will ensure prevention of fires. This will also

provide wage labour incomes to the people. In addition, if the control of grazing and ecodevelopment initiatives proposed in the project are successful, then the incidence of fire will tend to go down.

- 5.11 Forest working Bamboo working within the PA, by government agencies, should be immediately stopped as this is in violation of the law.
- 5.12 Other Issues Issues arising from the submergence of a part of the Reserve because of the Kutku Dam are not being taken up under this project as this problem is not within the control of the Reserve authorities.

Also, since a relocation plan has already been drawn up earlier for villages in the core zone, and funding for it has been solicited from the Government of India, it is not proposed to be funded under this project.

III. THE PROJECT

1. **Rationale:** Palamau Sanctuary lies in the Chotanagpur plateau (6D) biogeographic zone. It is the largest protected area in this part of Bihar.

The Sanctuary is surrounded on all sides by forests, except on the north. It is part of a continuous forest corridor with Surguja district (MP) on the west and Lawalong Sanctuary of Hazaribagh district (Bihar) in the north east. These forests form a vital watershed for the drought prone Palamau District.

Palamau Sanctuary is rich in biodiversity with various schedule I species of fauna like Tiger, Elephant, Gaur, Shikra, and peafowl. It has 56 recorded species of medicinal Plants (for more details on flora and fauna see section 1.3).

Livestock grazing, fuelwood and fodder collection, and NTFP collection are the major pressures on the Sanctuary. Some amount of poaching of wild animals and wood, and encroachments, have also been reported. Crop damage by wild animals is the major negative impact the Sanctuary has on the local people. The area has also been facing its worst drought ever, over the last few years. This has put additional pressure on the resources of the Sanctuary from the surrounding population.

The Project will attempt to tackle some of the problems mentioned above, and described elsewhere in this report, using two approaches. One, by strengthening the existing management capability of the Sanctuary through the involvement of the local people and the provision of infrastructure and equipment, and by providing training inputs for the staff, that will possibly reduce illegal activities and enhance protection. Two, a package of ecodevelopment possibilities will be worked out to increase biomass regeneration, generate income for a section of the population, and, give local people an actual stake in the protection of the Sanctuary.

There is an active local NGO with an ability to work with the Sanctuary authorities, and the Sanctuary authorities themselves are keen to implement the project, as is the state government.

2. Project Description:

2.1 PA Management: The following is being recommended for PA management under the project:

- 2.1.1 Those areas of the Palamau Tiger Reserve not presently under control of the PA authorities should be transferred immediately to the wildlife wing.
- 2.1.2 The local people should be involved in the management of the PA.
- 2.1.3 Crop compensation should be increased from the present amount of Rs. 100.00 per acre to an amount which will cover people's losses due to crop damage by wild animals.
- 2.1.4 Compensation should be paid for cattle death due to wild animals in villages outside the Reserve.
- 2.1.5 The regulations for tourism laid out in the Management Plan and highlighted in section II. subsection 5.3 above, should be implemented.
- 2.1.6 The use of the sanctuary for grazing by local people, should be regulated and maintained within the carrying capacity.
- 2.1.7 Local people should be employed as far as possible, in PA management activities like digging elephant proof trenches, weed eradication, maintenance of fire lines etc., especially in the transitional phase of the project when many of the income generation activities as part of ecodevelopment would not have been established.

2.2 Ecodevelopment:

- 2.2.1 To take up soil and water conservation measures like contour bunding, land leveling, checkdams, tubewells, percolation tanks etc. to improve agricultural land and provide minor irrigation facilities for increasing productivity of people's assets.
- 2.2.2 To meet the biomass requirement of people by providing fuelwood and fodder plantations on available waste and common lands in the villages. The biomass requirements of people can also be met by providing people with alternate energy sources like biogas plants, solar cookers, improved "chulas" etc.
- 2.2.3 To provide alternate sources of incomes for people dependent on the Reserve for their livelihood. The activities which are socially, environmentally, and economically feasible in the region are:
 - 1. Lac Culture: This is already being done in some villages of the area.
 - 2. Stitching: The women can earn or save cash by stitching garments for sale as well as their own use.
 - 3. Poultry farming: This option was suggested by the local people.
 - 4. Bee keeping: This option was also suggested by the local people.
 - 5. Pig rearing: This option was also suggested by the people.
 - 6. Fruit tree plantation: This was suggested by people in some villages.
 - 7. Handicrafts: Carpet weaving is a tradition among some of the villagers in the region, and some of the people there make a living out of this activity.

Basket making etc. from Lantana, which will be extracted from the PA could also provide additional income to the local people.

8. Iron Smithy and Carpentry: This option was suggested by the people themselves, especially those who have traditional skills.
9. Tourism: Tourism activities should increasingly be managed by and for, the local people so that they can get the earning through a co-operative or some such structure. Local people should also be trained as tourist guides and in providing hospitality to tourists.

2.2.4 To provide crop protection measures along with crop compensation.

- 3.1 Human Resources Development and Awareness: It is proposed to train people in poultry farming, apiculture, lac culture, stitching, handicrafts, carpentry, pig rearing, biogas plant servicing and repair, horticulture, providing bed-and-breakfast facilities to tourists, being a tourist guide, health care and adult education etc. The respective training can be provided by the concerned Government Departments, or appropriate NGOs.

It is also proposed to have groups of people who will interact with the villagers, and give them information about the significance of Palamau Tiger Reserve as a protected area, and its values. These people will also document and collect local people's knowledge about the area.

Training cum exhibition centres will be built at two suitable locations, for providing training courses and for display and sale of handicrafts, and other products made by the local people.

In addition, it is also proposed to train the Reserve staff in both wildlife management and ecodevelopment.

- 3.2 Institutional Arrangements: It is proposed to have a co-operative or a society which will have, as its members, all the people who are dependent upon the resources of Sanctuary. This co-operative will collect a token amount from tourists, or other visitors, and channel it back into ecodevelopment or PA management works.

It is also proposed to have village level ecodevelopment committees which will interact with the Reserve authorities and other concerned agencies on implementing and planning site specific ecodevelopment packages.

It is also proposed to involve the local NGOs who have been working on rural development issues in the area, so that they can help in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

It is proposed to have an institutional mechanism for enabling the local people to be consulted, and to participate in PA management. It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary. This would be supported by a district level co-ordination committee, involving the Collectors, and the Field Director, Palamau Tiger Reserve. Such committees will co-ordinate the inputs of the various line departments like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in the better co-ordination of protection measures.

The PA authorities should build up a mechanism for allowing local people to sell their produce to the tourists who visit the Reserve.

3.3 Research and Monitoring: Possible research topics include:

- a. To estimate the carrying capacity of grazing in the buffer of the Reserve.
- b. To study the elephant migration routes.
- c. To study the effect of drought on the Palamau Tiger Reserve ecosystem.
- d. To study the use of plants by tribals for food and medicinal purposes.
- e. To assess feasibility and methods of cultivating certain popular species of NTFP.
- f. To study biological methods for controlling crop depredation by wild animals.

Note on P.R.A. conducted in and around PALAMAU TIGER RESERVE

Palamau Tiger Reserve experienced one of the worst droughts in its history last year i.e. during 1993 summer. While negotiating and combating drought, it was experienced that the Park authorities have gone very close to the villagers and it was felt that unless the miseries of the village folk were mitigated, it was impossible to manage wildlife and the habitat of Palamau Tiger Reserve. Thus, employment generating schemes were worked out to benefit drought stricken populace and wildlife of the Park area side by side. The villagers in and around Tiger Reserve, were not only given employment but all the employment oriented schemes were covered by World Food Programme. Interface development like irrigation facility, drinking water facility, health care, crop protection from wild animals, fodder development for cattle, helped the villagers directly. This type of work during the crisis season was a blessing in disguise and when the P.R.A. exercises for eco-development under G.E.F. was started, almost all the villagers were free and friendly not only to the social organisations but to the project authorities.

METHODOLOGY: About 50 college and school students who were members either of the Nature Conservation Society or Nature Club, were selected for this purpose and were divided into smaller groups. Each group had two boys, one or two girls, and two forest department officials. The detailed methodology was designed in consultation with the local N.G.O's and groups were given a detailed briefing over several meetings before starting the PRA. After reaching the villages, each and every family was contacted and a meeting was held of villagers of different age groups and involving both men and women. The villagers were told about the purpose of the exercise and were requested to nominate four or five representative members who would function as contact persons for future. A detailed survey has been carried out in 140 villages.

Each consolidated format has been signed by the village representative and all items included for interface development have been suggested by the villagers themselves.

PRA Findings: The PRA findings have revealed that this area has been facing the worst drought ever over the last few years. This has also put additional pressure on the resources of the reserve from surrounding population.

Underlisted are the problems and solutions suggested by the people:

- i) Crop damage : The villagers are not able to cope with the attacks of elephants on their crops. It has been suggested by the villagers that
 - # compensation for crop damage be paid adequately to them.
 - # Also, crop protection measures such as elephant proof trenches or fencing, be taken up.
- ii) Adequate cattle compensation for kills within and outside the reserve should also be given.
- iii) It has also been suggested that controlled grazing in Palamau Sanctuary be allowed for the villagers dependent on the forest for meeting their requirements of fodder.

Other suggestions included:

- Replace cattle with other sources of income wherever possible.
- Develop fodder plantations in villages with common lands available.
- Plant fuelwood species where wasteland or common lands is available.
- Provide biogas plants.
- Provide energy conservation measures such as smokeless chullahs.
- Open fuelwood depots with wood procured from outside the Sanctuary.
- Initiate Joint Forest Management (JFM) in villages near the reserved forest outside the sanctuary.

REFERENCES

Census 1981 : District Census Handbook for Palamau District, Bihar

EPI : Five Years Ecodevelopment Plan for Buffer Zone Villages.

EP2 : Biodiversity Conservation through Ecodevelopment: A Preliminary, Indicative, Plan for Palamau Tiger Reserve, prepared by Shri P.K. Sen, Field Director, Palamau Tiger Reserve and Nature Conservation Society, Daltonganj.

FD Pers. Comm. Personnel Comments of the Field Director.

Mishra, J.(1970): An assessment of annual damage to crops by elephants in Palamau District, Bihar.

MP : Management Plan of Palamau Tiger Reserve (1987-88 to 1996-97) prepared by Shri R. C. Sahay, Conservator of Forests cum Field Director, Palamau Tiger Reserve.

QI : Questionnaire - 1 for Palamau Tiger Reserve, filled by Shri A. K. Chatterjee, Director Palamau Tiger Reserve, in December 1984.

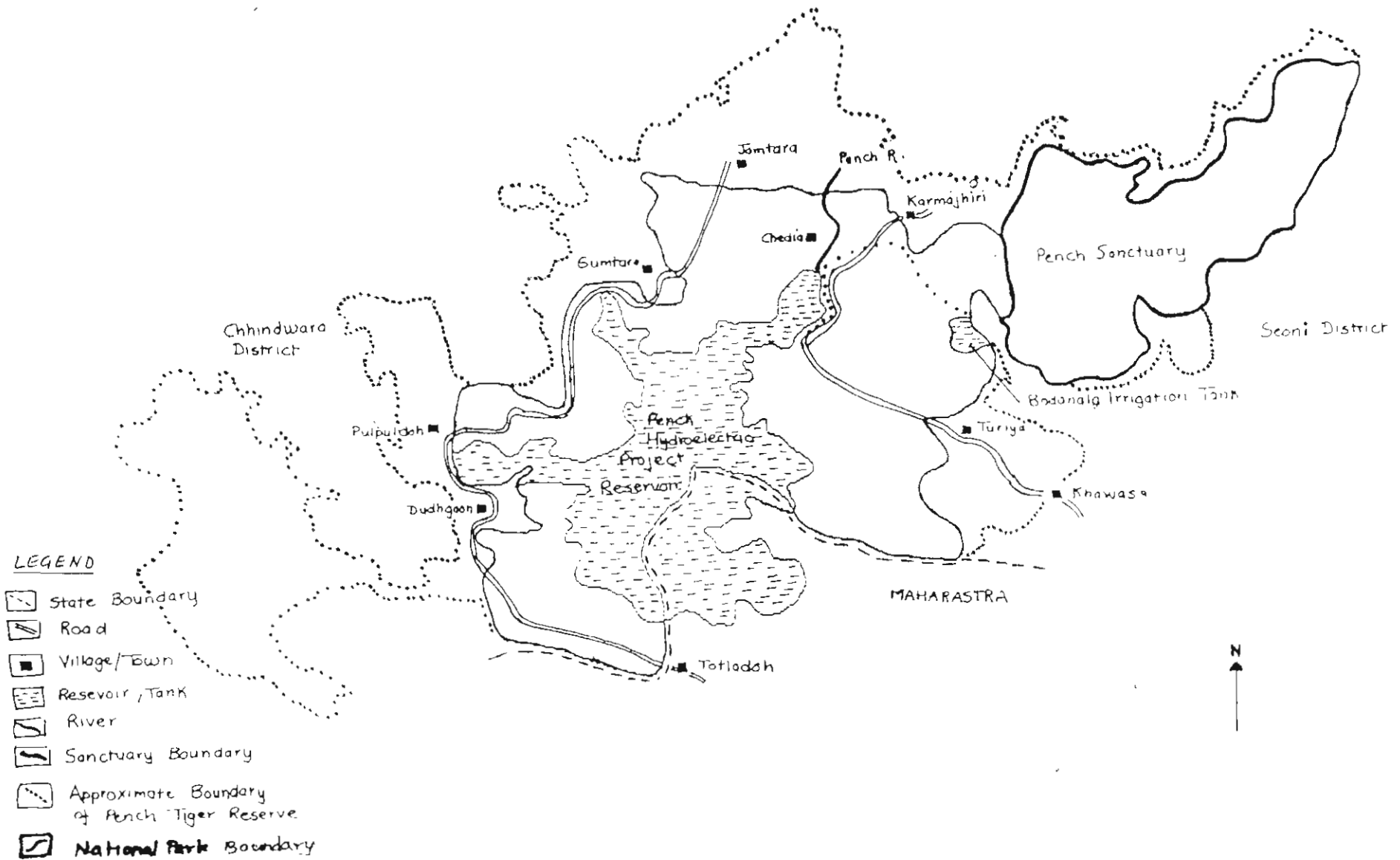
Rodgers, W.A. & Panwar, H.S. (1989): Planning a Wildlife Protected Area Network in India, Vol. I & II, Wildlife Institute of India.

SP: Status Paper on Palamau Tiger Reserve, anonymous, undated.

ZSI 1993 : Fauna of Tiger Reserves : An Overview, Zoological Survey of India, Calcutta.

PENCH TIGER RESERVE

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PENCH TIGER RESERVE

II THE PROJECT AREA (PENCH TIGER RESERVE) (Kindly refer to the attached map while reading the text)

1. The PA Area

- 1.1 Location and Approaches: The Protected Area (PA) comprises of the intended Pench National Park (NP) and the Pench Sanctuary.

The PA is located in Seoni and Chhindwara districts of Madhya Pradesh. The PA falls between latitudes 21° 37'10" to 21° 50'12" N and longitudes 70° 22' 47"E.to 79° 8' 12"E.

The PA headquarters are at Seoni approximately 60 km from the PA, via Khawasa.

The nearest airport and major railhead are at Nagpur (92 km). The nearest local meter gauge railhead is at Seoni. By road the PA can be approached on the Jabalpur-Nagpur Highway, National Highway 7; Nagpur to Khawasa (79.5 km) and then 11 km to the PA boundary via Turiya.

- 1.2 Legal Status, Area and Zoning: Prior to 1977, before the area was declared a Sanctuary, most of the area was a reserved forest (declared vide Government Notification No.917-C and 917-G dated 24 February 1929.)

In 1977, an area of 44939.2 ha was notified as Pench Game Sanctuary (vide Notification No. F-15/11/77 10 (3) dated 30 September 1977.) [M]. Of this, 25700 ha. was in South Seoni forest division and the rest in East Chhindwara forest division.

The Madhya Pradesh Government declared its intention to constitute an area of 29285 ha out of the pench sanctuary, as Pench National Park, vide Notification No.1582-10(2) dated 1 March 1983 [MP]. As the final notification for the national park has not yet been gazetted, the PA continues to have the status of a sanctuary. The Pench National Park and sanctuary was notified as a Project Tiger Reserve on 23-11-1992 vide notification No. 1-2/92 P.T. (Part II). The Project Tiger area has the national park as the core area and a surrounding area (including the Pench Sanctuary) of 46505 ha as buffer area. The total area of Pench Tiger Reserve is 75790 ha. [EP Final].

Date	Area (ha.)	Legal Status	Final Area(ha)/Unit
30 September, 1977	44939.2	Sanctuary	44939.2/Sanct.
1 March, 1983	29285	Intended NP	44939.2/Sanct. of which 29285 intended NP

Area: The Total Area of the PA is 44939.2 ha. of which 29285 ha. is the intended Pench National Park and the remaining area is Pench Sanctuary.

Zoning: There is a Core Zone which consists of the intended NP and a Buffer Zone of forest and revenue land of 46504 ha. The Pench Sanctuary falls within the Buffer zone [E]. The entire area falls within the boundaries of the Pench Tiger Reserve.

There is a Tourism Zone within the eastern section of the intended NP of approximately 5500 ha. in the Karmajhiri range (Seoni district) which is open to visitors [MP]. Tourists are allowed to enter only through the Turiya Barrier [Bagla]. There is

a proposal to allow another entry point at Totladoh barrier, located at the south west corner of the PA [SP].

- 1.3 Description of the Ecosystem: According to the Rodgers and Panwar biogeographic classification [Rodgers and Panwar 1988], the PA falls under Zone 6E: Deccan Peninsular-Central Highland.

Topography and Climate: The PA is located in the southern lower reaches of the Satpura hill ranges, which form the catchment for the Pench River. The folding and upheavals in the past resulted in the formation of a series of hills and valleys, rendering the terrain undulating, with most of the area covered by small hill ranges steeply sloping on the sides. Jutting out of the general undulating ground are many prominent hills, some rising to over 2000 feet above mean sea level [MP].

Most of the PA sports a sandy loam soil. Red kankar and saline soils are also found in some areas. Alluvial soils are confined to the banks of the major streams and of Pench River [MP].

The maximum and minimum temperatures occurring in PTR are 47.6° C and 2.7° C respectively.

The mean annual rainfall over the last eight years comes to 1173 mm, with fluctuations from 856.01mm to 1865.4 mm. Precipitation received during the monsoon season (June to September) is about 80% of the total annual rainfall.

Hydrology, Wetlands and Water Bodies: The Pench River flows through almost the center of the PA in a north to south-westerly direction. The river becomes dry by the end of April, leaving behind a number of pools of water, which are locally known as "kasa" or "doh". The PA is criss-crossed by a number of streams and nalas, most of them being seasonal.

The PA does not have any natural wetlands. An area of 5451 ha in the south central part was submerged in 1990 as part of the Pench Hydroelectric Project (PHEP). During the dry season the area of submergence is reduced to 2000 ha enclosing an area of 3451 ha, on the periphery of the reservoir [SP].

There are seven wells, seven tanks/anicuts (two perennial), twenty five (nine perennial) natural waterholes and seven handpumps within the intended NP area.

Bodanala, a small 43 ha. irrigation tank is situated on the intended NP boundary (in forest compartment numbers 41 and 22), and there is another tank called Dudhgaon talab situated in compartment number 240 in the Chhindwara area.

Some efforts have been made to develop water sources in various parts of the intended NP. It has been observed that due to poor water retention capacity of the soil, anicuts and tanks do not serve the purpose. Tanks usually get dry by end February. The best results have been observed where hand pumps have been established and artificial water holes have been created [MP].

Flora: The Forest types found in the PA are Southern tropical dry deciduous teak bearing forests (5A/C1(b)) and Southern tropical dry mixed deciduous forests (5A/C3). There is no sharp and permanent dividing line between the two types within the PA.

The Southern tropical dry deciduous teak bearing forests cover about 29% of the PA, and are found along the Pench river as well as on the hill slopes of Bodanala and Kariapahar area. Most of this type of forests have been submerged by the Pench

Hydroelectric Project. Teak (*Tectona grandis*) comprises 25 to 50% of the species, in association with dhaora (*Anogeissus latifolia*), lendia/seja (*Lageostroemia parviflora*), saja (*Terminalia tomentosa*), salai (*Boswellia serrata*), bija (*Pterocarpus marsupium*) and sirus (*Albizzia lebbeck*).

The Southern tropical dry mixed deciduous forests can be recognized as the prominent vegetation type in the PA. This type contains less than 25% teak in association with lendia/seja (*Lageostroemia parviflora*), saja (*Terminalia tomentosa*), dhaora (*Anogeissus latifolia*), salai (*Boswellia serrata*) and bhirra (*Chloroxylon swietenia*).

The forests in the PA have been altered by past timber felling, shifting cultivation, plantations and fire.

An average of 500-1000ha. is burned every year. In Chhindwara area is infested with weeds like chirota (*Cassia tora*) and gokhuru (*Xanthium strumarium*), while around Chedia, Alikatta, Tikari and Ambar village areas Lantana (*Lantana camara*) has spread over large areas [MP].

Fauna: Thirty eight species of mammals, one hundred and sixty eight species of birds, fifteen species of reptiles, three species of amphibians and fourteen species of fish have been recorded from the PA.

Among some of the endangered and Schedule I species are Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Sloth bear (*Melursus ursinus*), Leopard cat (*Felis bengalensis*), Fourhorned antelope (*Tetracerus quadricornis*), Mouse deer (*Tragulus meminna*), Indian python (*Python molurus*), Common Indian monitor (*Varanus bengalensis*), Water monitor (*Varanus salvator*), Marsh crocodile (*Crocodilus palustris*) and Shikra (*Accipiter badius*).

- 1.4 **Population:** There is one Forest Village, Chedia, within the intended NP area. This village, in Chhindwara district of the PA, has a population of 111 tribals, with 91 heads of cattle. The total area of the village is 154 ha. with 31.6 ha. under cultivation [MP].
- 1.5 **Land Use:** The land use within the PA consists of habitation, grazing and cultivation by Chedia village, use by the Pench Hydroelectric Project and the Bodanala Irrigation tank, and for tourism and pilgrimage. In addition, there is grazing by villages adjacent to the PA. A power line passes through the PA and roads within the PA are used by villagers.

A stone quarry of 1.62 ha. was sanctioned by the Central Government to the Pench Hydroelectric Project, in 1983. The sanction was valid until March 1992 and the quarry is not being worked at present. The PHEP has applied for a renewal for working the quarry.

No rights have been recognized in the intended NP area. Concessions regarding free grazing and provision of small timber and fuelwood at concessional prices were allowed before the area was notified as an intended national park. In the past, between 1818 and 1878, the forests were worked by contractors on a royalty system. Teak was heavily exploited and indiscriminate felling of Sal was undertaken to meet the demand for railway sleepers.

Grazing and nistar rights were generally unrestricted [MP]. Certain important trees like teak (*Tectona grandis*), amla (*Embellica officinalis*) and other fruit bearing trees were protected. In 1862 the first Conservator of Forests was appointed for the area. Among his policies was the demarcation of the area into forest divisions, fire protection and tapping the forest for revenue.

From 1896, the forests were worked under various working plans and under different silvicultural systems. The basic aim was to convert the mixed forests into teak, and to restock degraded areas. In 1929, these forests became reserved forests.

- 1.6 Staff and Equipment: The PA is headed by a director of the rank of a DFO. There are two ranges in the PA - Karmajhiri and Guntara ranges, both looked after by a Range Officer. Other staff include one assistant forest conservator, two forest rangers, one game supervisor, nineteen game guards, one accountant, one cook, one gardener, one driver, twenty barrier guards and two local incharge range officers.

The equipment consists of two binoculars, one spotlight, two jeeps and two motor cycles:

- 1.7 Management Plan: A plan was prepared for Pench Sanctuary, which was also used for the intended NP for the period 1979-80 to 1984-85. A new management plan has been formulated and approved for the period 1990-91 to 1994-95, and is currently being followed.

1.8 Major Management Issues

- 1.8.1 Habitation within the PA: Chedia village is situated within the intended NP area.
- 1.8.2 Grazing: Livestock from Chedia village and from villages adjacent to the PA are dependent on the PA for grazing. 6250 ha. (26 compartments) of the PA, which falls within Chhindwara district, have been opened for grazing. Following Chhindwara district's example, 1252.4 ha. of land (Compartments 38,39 and 40) within the intended NP have also been opened for grazing in Seoni district, to be used by livestock from villages in the adjoining area. It is estimated that about 8000 cattle, out of a total of 17,773 cattle in the 47 villages within a 5 km radius of the PA, graze within the PA [EP Final].
- 1.8.3 Fishing by the Madhya Pradesh Fisheries Development Corporation (MPFDC) within the Pench Hydroelectric Project (PHEP) Reservoir: The PHEP is a joint venture of the Madhya Pradesh and Maharashtra states. It is under the control of the Irrigation Department. The dam is located on the southern boundary of the PA in Chhindwara district. Of a total of 5451 ha under submergence, 75% of the submergence area falls within the intended NP, covering 1724 ha in Karmajhiri range and 3727 ha in the Guntara range (Chhindwara district). The remaining 25% (91993 ha) of submergence falls within the Pandit Jawahar Lal Nehru National Park (formerly the Pench National Park) in Maharashtra.

The interstate coordination board, which manages the PIIEP, envisaged fisheries development in the reservoir. After critically examining the possible repercussions, the Madhya Pradesh Forest Department (MPFD) ruled out fisheries development work in the reservoir falling within the territory of the PA. But the MPFDC is carrying out commercial fishing in the part of the reservoir that falls within the P. Jawahar Lal Nehru National Park in Maharashtra. For the purpose, a co-operative has been started by the Fisheries Corporation involving the local fisherfolk.

As there is no dividing line within the reservoir, it is difficult to monitor the fishing. Often the fisherfolk fish in the MP part of the PHEP reservoir, along the Pench river [MP].

- 1.8.4 Irrigation Departments control over Bodanala Irrigation Tank: This tank is situated along the eastern boundary of the intended NP, in compartments 21 and 40. As the tank is under the control of the Irrigation Department, protection becomes difficult and poaching occurs in the area.
- 1.8.5 Thoroughfares: In the Chhindwara area of the PA, due to alternate roads not being available, forest roads passing through the PA are used by villagers. The Guntara to Totladoh road is used daily by villagers. In the Seoni area also, the roads along the intended NP and Sanctuary boundary are regularly used by villagers. This causes disturbance to wildlife.
- 1.8.6 NWFP and Fuelwood Collection: The majority of people in the adjoining villages are tribals who have traditionally depended on the forest for their daily requirements of fuelwood and various NWFP. During the summer months, when food is scarce, a variety of fruits and rhizomes forms their staple diet.
- NWFP such as Mahua (Madhuca indica), grass, palm leaves, Mahul bel (Bauhinia vahli) leaves and Chironji/Achar (Buchanania lanzan) are collected by the villagers for their own use. Tendu leaves (Diospyros melanoxylon), Terminalia chebula, Terminalia bellirica, and Sterculia urens gum are sold commercially. In addition, lac is collected and sold commercially.
- 1.8.7 Crop Damage: Crop raiding by wild animals is common in the fields within the PA and adjacent to the PA. Extensive damage is done by Wild boar, Nilgai and Chital.
- 1.8.8 Fire: An average of 500 ha. of forest is burnt annually. Fires are essentially human made and both accidental. Sometimes honey collectors, gatherers of NWFP, collectors of shed antlers and fisherfolk start fires.
- 1.8.9 Weed Infestation: Overgrazed areas of the intended NP in Chhindwara district, compartments open to grazing and open areas of Alikatta and Chedia villages, and along the Pench river, have become infested with weeds such as Xanthium strumarium, Lantana camara, and Parthenium.
- 1.8.10 Antler Collection: Shed antlers of Chital and Sambar are collected by the local people and sold. The removal of antlers prevents the recycling of calcium and other minerals found in the antlers. Fires are started by the collectors to clear the undergrowth and facilitate the collection of the antlers.
- 1.8.11 Honey Collection: Honey is collected from within the PA by the local people for their own use and for sale. Fires are started by these people.
- 1.8.12 Pressures from the "Goose-neck": A finger shaped area between the intended NP and the Sanctuary is presenting problems to the Forest Department. The villages within this area graze their cattle within the PA as they have no alternate area, they are surrounded by the PA on three sides. They also poach fish in the Bodanala irrigation tank.
- 1.8.13 Water Shortage: During the summer months villagers bring their cattle to the PA waterholes. There is a shortage of water available to villagers for drinking and irrigation purposes in areas adjacent to the PA.

2. The PA Surrounds (10 km radius from the boundary of the PA)

2.1 Population: According to the 1981 District Census Handbook, there are 192 villages (183 inhabited) within the 10 km radius around the PA. The total population of these villages is 73,012 people. The villages fall within Sausar and Amarwara talukas of Chhindwara district, and Seoni taluka of Seoni district.

2.2 Land Use: The land use pattern of the surrounds mainly consists of cultivation, human habitation and forestry. The village economy is dependent on agriculture, animal husbandry and wage labour. Agriculture is generally restricted to the rainy season in the villages of Seoni district. Chhindwara district villages have at least two crops, one during the rains and one in winter. Where there is irrigation, a third crop is taken in summer. Agriculture, except in the case of large landowners, does not sustain the family. Marginal land holders and the landless are dependent on wage labour and are employed in forestry operations and in village development works. Marginal land owners take only one crop a year and are unemployed for 4 to 8 months of the year. Some villagers seasonally migrate to Nagpur for employment.

Adjacent to the northern and Western boundary of the PA are reserved forests with pockets of revenue villages. The north eastern boundary is surrounded totally by reserved forests. The southern boundary is contiguous with the Pandit Jawahar Lal Nehru National Park in Maharashtra. On the eastern boundary there are protected forests and pockets of revenue land.

The reserved forests and revenue lands surrounding the PA on the north, north-western, western and south-eastern boundaries are part of the Pench Project Tiger Reserve. Areas of village, forest, farm and culturable wasteland is summarized in the table below.

Number of Villages	192 (183 inhabited)
Total Area of Villages	66,968.39 ha.
Forest Land	14,628.47 ha.
Agricultural Land	39,243.25 ha.
Culturable Wasteland	8,517.39 ha.

3.1 Biomass: The local people graze their cattle within the PA. In addition, they collect grass, small timber and fuelwood for their own needs.

3.2 Income: The local people fish in the PHFP reservoir and Bodanala tank. They sell this fish. They also collect NWFP, honey and antlers, which are sold. Inhabitants of adjoining villages get employment on conservation and development works in the PA.

3.3 Emotional: The tribal culture is interwoven with the forest. Several festivals are celebrated within the PA. Birth and death rites are performed along the Pench river.

3.4 Water: Villagers are dependent on the PA water sources, during the summer months, for their cattle.

3.5 Roads: The roads within the PA are used by the local people.

3.6 Food: The local people collect honey from the PA. Also during the summer months the tribals depend on certain plants, collected from the PA, as for staple diet.

4. Impacts on/of PA

4.1 Negative Impacts of the People on the PA:

- Alteration of the forest due to excessive grazing.
- Degradation of the forest due to the removal of NWFP and fuelwood.
- Accumulation of solid wastes around the pilgrimage sites, Pench river and around Chedia forest village.
- Incidence of forest fires caused accidentally or intentionally by people collecting NWFP.
- Disturbance caused to animals due to traffic on the roads.
- Poaching and fishing within the PHEP reservoir and Bodanala tank.

4.2 Negative Impacts of the PA on the People:

- Loss in income due to crop damage caused by wild animals.
- Reduction in incomes because of restrictions related to NWFP collection.
- Shortage of biomass due to restrictions related to access to forests for grazing and fuelwood collection.
- Loss of food sources for some tribals, due to restriction related to access to forest.

5. Issues and Constraints

- 5.1 The PHEP and Fishing Rights: Fishing is illegal within national parks and sanctuaries. As fishing is taking place in Maharashtra, the authorities of the P. Jawahar Lal Nehru National Park will have to deal with the situation themselves. The dividing line between the two states, on the PHEP reservoir, should be properly demarcated with buoys or pillars. The area should be properly policed.

The issue of fishing within the reservoir and the fishermans cooperative should be taken up by the relevant authorities of both Maharashtra and Madhya Pradesh.

- 5.2 Bodanala Irrigation Tank The tank should be brought under the control of the wildlife authorities. This will allow them to check the poaching in the area. For the local people, in the "goose-neck" area, who are dependent on the Bodanala tank for fishing fish ponds should be established outside the PA. Also, alternative income generating activities should be provided for them.

- a. To allow controlled grazing within the opened compartments in the sanctuary area of the PA.
- b. To develop alternative grazing areas and fodder plantations around the PA in the revenue lands and protected forests, and to improve existing pastures.
- c. Supply grass from firelines to villagers for fodder.
- d. Improve cattle breeds where possible.
- e. Introduce stall feeding.
- f. Alternate employment for cattle owners.

There is enough land outside the PA which can be developed into fodder plantations or alternative grazing grounds. Fodder plantations could be developed on village community lands, where available. Also JFM could be initiated in the protected and reserved forests in the regions. However until fodder plantations and JFM activities get established, controlled grazing should be allowed within the already opened compartments in the sanctuary area of the PA [PRA]. Options c, d, e and f should also be implemented.

- 5.4 NWFP, Antler and Honey Collection: Alternative sources of income should be provided to those people who are dependent on NWFP, antler and honey collection for their livelihood. Planting of certain NWFP species could be done, on land outside the PA. Alternate sources of honey, such as beekeeping, should be established for the people who collect honey for their own use (PRA).
- 5.5 Crop Damage: A package of crop protection measures such as fencing, trenching etc., and hiring of local people as watchmen for the fields, can be implemented (PRA). Participatory patrolling of fields by the local people can be started.
- 5.6 Roads: The Forest Department is constructing another road from Totladoh to Guntara which is outside the PA, and which can be used as an alternative route to those inside the PA. Checkposts should be set up and regular monitoring of the roads passing through the PA should be carried out. Also, restrictions on heavy vehicles and use after sundown should be imposed.
- 5.7 Eradication of Weeds: The Forest Department should undertake a weed eradication programme. Local people can be employed in this programme. Also Lantana that is removed could be made into chipboards.
- 5.8 Fire: Adequate fire protection measures should be taken. Additional firelines and watchtowers should be set up and fire watchers should be employed during the fire season.

Alternate sources of income can be provided to the NTFP, antler and honey collectors, and fisherfolk who start the fires.
- 5.9 A New Entry Point for Tourists: A new entry point should not be allowed. The tourism zone should not be increased and tourism should be restricted to the already demarcated area.
- 5.10 Fuelwood plantation and alternate sources of energy: Fuelwood plantations should be established in the buffer area of the PTR. Joint Forest Management could be undertaken here. Alternate sources of energy such as biogas should be introduced (PRA). Fuelwood saving devices such as the smokeless chullah and fuel efficient funeral pyres should also be promoted. Fuelwood plantations should be established on public and private lands outside the PA.
- 5.11 Water Shortage: The villages adjacent to the PA have mentioned that they do not have enough sources of water for irrigation, and for meeting the drinking water needs of humans and cattle. As there is sufficient groundwater in the area, sustainable harvesting of ground water, for irrigation and drinking purposes, should be started.
- 5.12 Lack of Employment: Income generation activities should be initiated.
- 5.13 Degradation of Forest Land: In areas around the PA, forest land has been degraded due to overgrazing and removal of fuelwood. Soil and water conservation projects, and plantations should be undertaken for regeneration of the degraded areas.

III THE PROJECT

1. **Rationale**: The PA is situated in an area known for its richness in fauna and flora, which holds a significant place in the natural history of India. There are several Schedule I and endangered species in the area. The area is a good representative of teak and moist deciduous forest. It is part of a contiguous forest belt extending through Madhya

Pradesh and Maharashtra, and is important in the dispersal of wildlife. The Bodanala irrigation tank and the Pench Hydroelectric Project reservoir are wintering areas for migratory species of birds. The PA forests form an important catchment for the rivers of the region.

The project will attempt to minimize some of the problems being faced by the PA, by strengthening the existing PA management and by implementing eco-development programmes.

2. Project Description:

2.1 PA Management:

- 2.1.1 To demarcate the state boundary within the PHEP reservoir and to protect the reservoir waters within the Madhya Pradesh part of the reservoir, by policing.
- 2.1.2 To bring the Bodanala irrigation tank under the control of the Project Tiger authorities and to eliminate fishing and poaching in the area.
- 2.1.3 To minimize grazing pressure on the PA by establishing fodder plantations and identifying alternate grazing grounds outside the PA. (Until this is done, sustainable grazing should continue to be allowed within the already opened compartments in the PA). To provide grass from firelines to villages for fodder.
- 2.1.4 To reduce traffic on the roads within the PA by developing alternative roads outside the PA. Also, to establish checkpoints along roads within the PA and to police these roads. To restrict their use at night and by heavy vehicles.
- 2.1.5 To undertake a weed eradication programme, which could also provide employment to the local people
- 2.1.6 To build additional firelines and watchtowers within the PA and to hire fire watchers during the fire season.
- 2.1.7 To restrict the tourism zone within existing boundaries and not to open any new entry points.
- 2.1.8 To provide employment for the local people in construction work, eradication of weeds, maintenance of firelines and other PA work.
- 2.1.9 To minimize fuelwood collection within the PA by establishing fuelwood plantations in the buffer area of PTR, and by supplementing fuelwood supply through Joint Forest Management.

2.2 Ecodevelopment:

- 2.2.1 To develop alternate energy sources to reduce the pressure on the PA for fuelwood.
- 2.2.2 To initiate Joint Forest Management of the forest adjacent to the P.A.
- 2.2.3 To establish fodder pastures in village wastelands and to increase the production of existing pastures, to meet the existing fodder requirements.
- 2.2.4 To provide income generating activities to reduce the dependency on the PA for incomes through collection of NWFP and fuelwood and from keeping livestock and poaching wild animals. These activities would include:

- 2.2.4.1 Fish Farming: Many of the tribals in the area are expert fisherfolk (PRA).
- 2.2.4.2 Tourism Co-operative: A co-operative could be set up to provide lodgings, provide nature guides for the PA and maintain other visitor facilities in and around the PA. This co-operative could be started in the "goose-neck" area near the tourism zone.
- 2.2.4.3 Bee Keeping: The tribals collect honey from the PA and know how to work with bees (PRA).
- 2.2.4.4 Sericulture (PRA).
- 2.2.4.5 Poultry Farming: This would be done on a small scale, about 10 chickens per family, organise into units of 20 to 25 families.(PRA).
- 2.2.4.6 Ropemaking (PRA).
- 2.2.4.7 Crop Protection Measures: This will include a combination of possibilities such as digging trenches and ditches, rock walls with foundation to prevent wild boars from digging under them, 'green' fencing of thorny species etc. Watchmen could be appointed from the villages to guard the fields (PRA).
- 2.2.4.8 Water Harvesting: Check dams, tube wells, drip irrigation, handpumps etc. will be provided to meet the irrigation and human and livestock drinking water needs of the villagers outside the PA.
- 2.2.4.9 Agricultural Land Development: Activities such as bunding, leveling, gully plugging will be undertaken to improve the agricultural land.
- 2.2.4.10 Non-conventional Energy Sources: Alternate sources of energy such as biogas plants will be provided to the villagers. This will help alleviate the pressure on the PA for fuelwood. Energy conservation measures such as fuel efficient stoves and solar cookers will also be introduced.
- 2.2.4.11 To provide water tanks in villages, for cattle.
- 2.2.4.12 To improve cattle breeds and initiate stall feeding.

3. Support Systems:

3.3 Research Objectives;

- To estimate the impact of fishing on the PHEP reservoir.
- To estimate the effects of grazing in the compartments opened for grazing.
(Other topics to be identified through PRA)

Annexure A

PARTICIPATORY RURAL APPRAISAL

The Participatory Rural appraisal (PRA) for Pench Tiger Reserve was undertaken by the Indian Institute of Forest Management, Bhopal. The team was headed by two faculty member of the institute, Dr. P.C. Kotwal and Dr. Rekha Singhal. Three research associates, Anurag Joshi, Gyanendra Shukla and Habib Khan were also part of the team.

The PRA exercise was started in July 1993 and 6 villages within a 5 km radius of the Protected Area were covered.

Methodology: The villages of the region were divided into six clusters and PRA was conducted in the following six representative villages of these clusters:

1. Karmajhiri
2. Durgapur
3. Jantara
4. Guntara
5. Ambari
6. Dudhgaon

The following activities were covered as part of the PRA:

1. Time-line
2. Seasonal Calendar
3. Participatory Mapping and Modeling
4. Transact Analysis
5. Livelihood Analysis
6. Wealth Ranking

Alongwith the PRA, a semi-structured questionnaire covering topics such as extent of crop damage, cattle predation, restriction of entry into the PA, grazing and fuelwood, were discussed with the villagers in 41 villages. Basic information regarding the village was also collected.

Main Findings and Strategies:

1. Fodder: The total cattle population of the 41 villages is 21,366 and their annual fodder consumption is 66,415.9 tonnes. The villagers suggested that pasture lands be developed.
2. Fuelwood: The annual consumption of fuelwood is 125,227.83 quintals. Fuelwood plantations were suggested, along with alternate sources of energy such as biogas plants.
3. Crop damage: This was a major problem faced by the villages. Fencing of areas and the use of gajkundi's was suggested.
4. Marginal landowners are unemployed for 4 to 8 months of the year. They should be provided with employment. Beekeeping, sericulture, poultry farming and ropemaking were suggested as alternate sources of income.
5. There wasn't sufficient water for drinking and irrigation purposes. Water harvesting structures such as tubewells, dug wells, drip irrigation, etc. were asked for.

References:

Bagla, Pallava. Field Report Pench National Park. 27 December, 1987 to 1 January, 1988. [Bagla]

District Census Handbook 1981 for Seoni and Chhindwara Districts.

Ecodevelopment Plan for Pench National Park. Madhya Pradesh Forest Department. 1992.[EP]

Ecodevelopment Plan for Pench National Park. Madhya Pradesh Forest Department. 1994.[EP Final]

Dongaonkar, K.R. Pench National Park, Madhya Pradesh - A Status Paper. 1993 [SP]

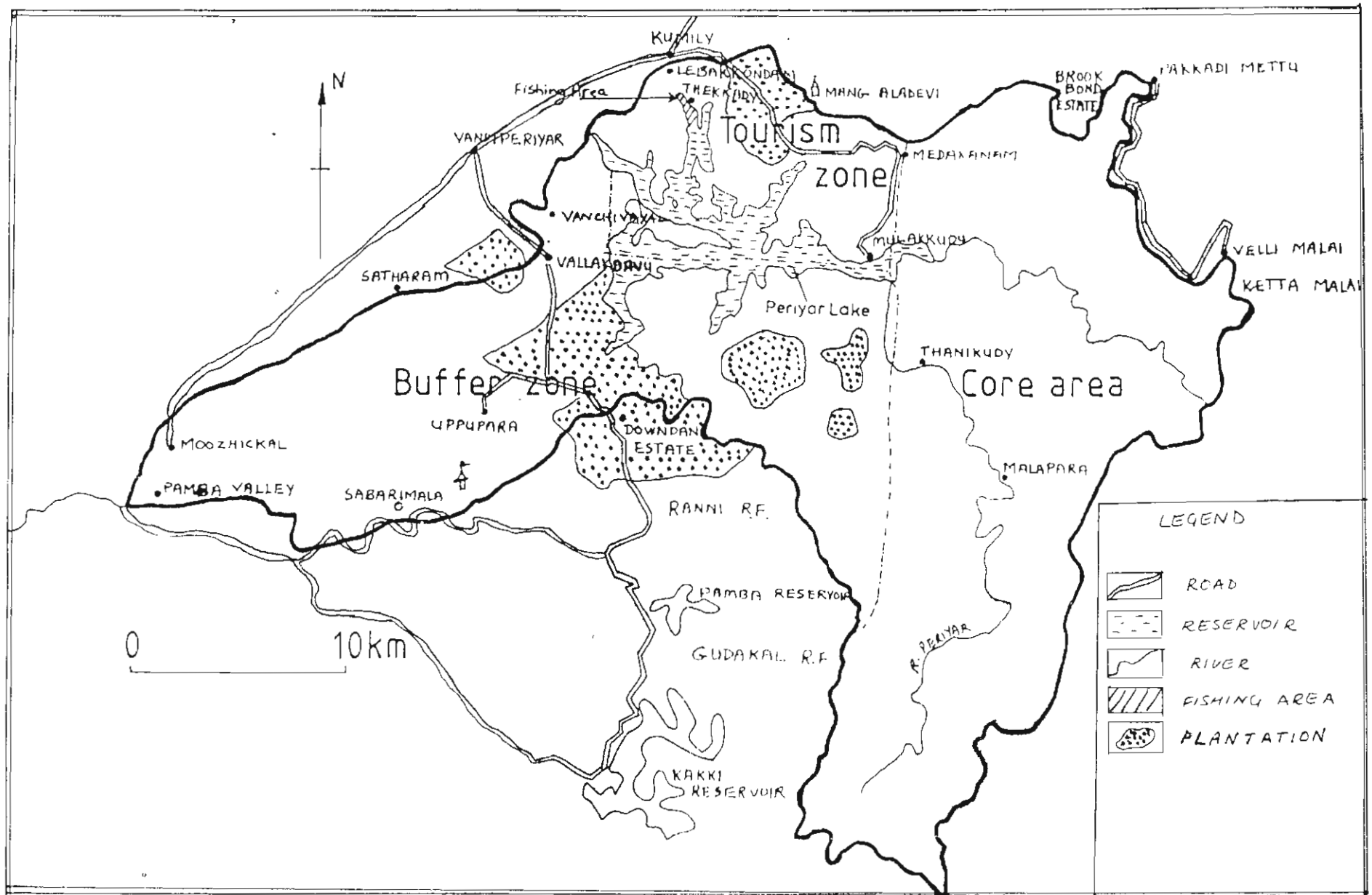
Kumar, Suhas. Management Plan for Pench National Park. 1990-91 to 1994- 95. [MP]

Questionnaire 1: All India Survey of National Parks and Sanctuaries 1984. Filled in by A.S. Parihar, Director. 20/7/1984. [Q1]

Rodgers, W.A. and H.S. Panwar. Planning a Wildlife Protected Area Network in India. Vol. 1 and 2. March 1986.

[PRA] : Finding of the Participatory Rural Appraisal

PERIYAR TIGER RESERVE



PERIYAR TIGER RESERVE

II. THE PROJECT AREA (PERIYAR TIGER RESERVE) (Kindly refer to the attached map while reading the text)

1. The PA Area

- 1.1 Location and Approaches: Periyar Tiger Reserve (PTR) is situated in the Peermade Taluk of Idukki District, Kerala, between latitudes 9° 18' to 9° 40' north and longitudes 76° 55' to 77° 25' east. The office of the Field Director (FD) PTR, is located at Kottayam, which is also the nearest railhead (115 km from Thekkady). There is also a Wildlife Protection Officer (WLPO) of the rank of DFO who is posted in Thekkady, and is the local officer in-charge. The nearest airport is at Madurai which is located about 140 km from PTR. The best way to approach PTR is to either take a train to Kottayam, or fly to Cochin or Madurai, from where one has to get to the reserve by road.
- 1.2 Area, Zoning, and Legal Status: An area of 777 sq km was declared Periyar Wildlife Sanctuary in 1950 vide notification no. F1. 2854/49/DD dated 11 August. In 1978, the Periyar Wildlife Sanctuary was declared a Project Tiger Reserve vide letter no. J.110025/34/75 FRY(PT), dated 29 August 1978. The sanctuary is demarcated into three zones a. Core Zone (350 sq km) b. Buffer Zone (377 sq km) c. Tourism Zone (50 sq km).

In 1982, the intention to constitute the Core Zone into a national park was declared vide notification no. G.O. (P) 310/82/AD dated 27 October 1982, [mp]. A reservoir, popularly known as the Periyar Lake, is also located within the buffer and tourism zones. It was created in 1895 after the damming of River Periyar. PTR is administratively divided into two ranges, viz. Thekkady and Vallakadavu. While the core zone of PTR is contained entirely within Thekkady Range, the buffer zone and the tourism zone are contained within Vallakadavu Range.

The headquarters of Thekkady Range are located at Thekkady, which is located in the tourism zone of PTR just inside its northern boundary, while the headquarters of Vallakadavu Range are located at Vallakadavu, which is located on the northern fringe of the buffer zone of PTR.

- 1.3 Description of the Ecosystem: The terrain in PTR is highly undulating, especially in the core zone. The highest point in PTR is Ketta Malai (2016 msl) on the eastern boundary of the Reserve. There are several perennial streams and rivers in PTR, of which the prominent ones are Periyar, Pamba, and Azhuda. The Periyar Lake is another perennial water source.

The forest types occurring in PTR, as per the Champion and Seth classification are:

1. Tropical Evergreen Forests (IA/C4)
2. SemiEvergreen Forests (2A/C2)
3. Moist Deciduous Forests (3B/C2)
4. Grasslands (IIA/C1/DS2)

So far, 49 species of mammals, 243 species of birds, 28 species of reptiles, 8 species of amphibians, 22 species of fish, and 112 species of butterflies have been identified in PTR. In addition, 70 species of grasses, 75 species of herbs, 130 species of shrubs, and 132 species of trees have been identified [Anon. undated(a)].

1.4 Population: There is no human habitation within the core zone of the reserve. Some tribal villages were relocated from the core zone to the buffer zone during the 1950s. The details of these are:

1. The Mannans (236 families) and the Paliyans (105 families) are settled in Lebbakondam near Thekkady, within and on the northern edge of PTR, in its tourism zone, and are occupying an area of 88.40 ha. The total population of this settlement is 1185.
2. The Uralis (38 families) are settled in Vanchivayal near Vallakadavu, within and close to the northern edge of the buffer zone of PTR, and are occupying an area of 39.39 ha. The total population of this settlement is 174.
3. The Arayans (186 families) are settled in Moozhickal, within and on the western tip of PTR, and are occupying an area of 112 ha. The total population of this settlement is 677.

In addition to the above, 692 landless families were allotted land within the Periyar Wildlife Sanctuary near Moozhickal, in 1962, under the "Grow More Food Scheme". They now occupy an area of 460.50 ha. The total number of people living in this area is 1820.

Also, some families have reportedly encroached forest land within PTR, in Moozhickal and Satharam [Anon. Undated(b)]. Satharam is situated near Vallakadavu, just outside the northern edge of the buffer zone of PTR.

1.5 Land Use: The area of PTR is being used for/occupied by the Periyar Lake reservoir (2600 ha), habitation and cultivation by tribals (700 ha), tourism (the tourism zone is 5000 ha), and the Sabarimala temple complex, occupying about 20 ha, near the southern edge of the buffer zone of PTR. There are also paths inside the Reserve which are used by pilgrims. In addition, there are Eucalyptus plantations in about 5500 ha of the buffer and tourism zones, from where Eucalyptus trees are being supplied to the Hindustan Newsprints Company Limited, in Vellore.

1.6 Staff and Equipment: Apart from the FD and WLPO mentioned in section 1.1 above, there is 1 research officer, 5 range officers, 2 deputy rangers, 8 foresters, and 79 forest guards posted in PTR. In addition, there are 56 other personnel posted for various field and office posts in the reserve [Anon. undated(a)].

There are 5 jeeps, 1 minibus, 4 boats, 6 motorcycles, 1 night viewing device, 1 VCR, 1 VCP, 2 film projectors, 1 slide projector, 2 TVs, 5 generators, a few wildlife films, and camping equipment available in PTR [Anon. undated(a)]

1.7 Management Plan: There is a management plan, valid from 1986 to 1996.

1.8 Major Management Issues: Major management issues, as perceived by the PTR management, are:

- 1.8.1 Pilgrimage: The Sabarimala Shrine, dedicated to Lord Ayyappa, is located within PTR. The number of people visiting the shrine is now reported to be about 10 million per annum. The bulk of pilgrims visit the shrine during a two month period between 15 November and 15 January. To provide fuel to this massive influx of pilgrims, hundreds of trees are cut for firewood. The presence of such a large number of people most of whom stay over night in the PTR, results in pollution due to accumulation of solid wastes, air and noise pollution due to the

movement of vehicles, especially on unmetalled roads, accidental fires, and disturbance to animals.

- 1.8.2 Ganja Cultivation: Ganja cultivation plots are reportedly located in the remote parts of the core zone (eastern side of PTR) in areas bordering Tamil Nadu.
- 1.8.3 Extraction of Wood for the Hindustan Newsprints Company Limited (HNCL): During the 1960s, Eucalyptus was planted by the Forest Department in the Periyar Sanctuary. Now that these plantations have matured, they are being harvested for the HNCL. Some of the plantations which were earlier harvested, have been replanted between 1990 and 1993.
- 1.8.4 Tourism: In 1991-92, around 2,50,000 people were reported to have taken boat rides at PTR, while in 1986-87, around 2,00,000 people were reported to have taken boat rides [Anon. undated (a)]. These figures show a 25% increase in about 6 years. The PA authorities believe that the total number of tourists visiting PTR might well be close to 3,50,000. The influx of so many people in the area, apart from exerting a direct pressure, also exerts an indirect pressure. Almost all the hotels and restaurants in Kumily town, all of which cater to the tourists visiting PTR, use fuelwood for cooking and heating. This is extracted from the forests of PTR. Kumily is a town situated adjacent to the northern boundary of PTR near Thekkady.
- 1.8.5 Grazing: 2000 cattle are reported to enter PTR for grazing from Kumily, from estates adjoining the northern boundary of the buffer zone of PTR, and from areas around Vallakadavu. They graze in the reserve along a length of about 40 km [Anon. undated(b)].
- 1.8.6 Fuelwood Extraction: Fuelwood is collected by the people living within PTR (see section 1.4 above). In addition, there is also extraction of fuelwood for use by people living adjacent to the reserve. "Nearly 300 bundles of firewood are collected and sold in Kumily town alone." [Anon. undated(b)]. Most of these bundles are consumed by the hotels/restaurants which cater to tourists visiting PTR. These bundles are supplied by the Paliyans of Lebbakondam, this being their main source of income. In addition, in 1992-93, 400 metric tonnes of fuelwood was supplied by PTR authorities to the Sabarimala authorities during the pilgrim season.
- 1.8.7 NTFP Collection: Various non timber forest products like Cinnamon bark, Thelli Powder (also known as **black diamar**, which is extracted from Carnarium strictum, and Vateria indica trees and used as incense), and honey are collected by the people, living in the settlements inside the reserve, and also by those living in adjacent villages. The Thevans, who are tribals, and who come from the Gudalur area in Tamil Nadu, are reported to extract NTFP even inside the core zone of PTR [Anon. undated(b)]. An impact of these activities is the accidental setting of forest fires, mainly due to the carelessness of people collecting NTFP inside the PTR.
- 1.8.8 Fishing: The Mannans of Lebbakondam are reported to fish in one small portion of the Periyar Lake, fishing being their main source of income [Anon. undated(b)].
- 1.8.9 Weeds: Lantana camara has come up in PTR, all along the edge of the Periyar Lake, as well as along many of the paths and roads in the Reserve. There is also infestation of Eupatorium [Anon. undated (b)].

- 1.8.10 Presence of other Government Agencies: The Kerala Tourism Development Corporation (KTDC) has hotels and boats in the tourism zone of PTR. The Public Works Department(PWD) also has a rest house inside. At present, the PA authorities do not have any control over these.
- 1.8.11 Forest Fires: Forest fires are mostly reported to occur from December till May. Most of these fires are caused accidentally due to the presence of humans who come into PTR for NTFP collection. Between 1990 and 1993, a total of 38 fires was reported to have broken out in PTR, damaging a total area of 679.5 ha.
- 1.8.12 Staff: According to the PA management, the number of staff posted in PTR is inadequate for providing effective protection to such a large area. Also, often the quality of staff posted to PTR is not upto the mark.
- 1.8.13 Pamba Valley Food Production Area: According to the PA management, they do not have any effective control over this particular area. Reportedly, the people here have even taken up making metalled roads and clearing of forests without taking permission from the PTR authorities.
- 1.8.14 Roads used by Pilgrims: There are two roads inside PTR which are used very heavily by pilgrims during the Sabarimala season. These are the Vandiperiyar-Downdan Estate-Kakki Reservoir road, and its offshoot upto Uppupara. The movement of vehicles carrying pilgrims on these roads for two months in an year, leads to disturbance of animals and air and noise pollution.
- 1.8.15 Crop damage: Though there are incidents of crop damage, by wild animals, in the periphery of PTR, the loss in monetary terms is not very high because the value of the crops being raided is not very much. However if, as a part of ecocodevelopment, agricultural activities are promoted, the value of crops being damaged might increase.

2. The PA Surrounds (10 km radius from the boundary of PTR)

- 2.1 Population: According to the District Census Handbook, 1981, the number of people living in a 10 km radius from the boundary of PTR in Kerala is 3,64,815, while the number of people living in a 10 km radius from the boundary of PTR in Tamil Nadu is 2,72,122, a total of 6,36,937.

Although the exact number of people from Kerala who impact on the reserve is at present not known, the settlements which these people come from have been identified by the PA authorities. These are Kumily, the Tea Estates situated adjacent to the northern boundary of the buffer zone of PTR, and Satharam. According to the District Census Handbook, 1981, the population of Kumily alone is 9,748. The eastern and north-eastern boundary of PTR is contiguous with the Tamil Nadu boundary. There is inadequate information about the surrounds of PTR in Tamil Nadu.

- 2.2 Land Use: There are several coffee, tea, cardamom, and rubber estates as well as forests in the immediate surrounds of PTR. There is also cultivation of rice, pepper, banana, tapioca etc. There is approximately 866 sq km [Mehta 1994] of forest land in the surrounds of PTR in Kerala, much of which is adjoining the southern boundary of the Reserve, in the Ranni Forest Division. Most of the estates are adjoining the northern boundary of the Reserve. There are some estates around the western and southern boundary of PTR also. Two reservoirs known as the Pamba Reservoir and the Kakki Reservoir, are also situated in the surrounds of PTR. The rest of the area in the surrounds of PTR, in Kerala, is taken up by cultivation.

There is approximately 1186 sq km [Mehta, 1994] of forest land in the surrounds of PTR in Tamil Nadu. In addition, there is cultivation of paddy and some pulses as well as plantations of coconut and grapes.

3. Local Dependencies on the PA: The dependencies of people on PTR, both local and others, are for the following needs:-

3.1 Biomass: The local people graze their cattle in PTR. Apart from that, they also extract fuelwood and small timber for their own needs.

3.2 Income: The local people, especially the Paliyans of Lebbakondam, extract headloads of fuelwood for sale in adjacent towns like Kumily. In the case of Paliyans, it is their main occupation. In addition, many other people's livelihood, especially around Kumily and Vallakadavu, depends on tourism in PTR. The Mannans fish in Periyar Lake, and then sell their catch in Kumily for cash. There is also collection of NTFP, from which people get an income.

3.3 Socio-cultural: The temple at Sabarimala, dedicated to Lord Ayyappa, attracts people from all over India. In addition, the Mangaladevi temple, located on the northern edge of the tourism zone of PTR, is a monument of religious and archaeological importance, and attracts about 10,000 people on just one day (Onam) in the year.

4. Impacts on/of PA

4.2 The major negative impacts of the people on PTR are:-

- Air and noise pollution, and disturbance to wild animals, due to the movement of vehicles transporting pilgrims inside PTR.
- Pollution and threat of infectious diseases due to accumulation of solid wastes inside PTR during the pilgrim season.
- Degradation of forests due to extraction of fuelwood, and timber for sale. (Timber is also extracted in PTR for HNCL).
- Incidence of forest fires accidentally caused by people entering PTR for collection of NTFP.
- Debarking and the resultant damage of Cinnamon trees inside PTR due to collection of NTFP.
- Disturbance to animals due to the presence of a large number of tourists and pilgrims in PTR.
- Deforestation due to clear felling by Ganja cultivators in PTR.
- Reduction of animal population due to animal poaching.
- Infestation of Lantana camara due to grazing and forest fires.

4.2 Negative Impacts of the PA on the People: The major negative impacts which PTR can potentially have on the people are:-

- Shortage of biomass due to restrictions related to the collection/extraction of biomass from, or access to, the forest, for activities like grazing, fuelwood collection, fodder collection, and small timber extraction.
- Reduction in incomes because of restrictions related to NTFP collection, and headloading of fuelwood for sale.
- Socio-cultural deprivation because of restriction on the activities and movements of pilgrims inside PTR.
- Damage to crops in the adjacent areas of PTR, by wild animals, especially wild boars.

5. **Issues and Constraints:** The major issues, which are also major problems for the PTR authorities and need to be addressed under this project are: a. Pilgrimage at Sabarimala, b. Ganja Cultivation and Poaching, c. Extraction of timber for the HNCL, d. Management of Tourism for the benefit of PTR and the local people, and e. Providing alternatives to the local people for their dependencies on PTR. These are discussed below.

5.1 Pilgrim Pressure at Sabarimala: The following options are available for minimising the impact of pilgrimage on the Reserve:-

- a. To completely stop all pilgrim activity in PTR
- b. To allow pilgrims to visit Sabarimala, but not allow them to use routes within PTR.
- c. To allow pilgrims to use routes within PTR, but to regulate their movement inside the Reserve.
- d. To develop the Sabarimala Temple complex in a way in which the demand for forest resources is minimised.
- e. To supply the fuelwood requirements of Sabarimala, during the pilgrim season, from outside PTR.

Of the options listed above, a. and b. are not viable, since their implementation would lead to a great deal of protest from not just local people, but probably people from all over the country. Options c. and d. are much more viable, both administratively as well as socially. However, even these options can only be implemented gradually, and over a longer time period than the five years available under this project. In addition, the requirement of funds is also much greater than what can be provided under this project. Option e. can be implemented after consulting the State Government and identifying an alternate area for supply of fuelwood to the Sabarimala complex during the pilgrim season.

5.2 Ganja Cultivation: The only solution to this problem is more stringent policing. However, if policing is done jointly with the local people, and by getting their active co-operation, it will be more effective. Also, aerial surveys of the core zone need to be regularly organised. Besides, the communication infrastructure has to be improved.

5.3 Extraction of Timber for HNCL: The only solution to this problem is to not allow any more extraction of timber for HNCL, and to remove all Eucalyptus trees from PTR. Apart from the disturbance, timber extraction is illegal under the Wildlife(Protection), Act (1972).

5.4 Management of Tourism: The tourist pressure is concentrated mainly around Thekkady, and a part of the reservoir, where people are taken for boat rides. This pressure can be dispersed within the tourism zone of PTR in a way in which the tourists can also make good use of their time. A related pressure of tourism is the extraction of fuelwood for sale to restaurants in Kumily. A regular supply of LPG cylinders should be ensured for the restaurants in Kumily and other areas around PTR, after which, a ban should be imposed on the use of fuelwood in the restaurants around PTR.

5.5 Grazing: The options for managing the grazing pressure on PTR are:-

- a. To disallow grazing completely in PTR.
- b. To develop alternate grazing grounds outside PTR.
- c. To encourage people to stall feed cattle, and to go in for improved breeds, if necessary

- d. To allow grazing in the buffer zone of PTR, since grazing can be permitted in a sanctuary.

Of the options listed above, a. is not feasible since it would lead to a great deal of hardship for the people. Option b. is difficult, since there is little land available outside the PTR which can be developed as a grazing ground. Option c. is feasible, but it may be difficult to implement since going in for improved breeds of cattle will need investments of money and infrastructure. Also, people who are used to grazing their cattle, find it difficult to shift to stall feeding, atleast initially. Option d. is the most feasible of all the options given above, especially since the number of livestock is small. However, a study of the carrying capacity of the habitat for grazing should be done, so that grazing can be regulated at a sustainable level. Also land should be purchased outside PTR, to develop as a fuel and fodder plantation. Local breeds should be upgraded.

5.6 Fuelwood Collection: The options for managing the pressure on PTR for the collection of fuelwood are:-

- a. To identify and develop land outside PTR where fuelwood plantations can be raised, so that the pressure on the Reserve can be diverted.
- b. To build up alternative income generation packages for those people who collect fuelwood for sale, in order to earn money.
- c. To make available to the people, alternate and sustainable fuel sources like biogas plants, solar cookers etc, and fuel efficient devices like smokeless chulhas.

Of the options given above, option a. is the most attractive. However, land outside PTR, which can be used for this purpose, is not easy to come by. The PTR authorities can consider buying or acquiring land outside PTR, which can then be used for raising fuelwood plantations for local people. Option b. is feasible, but only applies to those people (eg. the Paliyans), who do headloading of fuelwood for sale. The implementing of option c. would remove pressures from PTR completely. However, in order to operationalise this option, monetary and infrastructural investments would be needed. Also, like in the case of biogas, a prerequisite would be an adequate number of cattle in the site where the biogas plant has to be installed.

5.7 NTFP collection: Since NTFP collection is done by people for earning cash, the solution to this problem is to provide people with income generation alternatives.

5.8 Crop Damage: Crop compensation should be provided for crop damage by wild animals.

5.9 Weeds: The only option available here is to get rid of Lantana camara from inside PTR by uprooting/cutting it. This activity can be made economically sustainable by promoting the manufacture of Lantana Chipboard.

5.10 Presence of other Government Agencies: Control of the KTDC and PWD establishments should be handed over to the PA authorities.

5.11 Rationalisation of Boundaries of PTR: Since there are several intense pressure zones inside PTR, as well as very valuable, pressure free, forests around, the boundaries of PTR should be rationalised in such a way, that its status, as an area conserving biodiversity, is improved.

- 5.12 Forest Fires: Local people can be employed as fire watchers during the fire season. Also, if human presence inside PTR is removed/minimised due to the various ecodevelopment initiatives proposed above, the incidence of fire will also get reduced significantly.
- 5.13 Staff: One way in which this shortcoming can be rectified is to employ local people on either daily wages or as regular staff of the Forest Department. Additional posts should also be sanctioned for PTR, atleast during the project period. The PA authorities should be allowed to transfer staff according to their convenience.

III. THE PROJECT

1. **Rationale**: PTR is representative of the Western Ghats Biogeographic realm (5b) within the Western Ghats Biogeographic zone (5). It is the biggest protected area in the Periyar Biogeographic Subdivision [Rodgers & Panwar]. Some of the endangered faunal species in PTR are the Whitebellied Sea Eagle and the Great Indian Hornbill among birds, the Common Indian Monitor, the Indian Python, and the King Cobra among reptiles, and the Slender Loris, the Tiger, the Leopard, the Leopard Cat, the Fishing Cat, the Smooth Indian Otter, the Small Travancore Flying Squirrel, the Indian Elephant, the Indian Gaur, the Lion Tailed Macaque, the Nilgiri Langur, the Nilgiri Tahr, and the Indian Pangolin among the mammals. There is a significant population of Elephants in PTR. PTR is a representative area of the Shola forests ecosystem.

However, PTR is also impacted upon by several human activities, which threaten this valuable area, as has been highlighted in section II, subsection 1.8, above. A correct balance of effective and strong PA management along with the right kind of ecodevelopment inputs is needed to work towards a solution of problems created due to human uses and impacts in PTR. This is also the right time to initiate fresh strategies for PA management and ecodevelopment, because the State Government and the PTR authorities are willing to co-operate for the above. The administration will have to get co-operation of the local people and earn their trust, so that the two major players in the effort, ie; the people and the PTR authorities, can pull their weight together in the same direction.

2. Project Description:

- 2.1 PA Management: The following steps are being recommended for PA management under this project:
 - 2.1.1. The posts of one DFO and requisite support staff be made available at PTR, exclusively for ecodevelopment planning and implementation. Also, additional posts for strengthening protection staff should also be made available. These posts can be diverted from the Social Forestry Wing of the Forest Department, since the externally aided social forestry project has come to an end.
 - 2.1.2. An officer trained in ecodevelopment should be posted to PTR as DFO, exclusively for implementation of the Ecodevelopment Project.
 - 2.1.3. The Sabarimala Shrine and an area around it should be excluded from the Periyar Sanctuary (but maintained within the Periyar Tiger Reserve), and in its place the Dwindan Cardamom Estate (Pachakanam), should be acquired and included into the Sanctuary.
 - 2.1.4. The portion of the Ranni Reserved Forest east of the Vandiperiyar-Kakki Reservoir road, should be included in the Periyar Sanctuary, excluding only the small area under eucalyptus plantations or being used for reed collection.

- 2.1.5. Ranni and Gudakal Reserve forests west of the Vandiperiyar-Kakki Reservoir Road should be included in PTR, without at present including them into the Periyar Sanctuary.
- 2.1.6. The services of the Indian Air Force and Navy should be requested for carrying out aerial surveys over PTR, especially for detecting ganja cultivation plots in order to pinpoint their location in the Reserve. This will increase the effectiveness of patrolling inside PTR.
- 2.1.7. Efforts should be made to make available LPG to restaurants especially around Kumily, so that the extraction of fuelwood in PTR to cater to them can be stopped effectively.
- 2.1.8. At present, the Field Director of PTR does not exclusively look after the Reserve, and is engaged in managing several other sanctuaries as well. Once the project implementation begins, the workload on the PTR staff will increase manifold. Therefore, it is desirable that the Field Director be relieved of his other duties so that he can concentrate exclusively on PTR.
- 2.1.9. Efforts should be made to notify the core zone of PTR as a national park as soon as possible, since intention to constitute the core zone as a national park has already been notified.
- 2.1.10. At present, the staff which is posted in PTR is recruited by the High Range Circle of the Forest Department. It is proposed that, in future, junior staff appointments should be made by the Wildlife Circle, of which PTR is a part.
- 2.1.11. The FRI, Dehradun, has developed the technology for making high quality chip boards out of Lantana. Efforts should be made to develop local capabilities for making chip boards out of Lantana, and try to link this up with the extraction of the weed from PTR. In addition, Lantana also is a good fuel, and can be supplied to those people who will be using smokeless chulhas, which may be promoted as part of ecodevelopment.
- 2.1.12. Efforts should be made to bring all tourist facilities under the control of the PA authorities. In addition, an interpretation centre for PTR should be made on available land close to Lebbakondam.
- 2.1.13. In order to strengthen the protection network, it is proposed to make jeep/motorcycle tracks between Thanikudy and Malapara in the core zone, and Uppupara and Moozhickal in the buffer zone, so that the PTR staff can be mobile and effectively patrol these areas. A through jeepable road is not being recommended in the core zone since Thanikudy is already connected to Thekkady by boat.

Also, a jeepable road is proposed to be made to link up Medakanam, a check post close to the northern boundary of the core zone, with the road existing in the Brooke Bond Tea Estates across the border in Tamil Nadu to the north of the core zone of PTR. This road is connected to another road starting from Pakkadi Mettu which runs along the north-eastern boundary of PTR on the Kerala-Tamil Nadu border, all the way till Velli Malai. This will result in increased mobility, and therefore more effective patrolling of the PA staff along the northern boundary of PTR. Since most of the people who enter PTR for illegal activities do so from this part of the Kerala-Tamil Nadu border, more effective policing in this sector will help in curbing a significant proportion of

people entering the Reserve illegally for poaching, NTFP collection, and ganja cultivation.

- 2.1.14. The Eucalyptus plantations inside PTR should be harvested immediately in a manner in which the Eucalyptus trees do not regenerate, so that steps can be taken to allow the habitat to come back to its normal state of being.
 - 2.1.15. It is recommended that for making buildings or doing any other kind of construction inside PTR in future, the services of a qualified architect should be used in order to make buildings which are not eyesores, but blend into the surroundings.
- 2.2 Ecodevelopment: The following steps are proposed to be taken for eco-development under this project:
- 2.1.1. To meet the biomass demands of people while minimising and/or removing negative impacts on PTR. Since grazing can be permitted in a sanctuary, the other major biomass demand for fuelwood will have to be met through using alternate sources of fuel, unless an adequate area for use by local people is acquired outside the Sanctuary.
 - 2.2.2. To develop and establish alternate sources of income for the people currently dependent on PTR for their incomes. The income needs of the people are going to be met by socially, economically, and environmentally sustainable alternate income generation activities like poultry farming, pig rearing, apiculture, horticulture, Lantana chip board making etc. People will also be involved in managing and taking care of tourists, so that some incomes can be generated from tourism. The activities of people will be propped up by providing them with marketing support, wherever it may be needed. The list of income generation activities proposed for PTR is:
 1. Poultry farming: Since PTR is a very important tourist destination, poultry farming can generate good incomes for people, especially those living near Thekkady.
 2. Pisciculture: The Mannans fish in the Periyar Lake in order to earn a livelihood. In order to wean them away from fishing in PTR, an attempt should be made to allow them to rear fish outside PTR, in or near their village. This activity can also be useful for providing income generating alternatives for other tribals.
 3. Apiculture: This activity can give good returns to investment without there being need for very extensive training or marketing inputs. The honey can also be sold to tourists coming to PTR.
 4. Horticulture: The climate in the area is well suited to growing of fruits like banana, coconut, pineapple, grapes (in Tamil Nadu), and can bring in a good income for people.
 5. Handicrafts: The people are already adept at making mats and baskets. Their products can also be marketed to tourists visiting PTR. The raw material can be harvested from the areas outside the sanctuary and provided to the people by the Forest Department.
 6. Tourism (Guiding tourists and hospitality): Since a large number of tourists already visit PTR, there is scope for generating incomes for people by training them as tourist guides and for providing hospitality to people.
 7. Lantana Chip Boards: Since the technology for making high quality chipboards out of Lantana is now viable, this also can be an income

generating activity of the local people. People can also make baskets out of lantana.

2.2.3. Some soil and water conservation measures will also be taken to enhance the productivity of people's resources, so that their capacity to earn on their own is increased.

2.2.4. Crop compensation will be provided, so that crop deprivation due to damage by wild animals can be mitigated.

3. Support Systems:

3.1 Human Resources Development and Awareness: It is proposed to train people in running poultry farms, doing apiculture, pisciculture, providing bed-and-breakfast facilities to tourists, being tourist guides etc. The respective training can be provided by the concerned Government Departments, or appropriate NGOs.

It is also proposed to have groups of people who will interact with the villagers, and give them information about the significance of PTR as a protected area, and its values. These people will also document and collect local people's knowledge about the area.

In addition, it is also proposed to train the PTR staff in both wildlife management and ecodevelopment.

3.2 Institutional Arrangements: It is proposed to have a co-operative or a society which will have as its members, all the people who are dependent upon the resources of PTR. This co-operative will collect money on behalf of the local people from tourists, pilgrims, or other visitors, and channel it back into ecodevelopment or PA management works.

It is also proposed to have village level ecodevelopment committees which will interact with the PTR authorities and other concerned agencies on implementing and planning site specific ecodevelopment packages.

It is also proposed to identify local NGOs which have been working on rural development issues in the area, so that they can be involved in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

The Kerala Forest Research Institute can be involved in the research activities being undertaken in PTR as a part of the project.

It is proposed to have an institutional mechanism for enabling the local people to be consulted, and to participate in PA management.

It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary. This would be supported by a district level co-ordination committee, involving the Collectors, and the Field Director, PTR. Such committees will co-ordinate the inputs of the various line departments like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in better co-ordinating protection measures.

It is also proposed to have an institutional mechanism for co-ordinating ecodevelopment and PA management activities with district and forest authorities in Tamil Nadu.

In addition, the PTR authorities should also arrange for some marketing mechanisms which will allow the local people to sell some of their products to tourists visiting the Reserve.

3.3 Research and Monitoring: Possible research topics include:

- a. Studying the Movement Patterns and Habitat Use by Elephants in PTR.
- b. Studying the Elephant Carrying Capacity of PTR.
- c. Study of Existing Forest Corridors Connecting Periyar to other Areas and their Ecological Status.
- d. Monitoring Changes in Habitat Due to the Introduction of Eucalyptus in PTR.
- e. Effects of Forest Fires on the Habitat of PTR.
- f. Inventory of Flora/Fauna in PTR.
- g. Identification of Medicinal Plants and Herbs in PTR and their properties.
- h. Anthropological Study of Tribals in PTR
- i. Study of Tusker to Non-Tusker ratio of Elephants in PTR
- j. Study of the carrying capacity of the habitat for grazing of cattle in Periyar Sanctuary

Many more research topics could be identified as well.

A monitoring network, involving local, regional, and national NGOs and professional institutions would be created for regular monitoring of PTR.

Annexure A

Participatory Rural Appraisal for PERIYAR TIGER RESERVE

In the Labakkandam Tribal settlement near Kumaly in Thekkady Range the PRA exercises have been conducted by Dr. Raghuramadas from 'Land People'. He has done social mapping, Resource Mapping, Collection of Services and Opportunity details, Seasonality Graphing and analysis and problems and solutions. In the collection and compilation of data he was assisted by the forest staff and by the Wild Life Preservation Officer, Thekkady. In Vanchivayal localities PRA was conducted by T.G. Natesan, Assistant Wildlife Preservation Officer, Vallakkadavu. The forest staff and the trained locals (both boys and girls) were entrusted with doing the PRA exercises in the selected areas mentioned below.

1. VALLAKKADAVU I (Vallakkadavu Proper - Outside the Sanctuary)
2. VALLAKKADAVU II (Outside the Sanctuary)
3. VANCHIVAYAL TRIBAL SETTLEMENT
4. MOOZHICKAL SETTLEMENT (Near Koruthodu in Vallakkadavu Range)
5. KUTTIKKAYAM AND KANDANKAYAM AREAS -do- -do-
6. KORUTHODU (Proper Outside the Sanctuary in Kottayam District)
7. KUZHIMAVU AREA -do- -do-
8. ANAKKALLU AREA -do- -do-
9. PAMBAVALY AREAS
10. ATTATHODU GIRIJAN COLONEY
11. LABBAKKANDAM TRIBAL SETTLEMENT (In Thekkady Range of P.T.R.) and
12. ROSAPPOOKKANDOM (Sample only - outside P.T.R.)

These areas fall in 9 different revenue villages of Idukki, Kottayam and Pathanamthitta Revenue Districts.

FINDINGS:

1. Human dependence on the forests: The PRA findings have revealed that there is a high dependence of the people on the forests and on forestry works. Due to reduced access and forest working, after the establishment of the PA, there is a need to establish alternate income generation activities. This would also further reduce the dependence of the people on the forests.
2. Crop damage: Elephant and wild boar damage to crops is a major problem. The maintenance and repair of existing elephant proof trenches and construction of new trenches has to be taken up .
3. Water pollution: During the festival season at Sabrimala, the Pamba river gets polluted and the downstream villagers have no other source of drinking water. These people, therefore, want wells to be dug and also want the authorities to control the quantity of pollution at Pamba river.

REFERENCES

Anon. undated (a) : Status Paper on Periyar Tiger Reserve, Thekkady: 1991-92

Anon. undated (b) : Eco-development Scheme for Periyar Tiger Reserve, Kerala, Kerala Forest Department

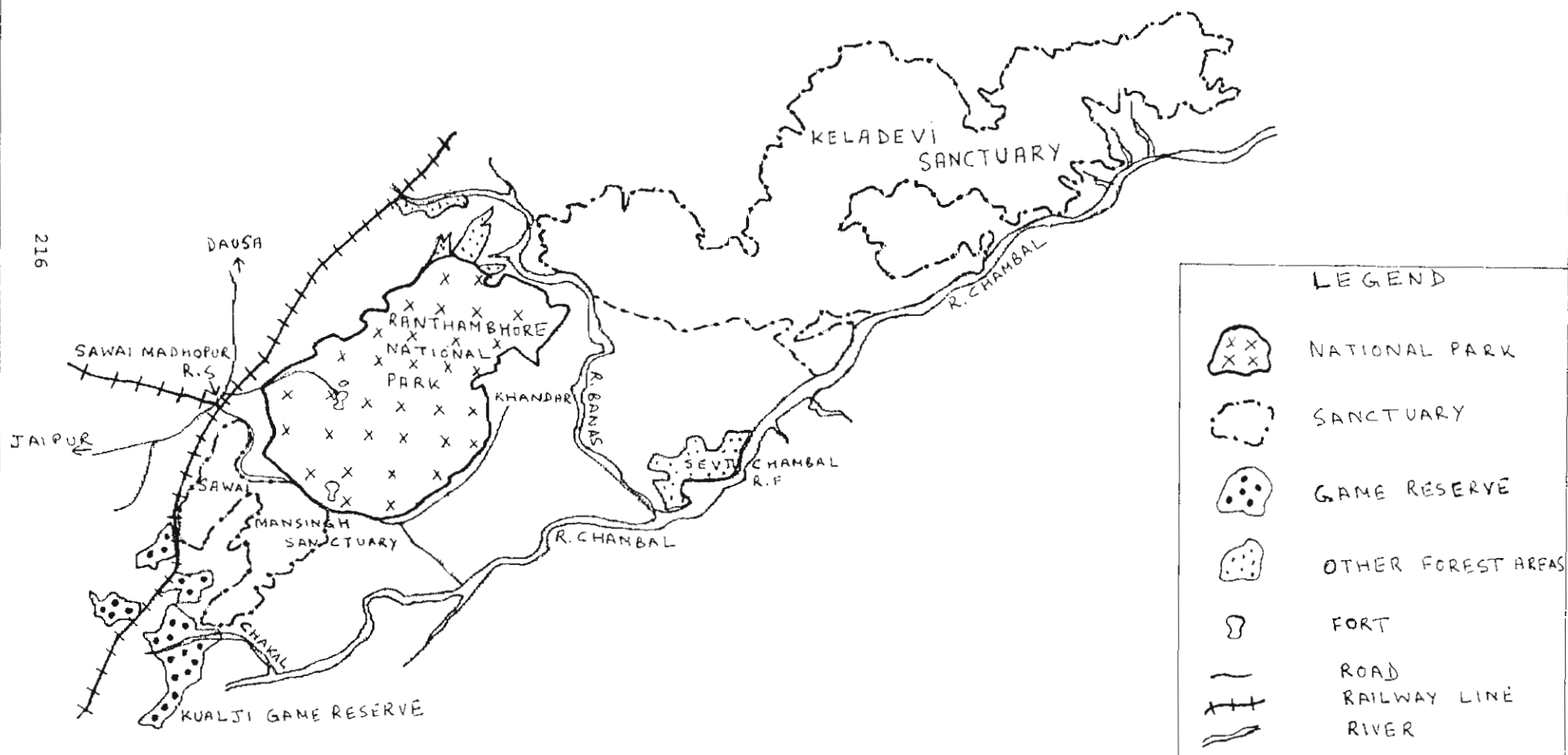
District Census Handbook, 1981: District Census Handbook, 1981, Part XIII - A & B, for Idukki, Kottayam, and Quilon Districts in Kerala, and Madurai, Ramanathapuram, and Ambasamudram Districts in Tamil Nadu.

MP Asari, Surendranathan P.K., Periyar Tiger Reserve: Wildlife Management Plan (1986-87 to 1995-96), Kerala Forest Department

Mehta, 1994 : Consultancy Report by Raman Mehta

Rodgers and Panwar Rodgers, W.A., and Panwar, H.S., Planning a Protected Area Network in India: Volume - II (mimeo), Wildlife Institute of India, Dehradun.

RANTHAMBHORE TIGER RESERVE



RANTHAMBHORE TIGER RESERVE

II. THE PROJECT AREA (RANTHAMBHORE TIGER RESERVE) (Kindly refer to the attached map while reading the text)

1. The PA Area

- 1.1 Location and Approaches: Ranthambhore National Park (RNP) forms the core of the Ranthambhore Tiger Reserve. It is situated in south eastern Rajasthan, in the district of Sawai Madhopur, occupying part of Sawai Madhopur and part of Khandar tehsil. Latitudinal range is 25°54'N -27°24'N and longitudinal range 76°23' - 77°13'E. Nearest town is Sawai Madhopur (14kms), which is also the nearest railhead. Nearest airport is Jaipur (110 kms). Situated to the north-east of the park is the Kailadevi Sanctuary and on its south-west is the Sawai Mansingh Sanctuary.
- 1.2 Legal status, Area and zoning: Part of the area, which is now known as the Ranthambhore National Park (RNP) was originally declared a Reserve under section 5 of the Rajasthan Wild animals and Birds Protection Act, 1951 vide notification no. F.39(2) For/55 dated November, 7 1955.

An area of 392 sq. km which included the original area was declared a Sanctuary vide notification No. F.39(2) Rev. A/54 under Wild Animals and Birds Protection Act, 1951, on August 5, 1958. The core area of the Sanctuary comprising of 274.5 sq. km. was declared a National park vide Government of Rajasthan order No. F11(26) Raj. 8/80 dated 1.11.80. An area of 674 sq. km. to the north of RNP located in Karoli Tehsil was notified as Kailadevi Sanctuary vide notification P.1(27)Raj Group-8/83 dated 9.7.85. An area of 127.6 sq. km. to the south, adjoining RNP was declared Sawai Mansingh Sanctuary vide notification dated 30.11.84.

Date	Area	Legal Status	Final Area/Unit
07-11-55	Not known	Reserve	Not known/Reserve
05-08-58	392.5 Sq.km	Sanctuary	392.5 Sq km/Sanctuary
01-11-80	274.50Sq.km	Declared National Park	274.50 Sq km/NP 118sq.km./Sanctuary
09-07-83	674.Sq km	Notified as Kailadevi Sanctuary	674 sq.km./Sanctuary
30-11-84	127.60 Sq km	Notified as Sawai Mansingh Sanctuary	127.60 sq. km/ Sanctuary

RNP was included as one of the sites under Project Tiger in 1973. For administrative purposes it was known as Ranthambhore Tiger Reserve (RTR). The total area of the RTR is 1334.64 sq. km.

1.2.1 Management Status:

<u>Name of Block</u>	<u>Area</u>
RNP	274.5 sq. km.
Ranthambhore Sanctuary	118 sq. km.
Sawai Mansingh Sanctuary	127.6 sq. km.
Kailadevi Sanctuary	674 sq. km.
Sawai Madhopur "A" block	24.87 sq. km.
Khandar "A" block	19.08 sq. km.
R.F. Olwara Niwari	5.08 sq. km.
R.F. Kila Khandar	9.20 sq. km.
R.F. Sewati Chambal	48.16 sq. km.
P.F. Rawanjna Doongar "main"	13.17 sq. km.
P.F. Rawanjna Doongar "A"	0.71 sq. km.
P.F. Phalodi	20.27 sq. km.
Total	1334.64 sq. km.

1.2.2 Zonation: The Ranthambhore National Park is also the core zone of the Ranthambhore Tiger Reserve. Kailadevi, Sawai Mansingh and Ranthambhore Sanctuary form the buffer zone.

1.3 Ecosystems and Bio diversity values: This Reserve falls in the Bio Geographic Province 4b (Semi-arid Gujrat-Rajwara) region of Rodgers & Panwar.

1.3.1 Topography and climate: The topography varies from gentle slopes to steep vertical rocky escarpments. A unique geomorphological feature of this area is that the hill ranges of two different systems of mountains meet here along a 'great boundary fault'. The conical hillocks of the ancient Aravallis is juxtaposed with the flat topped hills of the Vindhyan ranges. The altitudinal range is from 215 m to 507 m [NEDP]. Climate is subtropical with distinct cold, hot and rainy seasons. Summer months are from April to June, rainy months are from July to September and winter months are from October to March. Temperature vary from a maximum of around 47°C in May-June to a minimum of 4°C in January. The average rainfall is about 800 mm.

The drainage of the Park is towards south and south-east. The streams and nallahs of the south-east drain into the Banas River and those of the south into the Chambal River. There are six lakes and three perennial streams [mp]. There are seven springs and 100 water holes, many of which are natural. The Kailadevi Sanctuary has 1 perennial and 1 non-perennial stream.

1.3.2 Flora: The Champion and Seth forest types found in RNP are 5B/E1, 5B/C2 and 6B/C1(Q1). Forest type 5B predominate. This sub group includes the Northern Tropical Dry Deciduous Forests and C2-Northern Dry Mixed Deciduous Forests. The degradation stages found here are; Dsl-Dry deciduous scrub and Ss4:Dry grass lands.

E1 are Anogeissus pendula forests

Dsl are Anogeissus pendula Scrub

E5 are Butea sp forests.

The dominant species are Butea monosperma, Diospyros melanoxylon, Zizyphus mauritiana, Acacia catechu, Lannea coromandelica, Mimusops hexandra, Wrightia tomentosa, Sterculia urens, Boswellia serrata, Syzygium cumini, Mangifera indica, Mitragyna parviflora, Acacia leucophloea. [mp 84-89]. The vegetation on the plateau is grassy flat and open woodland, dominated by

drought tolerant species like Anogeissus pendula, Acacia catechu, Boswellia serrata, Capparis decidua and Diospyros melanoxylon.

The plateaus frequently fall off steeply especially at the edge of the Park's core zone and sometimes merge gradually into the flat valley bottom which is upto 2 km wide in places. The slopes and much of the valley flats are covered by dense stands of pure dhok (Anogeissus pendula). In the moister areas near water courses there is dry tropical riverine forest with Butea monosperma, Ficus glomerata and Zizyphus Spp [Berk 87-88]

- 1.3.3 Fauna: The RTR is an important Tiger habitat, with the population of Tigers rising from 14, in 1973, when Project Tiger got underway, to 40 at the end of the eighties [mp]. At present, the number is stated at 36. Further, 272 species of birds have also been recorded in RNP. (mp) The Schedule I species [of the Wildlife (Protection) Act] inhabiting the Park are the Tiger, Leopard, Ratel, Sloth bear, Caracal, Desert cat, Spoon bill, Soft shell turtle and Crocodile.

1.4 Human Population: (Within the RTR it is as follows):

S.No.	P.A. Unit	Population	Number of households	Number of villages/settlements
1.	Ranthambhore National Park	1210	225	4
2.	Kailadevi Sanctuary	2144	357	21
3.	Sawai Mansingh Sanctuary	923	156	4
Total		4277	738	29

There are four villages in the National Park whose inhabitants are mainly pastoralists by occupation. They keep buffaloes for milk production and are solely dependent on milk produce for subsistence.

1.5 Landuse:

- 1.5.1 Ranthambhore National Park: The RNP has an area of 274.5 sq. km. and forms the core zone of RTR. It is a compact piece of forest with the Aravalli range on two sides, and plateaus of the Vindhyan ranges rising steeply from the eastern side. The Chambal forms its southern boundary. There are no old plantations inside the RNP but some areas were worked in the past.
- 1.5.2 Kailadevi Sanctuary: Kailadevi Sanctuary, having an area of 674 sq. km., is situated to the north of RNP and is a part of the Rajasthan Vindhyas. This Sanctuary has 21 villages and settlements inside, which have around 1 lakh cattle population. The villagers here depend on agriculture and cattle rearing for sustenance.

The Sanctuary is used for grazing and the people from the villages in areas adjoining the Sanctuary also graze their cattle in the Sanctuary, mostly from mid June to end November. The Sanctuary is also browsed by migratory sheep numbering about 1.5 lakh, for 8 months in the year. Since 1990 these sheep are being prevented from entering the Sanctuary.

For their domestic needs, villagers residing within and around the Sanctuary collect dead and fallen wood from the Sanctuary. Green trees are chopped and lopped in a few pockets near Kailadevi, Sewti chambal block, Baler and Rahar. Mostly the villagers have formed their own village forest protection committees and have taken an oath 'not to lop or cut trees'. There is a small area (about 3 ha) along the boundary of the Sanctuary where the local villagers tried to do mining. For the last 3 years mining has been stopped.

- 1.5.3 Sawai Mansingh Sanctuary: There are 4 villages inside the Sanctuary and 18 villages in the adjacent area. Villagers residing inside are basically pastoralists and have small agricultural land holdings.
- 1.6 Staff and equipments: The overall administrative control of RTR is with the Field Director, who is a Conservator of forest. Under him there are two Deputy Directors and (Deputy Conservators), one for the core and the other for the buffer area. There are nine vehicles, a wireless network and other miscellaneous equipment in the Reserve.
- 1.7 Management Plan: Management plan for the year 1990-1995 has been prepared. It is yet to be approved by the State Govt.
- 1.8 Major Management Issues: The major management issues in the PA are as follows:
 - 1.8.1 Fuelwood extraction: Cities like Sawai Madhopur, Karauli and Khandar, and a number of villages, are situated near the boundary of RTR. A major part of the fuelwood requirement of these cities and villages is met from the forest area of the Tiger Reserve.
 - 1.8.2 Grazing: There is heavy grazing pressure in the RTR area. Villagers from within as well as the adjoining areas graze their livestock in the RTR and control has, in the past, proved difficult. On many occasions the field staff have faced violent opposition from the villagers in their efforts to regulate grazing.
 - 1.8.3 Poaching by Moghyar: Around 50-60 families of the Moghyar tribe live around the RTR, and they are traditional hunters. They often poach animals, partly for their own meat requirements, and partly at the behest of traders in animal skins.
 - 1.8.4 Tourism and Pilgrimage: Tourist activities are concentrated within the core area of the RTR, leading to high concentration of tourists. There is additional disturbance from pilgrims to the two big temples in RTR.
 - 1.8.5 Collection of NWFP timber and stones by the local villagers: This is not only illegal but disturbs the habitat.
 - 1.8.6 Shortage of water in the surrounding areas, especially in the dry season, and the resultant pressure on the water resources of the PA.
 - 1.8.7 Staff:
 - (i) RTR lacks adequate subordinate staff, especially for Kailadevi Sanctuary, where only one forest guard is present for a 50 sq. km area.
 - (ii) There are inadequate numbers of forest chowkis, especially for the staff staying in remote areas.
 - (iii) There is a lack of facilities for the staff posted in remote areas, especially a lack of drinking water facilities. At many areas in RTR there are no hand pumps or even open wells for drinking water.

2. The PA surroundings

2.1 Population:

Villages and Hamlets within 10 km radius of the PA

No. of villages	Average No. of persons in each village.	Population	Total No. of households
268	790	211695	36121

2.2 Land Use:

Land use Around RNP

Land use category	Percent
Crop	21.81
fallow	2.81
good tree cover	6.88
moderate tree cover	5.51
less tree cover	7.21
forest blank	11.92
scrub land	39.59
river sand	1.13
Land use category	Percent
muddy	0.11
marsh	0.11
water body	1.54
others	1.38

Source:Ranthambhore Foundation

3. Local dependencies on the PA

RTR is an ecological island in the vast degraded surrounds, with income pressure from livestock and human beings for firewood, timber and grazing. The local villagers are basically agriculturists and pastoralists, and dependent on the RTR for many of their basic needs.

Villagers living in the vicinity of the RTR consider grazing and fuelwood collection in the RTR their right, and do not grow much fodder and fuelwood trees on their own land.

- 3.1 Grazing: A number of villagers in the PA surrounds are Gujjars or cattle herders. Besides, RTR is on the migratory route of sheep herders of the western desert. As the area around RTR is extensively cultivated and hardly any common pastures exist, the villagers depend on the forests for grazing their animals. Also, villagers living in the vicinity of the Park/Sanctuary graze their cattle inside the Park. Some of the silvi pastoral sites developed in the past are successfully meeting a part of the demand of the nearby village inhabitants.
- 3.2 Fuelwood: Collection of fuelwood is a major source of dependency of the local population on the PA. All the villagers use fuelwood as they have little access to other fuels. Fuelwood is also sold by the villagers as a means of earning their livelihood. Although villagers inside the Sanctuary are allowed to collect deadwood, in actual fact the collection of fuelwood from the RTR is much in excess of what is permitted. Also, grazing and fuelwood collection often leads to antagonism between the PA staff and the

villagers. In the National Park, collection of fuelwood is not allowed and offenders are dealt with strictly.

3.3 Food: The Moghyar and other tribals poach animals in the RTR for food and for income.

3.4 Non-wood forest produce (NWFP): Butea monosperma leaves are collected under a contract. Apart from this, Diospyros melanoxylon fruits are also collected in season, by the inhabitants of several villages. Certain shrubs like Grewia spp. are collected in several villages and are used as roofing material. Stones for house construction are also extracted and a substantial number of people from several villages are involved in this business. These quarries are located near the PA boundaries. The stones are extracted from old mines which were earlier given on lease. All these mines are located in the buffer zone.

3.5 Religious yatra: There are two big temples within the RTR. They are the KAILADEVI and GANESH TEMPLE in Kailadevi and Ranthambhore respectively. Around 15 lakh pilgrims visit Kailadevi while another 3 lakh come to the Ganesh temple annually.

4. **Impacts:**

4.1 Negative Impact of the People on PA:

- (1) Kailadevi Sanctuary: Most of the degraded Anogeissus forests do not regenerate well due to the constant grazing and browsing pressures. Grazing and browsing also disturb the ungulates and other wild animals, confining them to only the dense pockets of the forests. Further, the roads within the sanctuary connecting different villages are also a source of disturbance.
- (2) Sawai Mansingh Sanctuary: The cattle population of the surrounding and inside villages graze in these areas resulting in disturbance to the habitat of the wildlife. Further, the browsing pressure due to the high goat population has done harm to the regeneration patterns.
- (3) Ranthambhore National Park and Sanctuary: Unauthorised grazing by villagers, heavy pilgrim pressure, dependency of villages on some of the waterbodies on the fringe of RNP, and collection of NWFP and stones, leads to disturbance of the eco system.

4.2 Negative Impact of the PA on the People :

People in the surrounding areas of PA are of the opinion that as no major industry, road network, irrigation dams are allowed in the PA, their living standards have gone down drastically. Crop raiding and cattle lifting by wild animals is another serious problem faced by inhabitants living around the PA area. The restriction of access to the PA area inhibits their ability to earn and to meet their basic needs.

5. **Issues and Constraints**

The major management issues for the RTR are the controlling of grazing and the stopping of fuelwood collection. Although grazing is permitted in the buffer zone, the intensity is so high, it consequently degrades the buffer zone and puts pressure on the core zone. The estimates available on fuel and fodder consumption show that some measures have to be taken immediately to contain this pressure. There is also need to develop alternate, sustainable, sources of water and NWFP, and to regulate tourism.

- 5.1 Grazing : Though animal husbandry is not the major occupation of the people in the majority of villages, a large number of heads of livestock are kept as supplement to agriculture. Village grazing lands have partially or totally been converted to agriculture and the remaining ones do not have the potential to sustainably provide fodder and grasses to the large population of cattle. In this situation, the RTR forest comes under increasing grazing pressure, with livestock remaining in the forest from the onset of the monsoons. The possibility of disease transmission to wildlife remains very high, as the cattle are not inoculated against common diseases. The competition between wild animals and livestock increases and often, the wild animals have to confine themselves to a smaller area. The intense pressure from livestock reduces the regeneration potential of the forest. This can be found out by low density of vegetation in certain areas which have been heavily exploited. This is further aggravated by the appearance of weeds in some areas, which replace the palatable species.

Apart from the local livestock population, large itinerant herds also make use of the forest. Sheep and goat graziers from far off places encroach upon the forest from March to June. These animals carry diseases which may be transmitted to the wildlife. Competition for food also increases in the lean period. The buffer area of RTR, especially Kailadevi Sanctuary, has heavy pressure of grazing from migratory sheep. Approximately 1.5 lakh sheep come to the area, in two seasons. As the Sanctuary is adjacent to the protected forest area where these graziers have grazing rights, ingress of sheep into the PA is a constant nuisance. Even the local villagers detest these sheep but can do nothing against the organized Raibaris, who are migratory sheep herders.

The village pastures (revenue lands) which once provided grass support are severely degraded or illegally occupied in a majority of the villages. Keeping large herds of goats and sheep is a recent development around the RTR and it is because of this that the demand for fodder has considerably increased. Green fodder is collected from July to September, and dry fodder from December to January. Anogeissus pendula forms the major fodder species, along with Butea monosperma, Ficus tomentosa etc. Apluda mutica, Aristida spp., Bothriochloa pertusa etc. form the major grasses collected by the people. People in several villages and especially in the surrounding townships sell the fodder and grasses collected from the forest, during summer, when the availability of fodder depletes.

- 5.1.1 This issue can be tackled by the following strategies:

- a) Animal Health Care Programme aimed at reducing numbers and improving breeds to facilitate stall feeding.
- b) Fodder plantations in private lands and alternating closures of common lands to help regeneration for fodder harvest.
- c) Agro forestry/ JFM in P.F. and R.F.

- 5.2 Collection of Firewood: Seasonal unemployment is to a great extent the reason for increased dependency on the forest. When villagers do not have any other means of getting income during the period when their land remains fallow, they begin to depend on the nearby forests for sustenance. Villagers have said that, if proper employment facilities are provided to them, they would desist from exploiting the forests for fuelwood. Firewood is the main source of fuel in small towns surrounding RTR, such as Sawai Madhopur, Man Town (a suburb of Sawai Madhopur town) and Khandar. A large number of inhabitants of these three towns are also involved in selling firewood. The reason for this high dependency on firewood is because only 1% of the population have gas connections and animal dung is usually put to composting for use as fertiliser. Also, Kerosene oil is not always available, especially

at controlled prices. The average farmers landholding is small and the production of crop residue is not enough to meet the local fuel needs. Also, crop residues are available for only a short time in a season. All these factors contribute to the extensive demand for firewood in the rural areas. Mostly women collect firewood. PRA data indicate that in villages mass collection of firewood, for their own consumption, takes place in winter, after Dipawali (November). The firewood collected during this time is stored for the whole year. On an average, 5-8 kg of wood is consumed per day in a household with 7-8 members, in addition to some dung cakes and crop residues. Those involved in the sale of firewood, collect it on a daily basis throughout the year. Usually dried, fallen, wood is collected, but many a time fresh wood is extracted too. Most species can be used for this purpose, but Anogeissus pendula is the preferred fire wood. Other species like Butea monosperma, Maytenus emarginatus and Acacia leucophloea, are also used, but in small quantities. A severe shortage of dried, fallen, wood in the peripheral areas has compelled people to encroach further into the forest. The distance covered by a woman to collect firewood from the forest has increased manifold over the years. This reflects the impact of firewood collection on the forest, and the impact of the shortage of firewood on the people, especially the women.

- 5.2.1 Several of the activities suggested to address this need are closely related to what can be considered as agroforestry. They are fuelwood and agro-silvicultural plantations, horticultural plantations with inter cropping, bundh plantations around private land, soil conserving measures where grasses, bushes, or trees are incorporated in the vegetative bunding of soil.
- 5.2.2 Introduction of fuel efficient stoves:
- 5.2.3 Bio-gas installations: The KVIC model is quite successful in this area (CEE report). To propagate the idea, demonstrations will have to be done by PA management.
- 5.2.4 Income generation activities.
- 5.3 Timber: It also forms one of the major requirements of people from the forest. It is needed for making agricultural implements like ploughs, for house construction, for fencing on the fields, and for constructing store houses for dry fodder, raised platforms in the fields to guard the crops from wild animals, and other items of daily use like chairs, tables and cots. Anogeissus pendula forms the major timber species. Other species are Butea monosperma, Acacia leucophloea and Acacia nilotica. Timber is mainly collected by the menfolk. Timber extraction is not allowed in the PA, but nevertheless carries on illegally.
 - 5.3.1 JFM in Reserve forest lands, small timber plantations and making available, affordably, alternatives to timber, for the villagers, are some of the proposed strategies.
- 5.4 Water: Lowering of the water table and scarcity of water for cattle as well as human beings has put a tremendous stress on the water bodies within RTR. The use of water sources within the RTR, by the livestock, increases the chances of spread of epidemics among wild animals, and disturbs the wild animal's habitat. Some of the proposed strategies are listed below.
 - 5.4.1 The run-off which drains out through seasonal rivulets can easily be stored and utilized for irrigation purpose during lean period. This can be done by repairing existing tanks, increasing their capacity by removing the silt and construction of new tanks.

- 5.4.2 Soil and water conservation works like checkdams and afforestation of degraded mini watersheds inside the PA will help in raising the the water table.
- 5.4.3 Lift irrigation schemes of Olwara, Piplait and Pipalda on two river systems of Banas and Chambal are the most potential alternatives to produce enormous biomass outside the RTR to cater to the needs of surrounding population. The request for lift irrigation involving a lift pump and pipelines was made at Olwara village at a PRA exercise. But lift irrigation has not come as a request in any other village.
- 5.5 Crop Depredation: Crop damage and crop raiding has been projected as one of the biggest problems of the villages adjoining RTR, as an estimated 30% of the produce is eaten away by wild animals. Crop depredation by wild animals also creates human animal conflicts, and some times result in the villagers killing the animals. There are also incidents of cattle lifting by Tigers and Leopards. Some of the strategies to reduce crop depredation are as follows:
 - 5.5.1 Electric and green fencing, and stone walls for crop protection. Village Eco-development committees should take up the responsibility of maintaining the fence.
 - 5.5.2 Increasing involvement of local people, especially the Moghyar tribals, in partolling and crop protection.
 - 5.5.3 Crop Insurance.
 - 5.5.4 Development of innovative methods, including biological methods, for crop protection.
 - 5.5.5 Payment of compensation for crop damage and livestock injury and death.
- 5.6 Tourism: The enormous increase in tourist traffic is a significant disturbance to animals and to the habitat. Tourism is presently confined to the core zone. There is a need to identify suitable, alternate, areas to divert the pressure. It is also necessary to organise tourism in a manner that helps the local people to earn a living rather than making profits for corporate houses and rich entrepreneurs. The tourism activities must be ecologically sensitive and the thrust must be on eco tourism.
 - 5.6.1 RTR has great potential to offer employment to the local people through tourism. In this direction the efforts have already started. A nature guide training camp was organized and 22 youth from the neighboring area of RTR have been trained as nature guides. These guides accompany the tourists and can earn Rs 50 per day.
 - 5.6.2 Villages near the tourism zone and even on the periphery could easily be developed as handicraft centers, catering to the tourists coming to RNP. Sales out-lets can be provided at the booking office or interpretation center.
 - 5.6.3 Kailadevi Sanctuary has vast tourism potential, which can be harnessed if a tourism area is developed by repairing roads and patrolling paths.
- 5.7 Pilgrimages: The pilgrim traffic has also caused problems in the past and continues to be a disturbance.

- 5.7.1 This is a sensitive issue and needs to be facilitated through the cooperation of the pilgrims. This can be solved by organising awareness programmes for the pilgrims, stressing the value of the forest and Tiger, and the way to protect them.
- 5.8 Poaching: This has become a very sensitive issue in this park. There is reason to believe that some of the hunting tribals have been lured to poach for economic gains. Policing such a vast area, which is surrounded by dense population, becomes very difficult. Many strategies besides constant vigil should be resorted to.
- 5.8.1 Better wireless communications and more vehicles are needed for patrolling.
- 5.8.2 Intensive patrolling by anti poaching squads needs to be undertaken. Such squads should involve the local people. In fact, there should be a much greater involvement of the local people in activities related to the prevention of poaching.
- 5.8.3 A 'reward scheme' for informers needs to be introduced.

6. Support Systems

- 6.1 Human Resources Development: Human resources development would include various training inputs needed for carrying out the proposed management and ecodevelopment activities. Training for income generation activities will be carried out. Local artisans who are capable of making and selling stoves will be given training, on the principles of fuel efficiency, so that they could use their own innovation for making locally suited and acceptable stoves and sell them. Training for setting up biogas plants will be given.
- 6.2 Awareness: Awareness programmes for both visitors and local people, focussed on the value of the PA and its linkages with the regional, national and global conservation efforts, will be started. An attempt to establish an exchange of knowledge between local persons and scientists, where the former will share their understanding of local resources, medicinal and other social significance of plants and animals, and the local nomenclature and understanding. The scientists would, on the other hand, share their understanding of the regional and global issues. The activities aimed at developing awareness include inviting school children from the surrounding areas to interpretation centres, screening films, inviting the village elder to share their knowledge and arranging day visits to the PA for local people so that they also have an opportunity to enjoy and appreciate the PA. NGOs help will be solicited for carrying on a campaign to use crop residue better and to improve the livestock situation.
- 6.3 Institutional Structure: It is proposed to have a co-operative or a society which will have, as its members, all the people who are dependent upon the resources of RTR. This co-operative will organise suitable tourist related activities and support services.

It is also proposed to have village level ecodevelopment committees which will interact with the RNP authorities and other concerned agencies on implementing and planning site specific ecodevelopment packages.

It is also proposed to identify local NGOs which have been working on rural development issues in the area, so that they can be involved in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

It is proposed to have an institutional mechanism for enabling the local people to be consulted, and to participate in PA management.

It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary, or in his absence, by the Forest Secretary. This would be supported by a district level co-ordination committee, convened by the Field Director and involving the local collector chaired by an eminent environmentalist of the State. Such committees will co-ordinate the inputs of the various line departments like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in better co-ordinating protection measures.

7. Research

Some of the main areas of research include:

- 7.1 Study of the impact of the various human activities, especially tourism on the habitat and on animal behaviour.
- 7.2 A study of new methods including biological methods, of crop and livestock protection.
- 7.3 A study of methods to conserve water and to regulate its use.
- 7.4 Study of the similarities and differences between the two different mountain systems meeting at Ranthambhore.

8 The Project

- 8.1 **Rationale:** Ranthambhore has an unique ecosystem in that two different mountain systems of two different ages in the Geological history meet at Ranthambhore. The overall Biogeographic zone is 4b (Rodgers and Panwar). The subtle differences between the two different geological systems have not yet been studied. It is a very valuable catchment area for the rivers Banas and Chambal. The rationale for the project is to preserve and protect this area as an ecological oasis, especially the Tiger, as well as conserve its rich and unique biodiversity.

The PA is under heavy pressure from the local people and their cattle. It is also under pressure from tourists and poachers. The various pressures have led to the degradation of land and to the formation of gullies and ravines. Timely inputs by way of fodder and fuel plantations, and soil and water conservation programmes may contain this problem and save the PA. The co-operation and involvement of the people in the management of the PA, as envisaged in the project, is another pre-condition to proper conservation.

Ranthambhore has recently been much in the news, nationally and internationally as there is evidence of large scale Tiger poaching. The proposed ecodevelopment and management inputs will go a long way in making the Tiger Reserve secure.

8.2 Project Description

- 8.2.1 PA management will undertake the following activities to improve the PA.

- Forming anti poaching squads and training fire watchers.
- Soil and water conservation through tanks, check dams etc.
- Protecting the area with improved staff and equipment.
- Regeneration of degraded areas.
- JFM of forests around the PA.
- Construction of fences for crop protection.
- Bio mass generation - fuel and fodder plantation.
- Supplying fuel efficient stoves/biogas plants.
- Land improvement schemes like levelling minor irrigation etc.

- Income generation activities like bee keeping, poultry, waste recycled paper making, all artisan activities.
- Awareness programmes for the people to generate an interest in the protected area. Training nature guides, building interpretation centres and preparing literature on the Park

Annexure A

PARTICIPATORY RURAL APPRAISAL EXERCISE

The Ranthambhore Participatory Rural Appraisal (PRA) was done by the Ranthambhore Foundation team headed by Nitin Pandya. They covered 11 villages in all, namely, Halonda, Kuthalpura, Olwara, Talwada, Kushalpur, Gopalpura, Jethpur, Mor Dungri, Kailashpuri and Bassnkalan. The P.R.A. techniques used were (a) Timeline (b) Social map (c) Resource map (d) Seasonality (e) Services and opportunities (f) Preference ranking of problems, and (g) preference ranking of solutions and their modes. The following issues emerged through the PRA exercise:

A. People's dependency on the PA was on the following resources given in descending order of priority.

1. Firewood
2. Grazing Grounds
3. Timber
4. Grasses & Fodder
5. NWFP- Butea leaves, Limestone, Tendu fruits and leaves, sand, rocks.
6. Land

B. The impact of the PA on the people was in the following ways:

- Crop damage
- Cattle lifting

According to the PRA, the village communities are willing to unite, through village committees, to solve some of their basic problems. The villagers also felt that greater income generation opportunities for the women was a priority.

APPROACH SUGGESTED

- To work with clusters of villages and to tackle problems at a village level through village committees.
- To tackle first those issues which are considered priorities by the local people. This would help in getting the trust of the villagers.
- To orient the forest staff, and to motivate them, to involve the people in management and protection of the PA.
- To organise trips for villagers to surrounding areas (NGO/Govt. Projects) for exposure to Biogas, breed improvement, soil/water conservation work, pasture land improvement and viable income generating schemes.

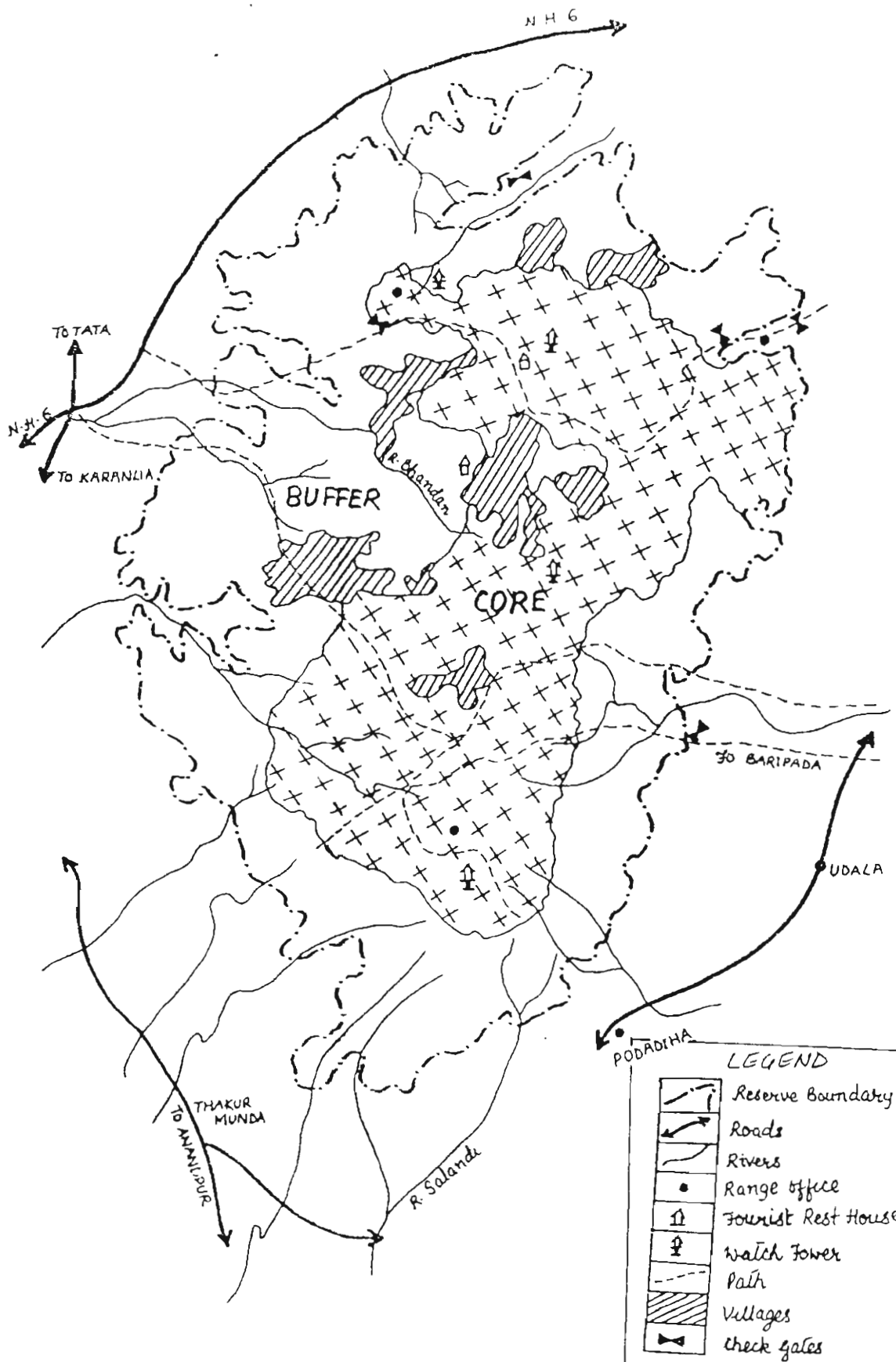
Solutions & Strategies suggested:

- Any Ecodevelopment measures must be carried out only after PRA has been conducted in the particular village.
- Arresting surface run-off to recharge water table. This can be done by construction of "Checkdams", Anicuts- Contour bunding on the basis of the PRA work done. This can also be an initial rapport building exercise.
- Establish income generation activities for people who are dependent on the forest.

References

- [mp] Rathore, S.S., Management Plan for Ranthambhore Tiger Reserve (1984-89)
- [Rodgers and Panwar] Rodgers, W.A. & Panwar, H.S., Planning a Wildlife Protection Area Network in India, WII, Dheradun (1988)
- [ep] Government of Ranthambhore Tiger Reserve, (Eco-Development Plan, Draft). Rajasthan, Department of Forest.
- [Champion and Seth] Champion H.G. and Seth, S.K., Forest Types of India,(1968)
- [q1] Questionnaire filled by Park authorities.
- [Berk] 87-88: Berkmuller K.P,Mukherjee S.K,Mishra B.K,Grazing and cutting pressure at Ranthambhore National Park.

SIMILIPAL TIGER RESERVE



SIMILIPAL TIGER RESERVE

II. THE PROJECT AREA (SIMILIPAL TIGER RESERVE) (Kindly refer to the attached map while reading the text)

1. The PA Area

1.1 Location and Approaches: The Similipal Tiger Reserve (STR) is located in the Mayurbhanj District of Orissa, and lies between latitudes 20° 17' to 20° 34' north and longitudes 85° 20' to 87° 10' east [mp]. The headquarters of the Field Director are located in Baripada, about 90 km from Jashipur, which is enroute to the Reserve, and is situated about 20 km away from the western boundary of STR. The nearest airports from Jashipur are Calcutta (240 km) and Bhubaneswar (270 km) [Q1]. The nearest railhead is Badanpahar (30 km) [QA]. The best way to approach STR is to either fly to Calcutta or Bhubaneswar, or take a train to Balasore (about 50 km from Baripada), and then get to the Reserve by road.

1.2 Area, Zoning, and Legal Status: The total area of STR, which was established as a Project Tiger Reserve in 1973, is 2,75,000 ha. (2,750 sq km.) Of this, 2,20,000 ha. (2,200 sq km) was earlier reserved forest, and was notified a sanctuary vide notification no. 30467/FFAH dated 3-12-1979. There are several revenue villages which are situated within the boundary of the Similipal Sanctuary, but their areas were not included in it when it was notified. The area of these villages was also not included in the reserved forests. Thus, about 55,000 ha. (550 sq km) of revenue land, geographically within the Similipal Sanctuary, is legally not a part of it. However, this revenue land is a part of STR. On 6-8-1980, the intention to constitute 30,00 ha. (303 sq km) out of the area of the sanctuary as national park was declared vide notification no. 18703/FFAH. The intention to constitute an additional area of 54,270 ha. (542.7 sq km), again from within the Sanctuary, as a National Park was declared on 11-6-1986 vide notification no. 19525/FFAH. Therefore, the total area for which intention has been declared to constitute a national park is 84,570 ha. (845.7 sq km). This is also the core zone of the STR. The rest of the area (1,35,430 ha. of the Similipal Sanctuary, and 55,000 ha. of revenue land) of STR comprises its buffer zone. Thus, STR is comprised of the following legal and administrative entities:

- a. Of the total area of STR (2,75,000 ha.), intention to constitute a national park has been declared for 84,570 ha. This is also the core zone of STR and in this report will hereafter be referred to as either the Similipal National Park, or the Core Zone.
- b. Of the total area of the buffer zone of STR (1,90,430 ha.), 1,35,430 ha. of reserved forests have been notified as a sanctuary. These will hereafter be referred to as Similipal Sanctuary.

There is also 550 sq km of revenue land in the buffer zone of STR, and will hereafter be referred to as Village Land inside STR.

The term Buffer Zone will, hereafter be used to refer to the Similipal Sanctuary and the Revenue Land inside STR, in this report.

1.3 Description of Ecosystem: STR is situated on a Plateau, which is a part of the larger plateau of Chhotanagpur. It rises sharply from the coastal plains of Orissa to its east, and is criss-crossed by several streams and rivers, many of which are perennial [QA]. The major forest types occurring in STR are 1. Northern Tropical Semi-evergreen Forests,

2. Northern Tropical Moist Deciduous Forests, 3. Dry Deciduous Hill Forests, 4. High Level Sal Forests, and 5. Grass Lands and Savanna [QA].

There are 42 species of mammals, 231 species of birds, and 29 species of reptiles found in STR. In addition, there are 500 plant species found in STR, including 87 species of orchids, and about a 100 species of medicinal plants [EP1, MP].

- 1.4 Population: According to the ecodevelopment plan prepared by the STR authorities, there are 65³ revenue villages inside Similipal Sanctuary. Of these, 4 inhabited and 2 uninhabited villages are in the core zone. The rest of the villages (59), are in the buffer zone of STR. The total population of these villages is 8,643.
- 1.5 Land Use: There are some stone quarries near the northern portion of STR [tp]. 550 sq km of land inside STR is revenue land, which is used for habitation and cultivation. However, detailed information on land use inside STR is not available.
- 1.6 Staff and Equipment: All the details given in this section regarding staff and equipment, are with reference to the core zone of STR. The Field Director, Similipal Tiger Reserve, who is an officer of the level of Conservator of Forests, is in charge of the intended Similipal National Park. He is assisted by one Asst. Field Director, one ACF, one Research Officer, four Range Officers, one Deputy Ranger, 15 Foresters, and 66 Forest and Gate Guards. In addition, there are 35 other people who are posted in STR [QA].

There are 19 fixed, six mobile, and eight handheld wireless sets available in STR. In addition, there are also 42 double barrel shotguns, 17 rifles, and five pistols, as well as 13 binoculars and one nightscope in possession of STR. Also, there are three jeeps, one maruti gypsy, one car, one minitruck, and one HMT tractor with a trolley [QA].

In addition, there is one colour TV, one VCR, one cordless phone, one megaphone, 12 cameras, one microscope and other assorted equipment available in STR [QA].

- 1.7 Management Plan: A management plan for STR has been written by Shri S. Mohapatra, for a time period starting from 1987-88 till 1996-97. However, this plan has not yet been approved [ep1]. Earlier, a management plan was written by Shri Saroj Raj Choudhury which was valid from 1973-74 till 1978-79.
- 1.8 Major Management Issues: The management problems of STR are as follows:-
 - 1.8.1 Akhand Shikar (Traditional Tribal Hunts): Several groups of tribals, sometimes consisting of upto 500 people, carry out an annual ritual of hunting wild animals called "Akhand Shikar". This takes place during April to May. The people who take part in these ritual hunts are not just local tribals, but also tribals come from Bihar and Bengal.
 - 1.8.2 Grazing: Grazing takes place in both the core zone as well as the buffer zone of STR. The cattle being grazed in STR come from within as well as around the protected area. The PA authorities feel that villagers in the adjacent area of Similipal bring their cattle to graze inside the Reserve from upto a distance of 5-7 km. Although grazing is carried out throughout

³ According to the District Census Handbook, 1981, for Mayurbhanj, there are 85 revenue villages (3 villages are uninhabited) in Similipal Sanctuary with a population of 8,574 people. Most of the people living in Similipal are tribals.

the year, its intensity is the greatest during the monsoons. An estimated 50,000 heads of cattle are grazed inside STR.

According to a survey carried out by the PA authorities in two clusters of 4 and 10 villages respectively, in the periphery of STR, atleast 50% of the people in the area graze their cattle inside the Similipal Sanctuary [ep1].

- 1.8.3 Fuelwood Collection: Fuelwood is collected by the people for both their own needs and for sale. Of the two, the quantum of extraction of fuelwood for sale is much greater than for self consumption. According to the PA authorities, people come into STR on cycles, load up their cycles with fuelwood, and then go to various towns in the periphery of STR, like Baripada, Jashipur, Karanjia etc. for sale of the wood. It is estimated that upto 1000 cycle loads of fuelwood are being extracted every day from STR, mainly along the roads and paths in the Reserve.

According to a survey carried out by the PA authorities and referred to in section 1.8.2 above, atleast 44% of the people living in the periphery of STR each extract between 5 and 10 tonnes of fuelwood in an year. According to the District Census Handbook, 1981, there are about 4 lakh people living in the periphery (10 km radius from the boundary) of STR. Even if it is assumed that most of the extraction of fuelwood is done by people living in a 5 km radius from the boundary of STR, if the results of the survey are extrapolated, approximately atleast 88,000 people are each taking out between 5 and 10 tonnes of fuelwood from STR every year. This implies, that atleast 4,40,000 tonnes of fuelwood is being annually extracted from STR.

- 1.8.4 Small Timber Extraction: Timber is being illegally extracted from all over the Reserve. This is done by local people in order to earn cash, and for use in construction and maintenance of houses, making agricultural implements, fencing of agricultural land and homesteads etc [ep1]. It is estimated that about 500 to 700 "Kabari" loads (back loads) are being taken out of Similipal every day.

- 1.8.5 Non Wood Forest Produce (NWFP) Extraction: NWFP is collected mainly for cash income. According to the PA authorities, this is the main occupation of the "Khadia" and "Mankadia" tribals. It is estimated that about 500 people are engaged in NWFP collection every day.

The NWFP collection in STR includes extraction of honey, arrowroot, sal seeds, gum, and resins, among others. Some roots and tubers are also collected, by tribals, for food [mp].

According to the management plan, the Similipahar Forest Development Corporation is the main buyer of NWFP collected from STR.

- 1.8.6 Forest Fires: In the period between 1991 and 1993, a total of 54 forest fires were reported from the STR, damaging a total of 91.20 sq km. Fires mainly break out during the summer months. Many of the fires are set off deliberately, especially by those who collect sal seeds or other NWFP. Also, fires are set off by people in areas whose natural drainage is towards their agricultural fields, so that the ash, which is a valuable fertiliser, can drain into their land [QA, mp].

- 1.8.7 Stone Quarries: According to the Survey of India Toposheets, there are some softstone quarries located inside STR, near its northern boundary.
- 1.8.8 Encroachments: Forest land within STR is being encroached upon by the local people for the purpose of agriculture [ep1].
- 1.8.9 Lack of Staff: There is inadequacy of staff, especially women, in STR, according to the PA authorities [ep1].

2. The PA Surrounds

2.1 Population: According to the District Census Handbook, 1981, for Mayurbhanj and Kendujhar, there are 1,230 revenue villages in the 10 km radius from the boundary of STR. The total population of these villages is 456172 with 87068 households.

2.2 Land Use: STR is mainly surrounded by revenue land except towards the south and north, where there are reserved forests.

3. Local Dependencies on the PA

3.1 Biomass: The biomass dependency of the people on STR manifests itself in the form of grazing. People also collect fuelwood and small timber for their own needs.

3.2 Incomes: People carry out extraction of fuelwood, timber, and NWFP from STR, in order to earn a living.

3.3 Food: The tribals also collect some roots and tubers from the forests of Similipal in order to satisfy atleast some of their demands for food.

3.4 Socio-cultural: The annual ritual hunts or "Akhand Shikar", is an important cultural and religious event in the lives of not just the local tribals, but also tribals from other districts and states.

4. Impacts

4.1 Negative Impacts of the People on STR: The following are the possible negative impacts of people on STR:

- Destruction of forests of STR due to illegal extraction of fuelwood, timber, and NWFP, as well as encroachment on forest land inside STR.
- Burning of the forests of STR due to forest fires, set off by people.
- Depletion in the number of wild animals in STR due to "Akhand Shikar".
- Depletion in availability of food for herbivorous wild animals due to grazing of domestic cattle in STR.
- Infestation of weeds due to grazing and forest fires.
- Disturbance to animals due to human activities like grazing, fuelwood collection, NWFP collection etc.
- Modification of habitat due to grazing in STR.
- Villagers inside STR allegedly harbour the offenders indulging in poaching of animals including tuskers.

4.2 Negative Impacts of STR on People: The possible negative impacts of STR on people could be:

- Shortage of biomass due to a restriction on grazing of cattle inside STR.

- Shortage of incomes due to a restriction on extraction of fuelwood, timber, and NWFP.
- Depradation of crops and livestock, by wild animals.

5. **Issues and Constraints:** The various issues that need to be addressed through the project are:

5.1 Akhand Shikar: The only option in this case is to stop this practise, since it is in violation of the law, and also violates animal rights. However, this should preferably be done with the support of the tribals, after engaging them in a dialogue over why this practise should be stopped.

5.2 Grazing: According to the Wildlife (Protection) Act, 1972, grazing can be permitted inside a sanctuary. Therefore, regulated grazing can be allowed to continue in the buffer zone of STR. However, a study to determine the carrying capacity of the habitat should be done, so that grazing can be maintained at that level.

In the case of grazing inside the core zone of STR, the following options are available:

- a. To try and identify alternate grazing grounds, perhaps in the buffer zone of STR, for the cattle grazing inside the core zone.
- b. To try and encourage stall feeding of cattle, along with raising of fodder plantations in village common lands, wastelands, or available forest lands. In addition, to try and convince people to go in for better breeds of cattle.
- c. In case the purpose for keeping cattle is to earn cash, then alternate income generating activities acceptable to the people can be identified.

Of the options listed above, option a. is the most feasible. However, if it cannot be operationalised, then options b. and c. will have to be implemented. But, both these options are much more difficult to operationalise. This is because it is difficult to persuade people to stall feed livestock. It is even more difficult to persuade people to change their traditional occupation. Also, the non availability of land for fodder plantations is a constraint.

5.3 Fuelwood Collection: The following options are available for solving the problem of fuelwood extraction in STR:

- a. Since most of the fuelwood is for sale, appropriate alternate income generation activities will have to be identified, with the help of the local people, so that their cash needs can be otherwise met.
- b. Fuelwood plantations will have to be raised on available land, for fulfilling the fuelwood needs of the people and for their own use.

STR forests are mainly Sal forests. Generally, 0.8 tonnes of fuelwood from Sal is equal to 1 cubic metres. This would mean that approximately 3,52,000 cubic metres of fuelwood is being extracted from STR. 1 ha. of Sal plantations, under ideal conditions and proper management, can produce upto 8 cubic metres of fuelwood (current yields of fuelwood from 1 ha. are only about 2 cubic metres). Therefore, in order to produce atleast 3,52,000 cubic metres of fuelwood in and around STR, atleast 44,000 ha. (440 sq km) of land will have to be found in and around STR, so that a sizable portion of the pressure for fuelwood can be removed from the protected area.

- c. Alternate energy sources like biogas, and energy conservation devices such as solar cookers and smokeless chulhas, will have to be promoted among the local people.
- d. Departmental collection of fuel wood, from the buffer reserved forests, for sale to the local people at cost price, can be undertaken.

All the above options should be attempted.

5.4 NWFP Collection: The main option in this case is to identify viable, alternate income generating activities, which the people accept. Some species can be cultivated outside the PA.

5.5 Small Timber collection: The options in this case are:

- a. To identify viable income generation activities acceptable to the local people.
- b. To identify suitable alternatives to small timber which can be used by people for construction and maintenance of houses, making agricultural implements, and fencing agricultural fields and homesteads, among other things.
- c. To identify land on which plantations can be raised for meeting the small timber needs of the people.
- d. Departmental collection of small timber from buffer (dead, dry fallen trees only) for sale to local people, at cost price.

Of the options listed above, option a. is relevant only in the case of those people who extract small timber for cash. Options b. and c. are relevant for those people who extract small timber for their own requirements. The constraint in the case of option c. is availability of land, while in the case of option b., the unacceptability of alternatives, by the people, might turn out to be a constraint.

5.6 Forest Fires: Local people should be employed as fire watchers and for maintaining fire lines in STR. Also, some fire watchtowers should be constructed in appropriate sites in STR.

5.7 Stone Quarries: The stone quarries inside STR should be immediately closed down, since quarrying is illegal inside a sanctuary.

5.8 Encroachment: Since people are going to be offered viable income generation alternatives as a part of this project, their desire to add to their existing land holdings for agriculture, by encroaching on forest land inside STR, may dampen. Also, if the PA authorities are able to win over the people's trust, it will be easier for them to police and prevent encroachers from taking illegal possession of forest land. In this case, the main option is to provide people with acceptable income generation alternatives and to strengthen policing by getting the cooperation of the local communities. In addition, the boundaries of STR may be clearly demarcated so that cases of encroachment can be clearly identified.

5.9 Staff: The existing staff should be trained and where possible, women staff should be recruited.

III. THE PROJECT

1. **Rationale**: STR falls in the Garhjat Hills sub-division of the Chhota Nagpur Plateau (6D) biogeographic province in the Deccan Peninsula (6) biogeographic zone. Also, STR is by far the largest protected area in the Garhjat Hills biogeographic sub-division. It is also connected to Kuldiha Sanctuary through a forest corridor.

Some of the Schedule - I species of animals found in STR are Four Horned Antelope (Chousingha), Gaur, Elephant, Mouse Deer, Indian Wolf, Leopard, Tiger, Leopard cat, Ratel, and Otter, among mammals, and Large Bengal Monitor Lizard, Indian Python, and Marsh Crocodile among reptiles.

However, STR is also impacted upon by several human activities, which threaten this valuable area, as has been highlighted in section II. subsection 1.8 above. A correct balance of effective and strong PA management along with the right kind of ecodevelopment inputs is needed to work towards a solution of problems created due to human uses and impacts in STR. This is also the right time to initiate fresh strategies for PA management and ecodevelopment, because the State Government and the STR authorities are interested in taking them up. The administration will have to get co-operation of the local people and earn their trust, so that the two major players in the effort, that is, the people and the STR authorities, can pull their weight together in the same direction.

2. Project Description:

2.1 PA Management: The following recommendations are being made for PA management in STR:

- 2.1.1 It is recommended that the stone quarries operating inside STR be closed down, and the area taken over by the PA authorities.
- 2.1.2 It is recommended that adequate staff, according to the requirements of the PA authorities, be sanctioned for STR.
- 2.1.3 It is recommended that committees like Ecodevelopment Committees and Village Forest Protection Committees, will be involved in the process of PA management and ecodevelopment.

2.2 Ecodevelopment: The following recommendations are being made for ecodevelopment in STR.

- 2.2.1. To try and meet the biomass demands of people while minimising and/or removing negative impacts of grazing and fuelwood collection on STR. An attempt will have to be made to try and meet a large part of the biomass demands of the people by raising fuel and fodder plantations in land available with the villagers. For this, nurseries will be raised by people, and saplings will be distributed to people to plant trees on their private as well as common lands.
- 2.2.2. To develop and establish alternate sources of income for the people currently dependent on STR for their incomes. The income needs of the people are going to be met by socially, economically, and environmentally sustainable alternate income generation activities like arrowroot cultivation, apiculture, raising of sabai grass plantations, rope making from sabai grass and other sabai products, sissal plantations, poultry, pigrearing, pisciculture, etc. Some of the local people can also be engaged as tourist guides. Training and funding can also be provided for cycle repairing units, iron smithy, and other such skills and professions.
- 2.2.3. Some soil and water conservation measures will also be taken up to enhance the productivity of people's resources, so that their capacity to earn on their own is enhanced. According to PA authorities, Mayurbhanj is a district where water is scarce for both drinking as well as irrigation. This is another reason for

investing in soil and water conservation measures around STR. Some of the activities envisaged in the project are digging of wells, establishing water harvesting structures, construction of anicuts and checkdams, sinking of tubewells etc.

3. Support Systems:

- 3.1 Human Resources Development and Awareness: It is proposed to train people in running poultry farms, doing apiculture, being tourist guides, and in various other income generating skills. Training can be provided by the concerned Government Departments, or by appropriate NGOs.

It is also proposed to have groups of people who will interact with the villagers, and give them information about the significance of STR as a protected area, and its values. These people will also document and collect local knowledge about the area.

In addition, it is also proposed to train the STR staff and members of the local community in both wildlife management and ecodevelopment.

- 3.2 Institutional Arrangements: It is proposed to have a co-operative or a society which will have, as its members, all the people who are dependent upon the resources of STR. This co-operative will collect money, on behalf of the local people, from tourists, pilgrims, or other visitors, and channel it back into ecodevelopment or PA management.

It is also proposed to have village level ecodevelopment committees which will interact with the STR authorities and other concerned agencies on planning and implementing site specific ecodevelopment packages.

It is also proposed to identify local NGOs which have been working on rural development issues in the area, so that they can be involved in the planning and implementation of the various biomass and income generation schemes proposed to be undertaken under ecodevelopment.

It is proposed to have an institutional mechanism for enabling the local people to be consulted, and to participate in, PA management.

It is also proposed to have an ecodevelopment coordination committee at the state level, chaired by the Chief Secretary or, in his/her absence, by the Forest Secretary. This would be supported by a district level co-ordination committee, involving the Collectors, and the Field Director, STR. Such a committee will co-ordinate the inputs of the various line departments like agriculture, animal husbandry etc., for implementing income generation schemes as part of ecodevelopment. The state and district level committees will also help in better co-ordinating protection measures.

In addition, the STR authorities should also arrange for some marketing mechanisms which will allow the local people to sell some of their products to tourists visiting the Reserve. Services of a marketing consultancy organisation could be hired, to determine the optimal marketing strategy for produce of some of the income generation activities to be taken up as a part of this project.

- 3.3 Research and Monitoring: Possible research topics include:

- a. Studying the movement patterns and habitat use by elephants in STR.
- b. Studying the elephant carrying capacity of STR.
- c. Study of existing forest corridors connecting Similipal to other Areas and their Ecological Status.

- d. Effects of forest fires on the habitat of STR.
- e. Inventory of flora/fauna in STR.
- g. Identification of medicinal plants and herbs in STR and their properties.
- h. Anthropological study of tribals in STR
- i. Study of the carrying capacity of the habitat for grazing of cattle in Similipal Sanctuary
- j. Effects of grazing on the habitat of STR

A monitoring network, involving local, regional, and national NGOs and professional institutions would be created for regular monitoring of STR.

PARTICIPATORY RURAL APPRAISAL

The Participatory Rural Appraisal was carried out by a team of Similipal Tiger Reserve staff in 10 (out of 1209) villages, selected by random sampling within a radius of 10kms of the STR. 187 sample households in the above ten villages were surveyed, by ascertaining the resource needs of the households as well as their approach and preferences for various alternative uses/programs.

The major findings from the PRA were:

- 1) 73.5% of the people in the impact zone are tribals and 5.2% belong to the scheduled caste category.
- 2) About 25.67% households are landless, 47.60% marginal farmers, 19.79% small farmers and 93.05% have to supplement their income from agriculture.
- 3) The fuel wood requirement of the sample households was recorded as high (7.8 q. per month).
- 4) Dependence on STR for following purposes:
 - a) 68.45% for fuelwood collection.
 - b) collection of house building material and MFP.
 - c) grazing.
- 5) The landless population were found to be more dependent on STR.

Alternatives suggested by people during PRA:

- i) Government should develop alternate sources (5 villages).
- ii) Supply firewood at nominal prices (5 villages).
- iii) By controlled felling in R.F and P.F (5 villages)
- iv) Plantation on wastelands.
 - a) 64.17% of the households wanted village woodlots on govt. wastelands.
 - b) 33.89% preferred roadside plantations.
 - c) 56.68% wanted farm forestry on private wasteland fallows.
- v) 74.33% of the households expressed that pressure on the PA would be considerably reduced if plantations were raised on village wastelands and private holdings.

References:

[mp] Mohapatra, S., Management Plan for Similipal Tiger Reserve (1987-88 to 1996-97), Forest Department, Government of Orissa

[ep] Ecodevelopment Plan for Similipal Tiger Reserve, October 1991, Forest Department, Government of Orissa

[ep1] Ecodevelopment Project for Similipal Tiger Reserve, October 1993, Forest Department, Government of Orissa

[QA] Questionnaire - A: All India Survey of National Parks and Sanctuaries, 1989

[Q1] Questionnaire - 1: All India Survey of National Parks and Sanctuaries, 1984

District Census Handbook, 1981, for the districts of Mayurbhanj and Kendujhar, Orissa

Rodgers W.A. and Panwar H.S.; Planning a Protected Area Network in India: Volume I + II, Wildlife Institute of India, Dehra Dun

E. FAUNA LISTS

LIST OF BIRDS FOUND IN THE EIGHT PROTECTED AREAS

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Adjutant	<i>Leptoptilos dubius</i>			*					
Babbler, Blackheaded	<i>Rhopocichla atriceps</i>						*		
Babbler, Common	<i>Turdoides caudatus</i>		*	*	*	*		*	*
Babbler, Jungle	<i>Turdoides striatus</i>	*	*	*	*	*	*	*	*
Babbler, Large Grey	<i>Turdoides malcolmi</i>		*		*	*		*	
Babbler, Large Scimitar	<i>Pomatorhinus hypoleucos</i>						*		*
Babbler, Quaker	<i>Alcippe poiocephala</i>			*	*		*		
Babbler, Redheaded	<i>Stachyris ruficeps</i>								*
Babbler, Rufous	<i>Turdoides subrufus</i>			*					
Babbler, Rufousbellied	<i>Dumetia hyperythra</i>		*	*	*			*	
Babbler, Rustychecked Scimitar	<i>Pomatorhinus erythrogenys</i>	*							
Babbler, Slatyheaded Scimitar	<i>Pomatorhinus horsfieldii</i>	*	*		*				
Babbler, Spotted	<i>Pellorneuni ruficeps</i>			*	*		*		*
Babbler, Striated	<i>Turdoides earlei</i>	*							
Babbler, Whiteheaded	<i>Turdoides affinis</i>			*					
Babbler, Yelloweyed	<i>Chrysomma sinense</i>		*	*	*	*		*	*
Barbet, Bluethroated	<i>Megalaima asiatica</i>	*			*				*
Barbet, Crimsonbreasted	<i>Megalaima haemacephala</i>		*	*	*	*		*	*
Barbet, Great Hill	<i>Megalaima virens</i>	*							

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCHI	PERIYAR	RANTHAMBHORE	SIMILIPAL
Barbet, Green	<i>Megalaima zeylanica</i>					*		*	*
Barbet, Lineated	<i>Megalaima lineata</i>	*							*
Barbet, Small Green	<i>Megalaima viridis</i>			*			*		*
Barwing, Spectacled	<i>Actinodura egertoni</i>	*							
Baya	<i>Ploceus philippinus</i>	*	*	*	*	*		*	*
Baya, Finn's	<i>Ploceus megarhynchus</i>	*							
Baza, Indian Blackcrested	<i>Aviceda leuphotes</i>	*					*		*
Bee-eater, Bluebearded	<i>Nyctornis athertoni</i>			*					*
Bee-eater, Bluecheeked	<i>Merops superciliosus</i>		*	*					
Bee-eater, Bluetailed	<i>Merops philippinus</i>	*		*	*				*
Bee-eater, Chestnutheaded	<i>Merops leschenaulti</i>	*		*	*		*		
Bee-eater, Green	<i>Merops orientalis</i>	*	*	*	*	*	*	*	*
Bittern	<i>Botaurus stellaris</i>							*	
Bittern, Black	<i>Ixobrychus flavicollis</i>						*		
Bittern, Chestnut	<i>Ixobrychus cinnamomeus</i>	*		*	*		*		*
Bittern, Yellow	<i>Ixobrychus sinensis</i>						*		
Blackbird	<i>Turdus merula</i>		*	*	*	*	*		*
Bluebird, Fairy	<i>Irena puella</i>			*			*		*
Bluethroat	<i>Erithacus svecicus</i>	*	*					*	
Broadbill Longtailed	<i>Psarisomus dalhousiae</i>	*							
Broadbill, Hodgson's	<i>Serilophus lunatus</i>	*							

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Bulbul, Black	<i>Hypsipetes madagascariensis</i>						*		
Bulbul, Blackheaded Yellow	<i>Pycnonotus melanicterus</i>								*
Bulbul, Greyheaded	<i>Pycnonotus priocephalus</i>						*		
Bulbul, Redvented	<i>Pycnonotus cafer</i>	*	*	*	*	*	*	*	*
Bulbul, Redwhiskered	<i>Pycnonotus jocosus</i>	*		*	*		*	*	*
Bulbul, Whitebrowed	<i>Pycnonotus luteolus</i>								*
Bulbul, Whitecheeked	<i>Pycnonotus leucogenys</i>							*	
Bulbul, Whitethroated	<i>Criniger flaveolus</i>	*							
Bulbul, Yellowbrowed	<i>Hypsipetes indicus</i>			*			*		
Bunting, Blackfaced	<i>Emberiza spodocephala</i>		*			*			
Bunting, Crested	<i>Melophus lathami</i>		*			*		*	
Bunting, Greynecked	<i>Emberiza buehanani</i>		*					*	
Bunting, Little	<i>Emberiza pusilla</i>	*							
Bunting, Redheaded	<i>Emberiza bruniceps</i>		*					*	
Bunting, Rock or Meadow	<i>Emberiza cia</i>							*	
Bunting, Striolated	<i>Emberiza striolata</i>		*						
Bunting, Whitecapped	<i>Emberiza stewarti</i>							*	
Bustard-quail, Common	<i>Turnix suscitator</i>	*		*	*	*			*
Bustard-quail, Little	<i>Turnix sylvatica</i>		*						
Buzzard	<i>Buteo buteo</i>								*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Buzzard, Honey	<i>Pernis ptilorhynchus</i>		*	*		*	*	*	*
Buzzard, Longlegged	<i>Buteo rufinus</i>		*					*	
Buzzard-eagle, White-eyed	<i>Butastur teesa</i>		*	*	*			*	*
Chat, Blue	<i>Erithacus brunneus</i>		*				*		
Chat, Brown Rock	<i>Cercomela fusca</i>							*	
Chat, Dark-grey Bush	<i>Saxicola ferrea</i>	*							
Chat, Isabelline	<i>Oenanthe isabellina</i>		*						
Chat, Pied	<i>Oenanthe picata</i>		*		*				
Chat, Pied Bush	<i>Saxicola caprata</i>	*	*	*		*	*	*	
Chat, Redtailed	<i>Oenanthe xanthopyrmina</i>		*						
Chat, Rufous	<i>Erythropgia galactotes</i>		*						
Chat, Stone or Collared Bush	<i>Saxicola torquata</i>	*	*			*		*	
Chloropsis, Goldfronted	<i>Chloropsis aurifrons</i>	*		*	*	*	*		*
Chloropsis, Goldmantled	<i>Chloropsis cochinchinensis</i>			*	*	*			*
Cock, Water	<i>Gallicrex cinerea</i>		*						
Coot	<i>Fulica atra</i>		*	*				*	
Cormorant, (Large)	<i>Phalacrocorax carbo</i>	*		*		*	*	*	
Cormorant, Little	<i>Phalacrocorax niger</i>	*	*	*		*	*	*	*
Coucal, Lesser	<i>Centropus toulou</i>						*		
Courser, Indian	<i>Cursorius coromandelicus</i>							*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Crake, Baillon's	<i>Porzana pusilla</i>		*						
Crake, Brown	<i>Amaurornis akool</i>		*	*				*	*
Crane, Demoiselle	<i>Anthropoides virgo</i>		*						
Crane, Sarus	<i>Gurus antigone</i>							*	
Crane, Siberian	<i>Grus leucogeranus</i>		*						
Crow, House	<i>Corvus splendens</i>	*	*	*	*	*	*	*	*
Crow, Jungle	<i>Corvus macrorhynchos</i>	*	*	*	*	*	*	*	*
Crow-pheasant	<i>Centropus sinensis</i>		*	*	*	*	*	*	*
Cuckoo, Indian	<i>Cuculus micropterus</i>	*		*		*	*		*
Cuckoo, Indian Banded Bay	<i>Cacomantis sonneratii</i>						*		*
Cuckoo, Indian Plaintive	<i>Cacomantis passerinus</i>			*					
Cuckoo, Pied Crested	<i>Clamator jacobinus</i>		*	*		*	*	*	*
Cuckoo, Redwinged Crested	<i>Clamator coromandus</i>						*		
Cuckoo, Rufousbellied Plaintive	<i>Cacomantis merulinus</i>			*					
Cuckoo, Sirkeer	<i>Taccocua leschenaultii</i>		*	*	*	*		*	*
Cuckoo, Small	<i>Cuculus poliocephalus</i>								*
Cuckoo, The	<i>Cuculus canorus</i>	*	*					*	
Cuckoo-dove, Bartailed	<i>Macropygia unehall</i>	*							
Cuckoo-shrike, Blackheaded	<i>Coracina melanoptera</i>		*	*	*		*	*	*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Cuckoo-shrike, Large	<i>Coracina novaehollandiae</i>		*	*	*	*	*	*	*
Cuckoo-shrike, Smaller Grey	<i>Coracina melaschistos</i>	*							
Curlew	<i>Numenius arquata</i>				*			*	
Curlew, Stone	<i>Burhinus oedienemus</i>		*	*	*	*		*	*
Darter	<i>Anhinga rufa</i>		*	*		*	*	*	
Dove, Emerald	<i>Chalcophaps indica</i>	*		*			*		*
Dove, Indian Ring	<i>Streptopelia decaocto</i>	*	*	*	*	*	*	*	*
Dove, Little Brown	<i>Streptopelia senegalensis</i>		*	*	*			*	
Dove, Red Turtle	<i>Streptopelia tranquebarica</i>		*			*		*	
Dove, Rufous Turtle	<i>Streptopelia orientalis</i>		*			*		*	
Dove, Spotted	<i>Streptopelia chinensis</i>		*	*	*	*	*	*	*
Dove, Turtle	<i>Streptopelia turtur</i>								*
Drongo, Ashy or Grey	<i>Dicrurus leucophaeus</i>		*	*			*		
Drongo, Black	<i>Dicrurus adsimilis</i>	*	*	*	*	*	*	*	*
Drongo, Bronzed	<i>Dicrurus aeneus</i>			*			*		
Drongo, Greater Racket-tailed	<i>Dicrurus paradiseus</i>	*		*	*	*	*		*
Drongo, Hairrested	<i>Dicrurus hottentottus</i>	*					*		
Drongo, Lesser Racket-tailed	<i>Dicrurus remifer</i>	*							
Drongo, Whitebellied	<i>Dicrurus caeruleus</i>		*	*	*	*		*	*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Drongo-cuckoo	<i>Surniculus lugubris</i>						*		
Duck, Comb	<i>Sarkidiornis melanotos</i>		*					*	
Duck, Spotbill	<i>Anas poecilorhyncha</i>		*	*		*			*
Duck, Tufted	<i>Aythya fuligula</i>	*						*	
Eagle, Black	<i>Ictinaetus malayensis</i>			*			*	*	*
Eagle, Bonelli's (Slender Hawk-eagle)	<i>Hieraaetus fasciatus</i>		*				*	*	*
Eagle, Crested Serpent	<i>Spilornis cheela</i>		*	*	*	*	*	*	*
Eagle, Greater Spotted	<i>Aquila clanga</i>							*	
Eagle, Greyheaded Fishing	<i>Ichthyophaga ichthyaetus</i>			*			*		
Eagle, Lesser Spotted	<i>Aquila pomarina</i>							*	*
Eagle, Pallas's Fishing	<i>Haliaeetus leucoryphus</i>		*			*			
Eagle, Short-toed	<i>Circus gallicus</i>		*		*		*	*	
Eagle, Tawny	<i>Aquila rapax</i>			*	*			*	
Eagle, Whitebellied Sea	<i>Haliaeetus leucogaster</i>						*		
Eagle, Whitetailed	<i>Haliaeetus albicilla</i>						*		
Eagle-owl, Forest	<i>Bubo nipalensis</i>	*					*		*
Egret, Cattle	<i>Bubulcus ibis</i>	*	*	*	*	*	*	*	*
Egret, Large	<i>Ardea alba</i>	*	*	*			*	*	
Egret, Little	<i>Egretta garzetta</i>		*	*	*	*	*	*	
Egret, Smaller	<i>Egretta intermedia</i>		*	*		*	*	*	*
Falcon, Lanner	<i>Falco biarmicus</i>		*	*				*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Falcon, Peregrine or Shahin	Falco peregrinus		*	*		*	*	*	*
Falcon, Redlegged	Falco vespertinus							*	
Falconet, Redbreasted	Microhierax caerulescens	*							*
Finch, Scarlet	Haematozpiza sipahi	*							
Finch-lark, Ashycrowned	Eremopterix grisea		*	*	*	*		*	
Finch-lark, Blackcrowned	Eremopterix nigriceps							*	
Finch-lark, Desert	Ammodramus deserti							*	
Finch-lark, Rufoustailed	Ammodramus phoenicurus		*					*	
Floricane, Bengal	Eupodotis bengalensis	*							
Floricane, Lesser	Syphialotis indica		*						
Flowerpecker, Plaincoloured	Dicaeum concolor	*							
Flowerpecker, Scarletbacked	Dicaeum cruentatum	*							
Flowerpecker, Thickbilled	Dicaeum agile		*		*	*	*		*
Flowerpecker, Tickell's	Dicaeum erythrorhynchos	*	*	*	*	*	*		*
Flycatcher, Black-and-orange	Muscicapa nigrorufa						*		
Flycatcher, Blacknaped	Hypothymis azurea	*	*	*		*	*		
Flycatcher, Bluethroated	Muscicapa rubeculoides	*					*		*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Flycatcher, Brown	<i>Muscicapa latirostris</i>		*	*		*	*	*	
Flycatcher, Brownbreasted	<i>Muscicapa muttui</i>					*	*		
Flycatcher, Dusky Blue	<i>Muscicapa sordida</i>								*
Flycatcher, Greyheaded	<i>Culicicapa ceylonensis</i>	*	*		*		*	*	
Flycatcher, Little Pied	<i>Muscicapa westermanni</i>	*							
Flycatcher, Nilgiri	<i>Muscicapa albicaudata</i>			*					
Flycatcher, Paradise	<i>Terpsiphone paradisi</i>	*	*	*	*	*	*	*	*
Flycatcher, Redbreasted	<i>Muscicapa parva</i>		*	*		*	*	*	
Flycatcher, Rufoustailed	<i>Muscicapa ruficauda</i>		*	*			*		
Flycatcher, Slaty Blue	<i>Muscicapa leucomelanura</i>	*							
Flycatcher, Sooty	<i>Muscicapa sibirica</i>	*							
Flycatcher, Spotted	<i>Muscicapa striata</i>		*						
Flycatcher, Tickell's Blue	<i>Muscicapa tickelliae</i>		*	*	*		*	*	*
Flycatcher, Verditer	<i>Muscicapa thalassina</i>	*	*		*	*	*	*	*
Flycatcher, Whitebellied Blue	<i>Muscicapa pallipes</i>						*		
Flycatcher, Whitebrowed Blue	<i>Muscicapa superciliaris</i>								*
Flycatcher, Whitebrowed Faintail	<i>Rhipidura aureola</i>		*	*		*	*	*	*
Flycatcher, Whitethroated Faintail	<i>Rhipidura albicollis</i>				*	*			*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Flycatcher-shrike, Pied	<i>Hemipus picatus</i>			*			*		*
Flycatcher-warbler, Blackbrowed	<i>Seicercus burkii</i>	*							
Forktail, Blackbacked	<i>Enicurus immaculatus</i>	*							
Forktail, Spotted	<i>Enicurus maculatus</i>	*							
Frogmouth, Ceylon	<i>Batrachostomus moniliger</i>						*		
Gadwall	<i>Anas strepera</i>							*	
Garganey, or Bluewinged Teal	<i>Anas querquedula</i>			*			*	*	
Godwit, Bartailed	<i>Limosa lapponica</i>		*						
Godwit, Blacktailed	<i>Limosa limosa</i>							*	
Goose, Barheaded	<i>Anser indicus</i>							*	
Goose, Grey Lag	<i>Anser anser</i>							*	
Goshawk, (Eastern)	<i>Accipiter gentilis</i>		*						*
Goshawk, Crested	<i>Accipiter trivirgatus</i>	*					*		
Grebe, Little	<i>Podiceps ruficollis</i>	*	*	*		*	*	*	*
Greenshank	<i>Tringa nebularia</i>		*					*	
Gull, Brownheaded	<i>Larus brunnecephalus</i>			*					*
Harrier, Marsh	<i>Circus aeruginosus</i>		*	*			*	*	
Harrier, Montagu's	<i>Circus pygargus</i>		*	*				*	
Harrier, Pale	<i>Circus macrourus</i>		*	*					*
Harrier, Pied	<i>Circus melanoleucos</i>					*	*		

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTILAMBHORE	SIMILIPAL
Hawk-cuckoo, Common or Brainfever Bird	Cuculus varius	*	*	*	*	*	*	*	*
Hawk-cuckoo, Large	Cuculus sparveroides						*		
Hawk-eagle, Booted	Hieraaetus pennatus		*	*			*		
Hawk-eagle, Crested	Spizaetus cirrhatus		*	*	*	*	*	*	
Hawk-eagle, Hodgson's	Spizaetus nipalensis	*							
Hawk-eagle, Rufousbellied	Hieraaetus kienerii						*		
Hawk-owl, Brown	Ninox scutulata			*			*		*
Heron, Grey	Ardea cinerea		*	*	*	*	*	*	
Heron, Little Green	Ardeola striatus	*	*	*	*	*	*	*	*
Heron, Night	Nycticorax nycticorax	*	*	*	*	*	*		
Heron, Pond	Ardeola grayii	*	*	*	*	*	*	*	*
Heron, Purple	Ardea purpurea	*	*	*				*	
Hobby	Falco subbutco		*	*					
Hoopoe	Upupa epops	*	*	*		*	*	*	*
Hornbill, Common Grey	Tockus birostris		*	*		*		*	*
Hornbill, Great Pied	Buceros bicornis	*					*		
Hornbill, Indian Pied	Anthracoceros malabaricus					*			*
Hornbill, Malabar Grey	Tockus griseus			*	*		*		
Hornbill, Malabar Pied	Anthracoceros coronatus			*					*
Hornbill, Rufousnecked	Aceros nipalensis	*							

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTILAMBHORE	SIMILIPAL
Hornbill, Wreathed	<i>Phyticeros undulatus</i>	*							
Ibis, Black	<i>Pseudibis papillosa</i>		*	*	*	*			
Ibis, Glossy	<i>Plegadis falcinellus</i>							*	*
Ibis, White	<i>Threskiornis aethiopica</i>		*	*	*	*		*	
Ibisbill	<i>Ibidorhyncha struthersii</i>	*							
Iora, Common	<i>Aegithina tiphia</i>	*	*	*	*	*	*	*	*
Iora, Marshall's	<i>Aegithina nigrolutea</i>		*					*	
Jacana, Bronzewinged	<i>Metopidius indicus</i>	*		*		*		*	*
Jacana, Pheasant-tailed	<i>Hydrophasianus chirurgus</i>		*	*				*	
Junglefowl, Grey	<i>Gallus sonneratii</i>		*				*		*
Junglefowl, Red	<i>Gallus gallus</i>	*			*	*			*
Kestrel	<i>Falco tinnunculus</i>		*	*		*	*	*	*
Kingfisher, Blackcapped	<i>Halcyon pileata</i>						*	*	
Kingfisher, Blue-eared	<i>Alcedo meninting</i>	*					*		
Kingfisher, Common	<i>Alcedo atthis</i>	*	*	*	*	*	*	*	*
Kingfisher, Lesser Pied	<i>Ceryle rudis</i>		*	*	*	*	*	*	*
Kingfisher, Storkbilled	<i>Pelargopsis capensis</i>			*			*	*	
Kingfisher, Threetoed	<i>Ceyx erithacus</i>	*							
Kingfisher, Whitebreasted	<i>Halcyon smyrnensis</i>	*	*	*	*	*	*	*	*
Kite, Blackwinged	<i>Elanus caeruleus</i>	*	*	*	*	*	*	*	*
Kite, Brahminy	<i>Haliastur indus</i>		*	*	*	*	*	*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Kite, Pariah	<i>Milvus migrans</i>	*	*	*	*		*	*	*
Koel	<i>Eudynamys scolopacea</i>	*	*	*	*	*	*	*	*
Lapwing	<i>Vanellus vanellus</i>							*	
Lapwing, Redwattled	<i>Vanellus indicus</i>		*	*	*	*	*	*	*
Lapwing, Spurwinged	<i>Vanellus spinosus</i>	*						*	
Lapwing, Whitetailed	<i>Vanellus leucurus</i>							*	
Lapwing, Yellow-wattled	<i>Vanellus malabaricus</i>		*	*	*	*		*	*
Lark, Bush	<i>Mirafra assamica</i>	*		*			*	*	*
Lark, Crested	<i>Galerida cristata</i>				*			*	
Lark, Large Desert	<i>Alaemon alaudipes</i>							*	
Lark, Malabar Crested	<i>Galerida malabarica</i>			*					
Lark, Redwinged Bush	<i>Mirafra erythroptera</i>		*	*	*	*			*
Lark, Short-toed	<i>Calandrella cinerea</i>		*					*	
Lark, Singing Bush	<i>Mirafra javanica</i>		*					*	
Lark, Sykes's Crested	<i>Galerida deva</i>		*						
Lorikeet, Indian	<i>Loriculus vernalis</i>			*	*		*		*
Magpie, Green	<i>Cissa chinensis</i>	*							
Magpie-robin	<i>Copsychus saularis</i>	*	*	*	*	*	*	*	*
Malkoha, Large Greenbilled	<i>Rhopodytes tristis</i>	*							
Malkoha, Small Greenbilled	<i>Rhopodytes viridirostris</i>			*			*		*

COMMON NAME	LAITN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Martin, Collared Sand	Riparia riparia		*					*	
Martin, Crag	Hirundo rupestris		*					*	
Martin, Dusky Crag	Hirundo concolor		*	*			*	*	*
Martin, Plain Sand	Riparia paludicola		*						
Merganser, Common	Mergus merganser	*							
Merlin	Falco columbarius			*					
Merlin, Redheaded	Falco chicquera		*					*	
Minivet, Longtailed	Pericrocotus ethologus	*							*
Minivet, Rosy	Pericrocotus roseus	*							*
Minivet, Scarlet	Pericrocotus flammeus	*		*	*			*	*
Minivet, Shortbilled	Pericrocotus brevirostris	*							
Minivet, Small	Pericrocotus cinnamomeus		*	*	*	*	*	*	*
Minivet, Whitebellied	Pericrocotus erythropygus		*						
Minivet, Yellowthroated	Pericrocotus solaris	*							
Minla, Redtailed	Minla ignotincta	*							
Moorhen	Gallinula chloropus		*	*				*	
Moorhen, Purple	Porphyrio porphyrio	*	*	*				*	
Munia, Blackheaded	Lonchura malacca			*	*	*	*		*
Munia, Green	Estrilda formosa				*				*
Munia, Red or Avadavat	Estrilda amandava			*	*	*	*		*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Munia, Rufousbellied	<i>Lonchura kelaarti</i>						*		
Munia, Spotted	<i>Lonchura punctulata</i>	*	*	*	*	*	*	*	*
Munia, Whitebacked	<i>Lonchura striata</i>	*			*	*	*		*
Munia, Whitethroated	<i>Lonchura malabarica</i>		*		*		*	*	
Myna, Bank	<i>Acridotheres ginginianus</i>	*			*			*	
Myna, Brahminy	<i>Sturnus pagodarum</i>		*	*	*	*		*	*
Myna, Common	<i>Acridotheres tristis</i>	*	*	*	*	*	*	*	*
Myna, Greyheaded	<i>Sturnus malabaricus</i>	*		*	*	*	*	*	*
Myna, Hill	<i>Gracula religiosa</i>	*		*			*		*
Myna, Jungle	<i>Acridotheres fuscus</i>	*	*		*	*	*		*
Myna, Pied	<i>Sturnus contra</i>	*			*	*		*	*
Myna, Whiteheaded	<i>Sturnus erythropygius</i>			*					
Nightjar, Common Indian	<i>Caprimulgus asiaticus</i>		*	*	*			*	
Nightjar, Franklin's	<i>Caprimulgus affinis</i>		*			*	*	*	
Nightjar, Great Eared	<i>Eurostopodus macrotis</i>						*		
Nightjar, Indian Jungle	<i>Caprimulgus indicus</i>		*			*	*	*	*
Nightjar, Longtailed	<i>Caprimulgus macrurus</i>	*							*
Niltava, Rufousbellied	<i>Muscicapa sundara</i>	*							
Niltava, Small	<i>Muscicapa macgrigoriae</i>	*							
Nuthatch, Chestnutbellied	<i>Sitta castanea</i>	*		*	*				*
Nuthatch, Velvetfronted	<i>Sitta frontalis</i>			*			*		*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHAMBHORE	SIMILIPAL
Oriole, Blackheaded	Oriolus xanthornus	*	*	*	*	*	*	*	*
Oriole, Golden	Oriolus oriolus		*	*	*	*	*	*	*
Oriole, Maroon	Oriolus traillii	*							
Osprey	Pandion haliaetus		*	*			*		
Owl, Barn	Tyto alba		*	*	*	*		*	
Owl, Brown Fish	Bubo zeylonensis		*	*	*	*	*	*	
Owl, Brown Wood	Strix leptogrammica								*
Owl, Collared Scops	Otus bakkamoena		*		*		*	*	*
Owl, Dusky Horned	Bubo coromandus							*	
Owl, Great Horned or Eagle-owl	Bubo bubo		*		*		*	*	*
Owl, Mottled Wood	Strix ocellata		*	*			*		*
Owl, Scops	Otus scops			*			*	*	*
Owl, Shorteared	Asio flammeus		*						
Owl, Spotted Scops	Otus spilocephalus	*							
Owlet, Jungle	Glaucidium radiatum	*	*	*	*	*	*		
Owlet, Spotted	Athene brama	*	*				*	*	
Parakeet, Alexandrine	Psittacula eupatria	*		*	*	*		*	*
Parakeet, Blossomheaded	Psittacula cyanocephala	*	*	*	*	*	*	*	*
Parakeet, Bluewinged	Psittacula columboides			*			*		
Parakeet, Redbreasted	Psittacula alexandri	*							
Parakeet, Roseringed	Psittacula krameri	*	*		*	*	*	*	*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Partridge, Black	<i>Francolinus francolinus</i>	*			*			*	*
Partridge, Grey	<i>Francolinus pondicerianus</i>	*	*	*	*	*		*	*
Partridge, Painted	<i>Francolinus pictus</i>		*			*		*	
Partridge, Rufousthroated Hill	<i>Arborophila rufogularis</i>	*							
Partridge, Swamp	<i>Francolinus gularis</i>	*							
Pastor, Rosy	<i>Sturnus roseus</i>		*	*			*	*	*
Peafowl, Common	<i>Pavo cristatus</i>	*	*		*	*		*	*
Piculet, Speckled	<i>Picumnus innominatus</i>	*					*		
Pigeon, Ashy Wood	<i>Columba pulchricollis</i>	*							
Pigeon, Blue Rock	<i>Columba livia</i>	*	*	*		*		*	
Pigeon, (Yellowlegged) Green	<i>Treron phoenicoptera</i>	*	*		*			*	*
Pigeon, Green Imperial	<i>Ducula aenea</i>	*		*			*		*
Pigeon, Greyfronted Green	<i>Treron pompadora</i>						*		
Pigeon, Imperial	<i>Ducula badia</i>						*		
Pigeon, Nilgiri Wood	<i>Columba elphinstoni</i>						*		
Pigeon, Orangebreasted Green	<i>Treron bicincta</i>	*							
Pigeon, Pintailed Green	<i>Treron apicauda</i>	*							
Pigeon, Wedgetailed Green	<i>Treron sphenura</i>	*							
Pigeon, Wood	<i>Columba palumbus</i>						*		

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCHI	PERIYAR	RANTHAMBHORE	SIMILIPAL
Pintail	<i>Anas acuta</i>	*		*	*			*	
Pipit, Blyth's	<i>Anthus goldewskii</i>	*							
Pipit, Brown Rock	<i>Anthus similis</i>		*				*		
Pipit, Indian Tree	<i>Anthus hodgsoni</i>	*		*		*		*	*
Pipit, Nilgiri	<i>Anthus nilghiriensis</i>						*		
Pipit, Paddyfield	<i>Anthus novaeseelandiae</i>		*	*	*	*	*		*
Pipit, Tawny	<i>Anthus campestris</i>		*						
Pipit, (European) Tree	<i>Anthus trivialis</i>		*			*		*	
Pitta, Indian	<i>Pitta brachyura</i>		*	*		*	*	*	*
Plover, Great Stone	<i>Esacus magnirostris</i>		*	*				*	
Plover, Grey Or Blackbellied	<i>Pluvialis squatarola</i>	*							
Plover, Kentish	<i>Charadrius alexandrinus</i>							*	
Plover, Little Ringed	<i>Charadrius dubius</i>			*	*		*	*	
Plover, Ringed	<i>Charadrius hiaticula</i>		*						
Pochard, Common	<i>Aythya ferina</i>	*						*	
Pochard, Redcrested	<i>Netta rufina</i>							*	
Pochard, White-eyed	<i>Aythya nyroca</i>							*	
Pratincole, Collared	<i>Glareola pratincola</i>								*
Pratincole, Small Indian	<i>Glareola lactea</i>		*						
Quail, Blackbreasted	<i>Coturnix coromandelica</i>	*	*		*			*	
Quail, Bluebreasted	<i>Coturnix chinensis</i>						*		*
Quail, Button	<i>Turnix tanki</i>		*		*		*	*	*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHAMBHORE	SIMILIPAL
Quail, Common or Grey	<i>Coturnix coturnix</i>	*	*		*	*	*	*	
Quail, Jungle Bush	<i>Perdicula asiatica</i>		*	*	*	*	*	*	*
Quail, Painted Bush	<i>Perdicula erythrorhyncha</i>			*			*		*
Quail, Rock Bush	<i>Perdicula argoondah</i>		*					*	
Redshank, Common	<i>Tringa totanus</i>				*			*	
Redshank, Dusky	<i>Tringa erythropus</i>		*					*	
Redstart, Black	<i>Phoenicurus ochruros</i>		*	*		*		*	*
Redstart, Daurian	<i>Phoenicurus aureus</i>	*							
Redstart, Plumbeous	<i>Rhyacornis fuliginosus</i>	*							
Redstart, Whitecapped	<i>Chaimarrornis leucocephalus</i>	*							
Robin, Indian	<i>Saxicoloides fulicata</i>		*	*	*	*		*	*
Roller, European	<i>Coracias garrulus</i>		*					*	
Roller, Indian	<i>Coracias benghalensis</i>	*	*	*	*	*	*	*	*
Rosefinch, Common	<i>Carpodacus erythrinus</i>	*	*					*	*
Rubythroat, Himalayan	<i>Erithacus pectoralis</i>	*							
Ruff and Reeve	<i>Philomachus pugnax</i>		*					*	
Sandgrouse, Indian	<i>Pterocles exustus</i>		*		*				
Sandgrouse, Painted	<i>Pterocles indicus</i>		*		*	*		*	*
Sandpiper, Common	<i>Tringa hypoleucos</i>	*	*	*	*		*	*	
Sandpiper, Green	<i>Tringa ochropus</i>	*	*			*	*	*	
Sandpiper, Marsh	<i>Tringa stagnatilis</i>		*					*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHAMBHORE	SIMILIPAL
Sandpiper, Wood	<i>Tringa glareola</i>	*	*		*	*	*	*	
Shag, Indian	<i>Phalacrocorax fuscicollis</i>			*		*		*	
Shama	<i>Copsychus malabaricus</i>	*			*				*
Shelduck, Ruddy or Brahminy Duck	<i>Tadorna ferruginea</i>		*	*			*	*	
Shikra	<i>Accipiter badius</i>	*	*	*	*	*	*	*	*
Shoveller	<i>Anas clypeata</i>		*	*				*	
Shrike, Baybacked	<i>Lanius vittatus</i>		*	*	*			*	*
Shrike, Brown	<i>Lanius cristatus</i>			*		*	*		*
Shrike, Common Wood	<i>Tephrodornis pondicerianus</i>	*	*	*	*	*	*	*	*
Shrike, Grey	<i>Lanius excubitor</i>		*			*		*	*
Shrike, Large Wood	<i>Tephrodornis virgatus</i>			*					
Shrike, Redbacked	<i>Lanius collurio</i>		*						*
Shrike, Rufousbacked	<i>Lanius schach</i>		*	*	*	*	*	*	*
Sibia, Blackcapped	<i>Heterophasia capistrata</i>	*							
Sibia, Longtailed	<i>Heterophasia picaoides</i>	*							
Skylark	<i>Alauda arvensis</i>						*		
Skylark, Eastern or Small	<i>Alauda gulgula</i>	*		*	*		*		*
Snipe, Fantail or Common	<i>Gallinago gallinago</i>	*	*			*	*	*	
Snipe, Jack	<i>Gallinago minima</i>		*						
Snipe, Painted	<i>Rostratula benghalensis</i>	*	*			*	*	*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Snipe, Pintail	<i>Gallinago stenura</i>	*							
Snipe, Wood	<i>Gallinago nemoricola</i>	*							
Sparrow, House	<i>Passer domesticus</i>	*	*	*	*	*	*	*	*
Sparrow, Tree	<i>Passer montanus</i>	*							
Sparrow, Yellowthroated	<i>Petronia xanthocollis</i>		*	*	*	*		*	
Sparrow-hawk	<i>Accipiter nisus</i>		*	*				*	*
Sparrow-hawk, Besra	<i>Accipiter virgatus</i>	*	*				*		
Spiderhunter, Little	<i>Arachnothera longirostris</i>						*		*
Spiderhunter, Streaked	<i>Arachnothera magna</i>	*							
Spinetail, Whiterumped	<i>Chaetura sylvatica</i>			*					*
Spoonbill	<i>Platalca leucorodia</i>		*	*				*	
Spurfowl, Painted	<i>Galloperdix lunulata</i>							*	
Spurfowl, Red	<i>Galloperdix spadicea</i>			*	*	*	*	*	*
Starling	<i>Sturnus vulgaris</i>	*				*		*	
Stilt, Blackwinged	<i>Himantopus himantopus</i>		*	*	*	*		*	
Stint, Little	<i>Calidris minuta</i>			*	*				
Stint, Temminck's	<i>Calidris temminckii</i>		*					*	
Stork, Black	<i>Ciconia nigra</i>							*	
Stork, Blacknecked	<i>Ephippiorhynchus asiaticus</i>		*		*	*		*	
Stork, Openbill	<i>Anastomus oscitans</i>		*	*				*	
Stork, Painted	<i>Mycteria leucocephala</i>		*	*				*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Stork, White	<i>Ciconia ciconia</i>				*			*	
Stork, Whitenecked	<i>Ciconia episcopus</i>	*	*	*	*	*	*	*	*
Sunbird, Blackbreasted	<i>Aethopyga saturata</i>	*							
Sunbird, Loten's	<i>Nectarinia lotenia</i>						*		
Sunbird, Mrs Gould's	<i>Aethopyga gouldiae</i>	*							
Sunbird, Purple	<i>Nectarinia asiatica</i>	*	*	*	*	*	*	*	*
Sunbird, Purplerumped	<i>Nectarinia zeylonica</i>			*	*		*		*
Sunbird, Small	<i>Nectarinia minima</i>						*		
Sunbird, Yellowbacked	<i>Aethopyga siparaja</i>	*							
Swallow	<i>Hirundo rustica</i>	*	*	*	*	*	*		
Swallow, House	<i>Hirundo tahitica</i>						*	*	
Swallow, Indian Cliff	<i>Hirundo fluvicola</i>		*					*	
Swallow, Redrumped or Striated	<i>Hirundo daurica</i>	*	*	*	*	*	*	*	
Swallow, Wiretailed	<i>Hirundo smithii</i>		*	*	*	*		*	
Swallow-shrike, Ashy	<i>Artamus fuscus</i>	*		*	*		*		*
Swift, Alpine	<i>Apus melba</i>		*				*		*
Swift, Crested	<i>Hemiprocne longipennis</i>		*	*	*		*		
Swift, House	<i>Apus affinis</i>	*	*	*	*		*	*	
Swift, Large Brownthroated Spinetail	<i>Chaetura gigantea</i>			*			*		
Swift, Large Whiterumped	<i>Apus pacificus</i>						*	*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Swift, Palm	<i>Cypsiurus parvus</i>	*	*		*		*	*	*
Swiftlet, Indian Edible-nest	<i>Collocalia unicolor</i>						*		
Tailorbird	<i>Orthotomus sutorius</i>	*	*	*	*	*	*	*	*
Teal, Common	<i>Anas crecca</i>	*		*	*	*	*	*	
Teal, Cotton	<i>Nettapus coromandelianus</i>	*		*				*	*
Teal, Falcated	<i>Anas falcata</i>							*	
Teal, Lesser Whistling	<i>Dendrocygna javanica</i>	*	*			*		*	*
Tern, Blackbellied	<i>Sterna acuticauda</i>							*	
Tern, Gullbilled	<i>Gelochelidon nilotica</i>							*	
Tern, Indian River	<i>Sterna aurantia</i>	*	*	*	*	*	*	*	*
Tern, Whiskered	<i>Chlidonias hybrida</i>		*		*			*	
Thrush, Blue Rock	<i>Monticola solitarius</i>	*	*	*		*	*	*	*
Thrush, Blue or Himalayan Whistling	<i>Myiophonus caeruleus</i>	*							
Thrush, Blueheaded Rock	<i>Monticola cinclorhynchus</i>		*				*		
Thrush, Crimsonwinged Laughing	<i>Garrulax phoeniceus</i>	*							
Thrush, Golden Mountain	<i>Zoothera dauma</i>	*							*
Thrush, Large Brown	<i>Zoothera monticola</i>	*							
Thrush, Malabar Whistling	<i>Myiophonus horsfieldii</i>			*			*		*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHAMBHORE	SIMILIPAL
Thrush, Necklaced Laughing	<i>Garrulax moniligerus</i>	*							
Thrush, Orangeheaded Ground	<i>Zoothera citrina</i>			*		*		*	
Thrush, Pied Ground	<i>Zoothera wardii</i>								*
Thrush, Redthroated or Blackthroated	<i>Turdus ruficollis</i>	*						*	
Thrush, Rufousnecked Laughing	<i>Garrulax ruficollis</i>	*							
Thrush, Tickell's	<i>Turdus unicolor</i>								*
Thrush, Variegated Laughing	<i>Garrulax variegatus</i>						*		
Thrush, Whitecrested Laughing	<i>Garrulax leucolophus</i>	*							
Thrush, Wynaad Laughing	<i>Garrulax deleserti</i>						*		
Tit, Firecapped	<i>Cephalopyrus flammiceps</i>					*		*	
Tit, Greenbacked	<i>Parus monticolus</i>	*							
Tit, Grey	<i>Parus major</i>	*	*	*	*	*	*	*	*
Tit, Sultan	<i>Melanochlora sultanea</i>	*							
Tit, Yellowchecked	<i>Parus xanthogenys</i>			*		*	*	*	*
Tree Pie, Himalayan	<i>Dendrocitta forinosae</i>	*							
Tree Pie, Indian	<i>Dendrocitta vagabunda</i>		*	*	*	*	*	*	*
Tree Pie, Southern	<i>Dendrocitta leucogastra</i>			*			*		
Trogon, Malabar	<i>Harpactes fasciatus</i>						*		*

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Vulture, Black or Cinereous	<i>Aegypius monachus</i>						*		
Vulture, Egyptian or Scavenger	<i>Neophron percnopterus</i>		*		*	*		*	
Vulture, Griffon	<i>Gyps fulvus</i>		*					*	
Vulture, Indian Black or King	<i>Sarcogyps calvus</i>		*		*	*		*	*
Vulture, Indian Longbilled	<i>Gyps indicus</i>	*	*			*		*	*
Vulture, Indian Whitebacked	<i>Gyps bengalensis</i>	*	*		*	*		*	*
Wagtail, Forest	<i>Motacilla indica</i>		*				*		*
Wagtail, Grey	<i>Motacilla cinerea</i>	*	*		*	*	*	*	*
Wagtail, Large Pied	<i>Motacilla maderaspatensis</i>		*		*	*	*	*	*
Wagtail, White	<i>Motacilla alba</i>		*		*	*		*	
Wagtail, Yellow	<i>Motacilla flava</i>	*	*		*		*	*	*
Wagtail, Yellowheaded	<i>Motacilla citreola</i>		*		*	*		*	*
Warbler, Blackbrowed Leaf	<i>Phylloscopus cantator</i>	*							
Warbler, Blyth's Reed	<i>Acrocephalus dumetorum</i>		*				*	*	
Warbler, Booted	<i>Hippolais caligata</i>		*						
Warbler, Brown Leaf	<i>Phylloscopus collybita</i>	*	*			*		*	
Warbler, Chestnut-headed Ground	<i>Tesia castaneocoronata</i>	*							

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Warbler, Dull Green Leaf	<i>Phylloscopus trochiloides</i>	*	*			*		*	*
Warbler, Dusky Leaf	<i>Phylloscopus fuscatus</i>							*	
Warbler, Eastern Great Reed	<i>Acrocephalus orientalis</i>						*		
Warbler, Grasshopper	<i>Locustella naevia</i>		*						
Warbler, Indian Great Reed	<i>Acrocephalus stentoreus</i>		*						
Warbler, Largebilled Reed	<i>Acrocephalus (stentoreus) orinus</i>							*	
Warbler, Large Crowned Leaf	<i>Phylloscopus occipitalis</i>		*			*	*		*
Warbler, Largebilled Leaf	<i>Phylloscopus magnirostris</i>						*		*
Warbler, Moustached Sedge	<i>Acrocephalus melanopogon</i>		*						
Warbler, Olivaceous Leaf	<i>Phylloscopus griseolus</i>		*					*	
Warbler, Orphean	<i>Sylvia hortensis</i>		*						*
Warbler, Paddyfield	<i>Acrocephalus agricola</i>		*						
Warbler, Palefooted Bush	<i>Cettia pallidipes</i>								*
Warbler, Plain Leaf	<i>Phylloscopus neglectus</i>							*	
Warbler, Smoky Willow	<i>Phylloscopus fulgiventis</i>	*						*	
Warbler, Spotted Bush	<i>Bradypterus thoracicus</i>	*							*
Warbler, Streaked Fantail	<i>Cisticola juncidis</i>		*		*			*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHIAMBIIORE	SIMILIPAL
Warbler, Thickbilled	<i>Acercephalus aedon</i>								*
Warbler, Tickell's	<i>Phylloscopus affinis</i>		*				*	*	
Warbler, Yellowbrowed Leaf	<i>Phylloscopus inornatus</i>							*	
Waterhen, Whitebreasted	<i>Amaurornis phoenicurus</i>	*	*		*		*	*	*
Waxwing	<i>Bombycilla garrulus</i>				*				
Weaver Bird, Blackthroated	<i>Ploceus benghalensis</i>				*			*	*
Weaver Bird, Streaked	<i>Ploceus manyar</i>							*	
Wheatcar, Desert	<i>Oenanthe deserti</i>		*						
White-eye	<i>Zosterops palpebrosa</i>		*		*	*	*	*	*
Whitethroat	<i>Sylvia communis</i>		*						
Whitethroat, Lesser	<i>Sylvia curruca</i>		*					*	*
Wigeon	<i>Anas penelope</i>					*		*	
Woodcock	<i>Scolopax rusticola</i>	*							
Woodpecker, Blackbacked	<i>Chrysocolaptes festivus</i>							*	
Woodpecker, Blacknaped Green	<i>Picus canus</i>	*							
Woodpecker, Heartspotted	<i>Hemicircus canente</i>						*		*
Woodpecker, Himalayan Goldenbacked Threetoed	<i>Dinopium shorii</i>	*							

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Woodpecker, Indian Goldenbacked Threetoed	<i>Dinopium javanense</i>						*		
Woodpecker, Indian Great Black	<i>Dryocopus javensis</i>						*		
Woodpecker, Large Yellownaped	<i>Picus flavinucha</i>	*							*
Woodpecker, Larger Goldenbacked	<i>Chrysocolaptes lucidus</i>					*			*
Woodpecker, Lesser Goldenbacked	<i>Dinopium benghalense</i>		*		*	*		*	*
Woodpecker, Little Scalybellied Green	<i>Picus myrmecophoneus</i>								*
Woodpecker, Pigmy	<i>Picoides nanus</i>		*		*		*	*	*
Woodpecker, Rufous	<i>Micropternus brachyurus</i>	*			*		*		*
Woodpecker, Scalybellied Green	<i>Picus squamatus</i>						*		
Woodpecker, Small Yellownaped	<i>Picus chlorolophus</i>						*		*
Woodpecker, Yellowfronted Pied	<i>Picoides maharattensis</i>		*		*		*	*	*
Wren-babbler, Brown	<i>Pnoepyga pusilla</i>	*							
Wren-warbler, Ashy	<i>Prinia socialis</i>	*	*		*	*		*	
Wren-warbler, Franklin's	<i>Prinia hodgsonii</i>		*			*		*	*
Wren-warbler, Jungle	<i>Prinia sylvatica</i>	*	*			*			*
Wren-warbler, Plain	<i>Prinia subflava</i>		*		*	*		*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Wren-warbler, Rufousfronted	<i>Prinia buchanani</i>		*			*		*	
Wren-warbler, Yellowbellied	<i>Prinia flaviventris</i>	*							
Wryneck	<i>Jynx torquilla</i>							*	
Yuhina, Yellownaped	<i>Yuhina flavicollis</i>	*							

LIST OF MAMMALS FOUND IN THE EIGHT PROTECTED AREAS

COMMON NAME	SCIENTIFIC NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBORE	SIMILIPAL
Antelope, Fourhorned or Chowsingha	Tetracerus quadricornis		*	*	*	*			*
Badger, Honey or Ratel	Mellivora capensis		*		*			*	*
Bat, Common Yellow	Scotophilus heathi							*	
Bat, Fulvous Fruit	Rousettus leschenaulti	*			*				
Bat, Great Himalayan Leafnosed	Hipposideros armiger	*							
Bat, Painted	Kerivoula picta	*							
Bat, Short-nosed Fruit	Cynopterus sphinx				*		*		
Bat, Tickell's	Hesperoptenus tickelli	*							
Bear, Himalayan Black	Selenarctos thibetanus	*							
Bear, Sloth	Melursus ursinus	*		*	*	*		*	*
Bison, Indian or Gaur	Bos gaurus	*		*	*	*	*		*
Boar, Indian Wild	Sus scrofa	*	*	*	*	*	*	*	*
Bull, Blue or Nilgai	Boselaphus tragocamelus		*		*	*		*	
Caracal	Felis caracal							*	
Cat, Desert	Felis libyca		*					*	
Cat, Fishing	Felis viverrina	*					*	*	*
Cat, Jungle	Felis chaus	*	*	*	*	*	*	*	*
Chevrotain, Indian or Mouse-deer	Tragulids meminna			*	*	*	*		*
Civet, Brown Palm	Paradoxurus jerdoni						*		

COMMON NAME	SCIENTIFIC NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBORE	SIMILIPAL
Civet, Common Palm or Toddy Cat	<i>Paradoxurus hermaphroditus</i>			*	*		*	*	*
Civet, Large Indian	<i>Viverra zibetha</i>	*				*			
Civet, Small Indian	<i>Viverricula indica</i>	*	*	*	*	*	*		*
Deer, Barking or Muntjac	<i>Muntiacus muntjak</i>	*		*	*	*	*		*
Deer, Spotted or Chital	<i>Axis axis</i>	*	*		*	*		*	*
Dog, Indian Wild or Dhole	<i>Cuon alpinus</i>			*	*	*	*	*	*
Elephant, Indian	<i>Elephas maximus</i>	*		*	*		*		*
Ferret-badger, Burmese	<i>Melogale personata</i>	*							
Fox, Flying	<i>Pteropus giganteus</i>	*		*	*	*	*		*
Fox, Indian	<i>Vulpes bengalensis</i>	*	*		*	*	*	*	*
Gazelle, Indian or Chinkara	<i>Gazella gazella</i>		*					*	
Gerbill, Indian	<i>Tatera indica</i>				*		*	*	
Hare, Indian	<i>Lepus nigricollis</i>	*	*	*	*	*	*	*	*
Hog-badger	<i>Arctonyx collaris</i>	*							
Hyena, Striped	<i>Hyaena hyaena</i>		*	*	*	*		*	*
Jackal	<i>Canis aureus</i>	*	*	*	*			*	*
Langur, Common, or Hanuman Monkey	<i>Presbytis entellus</i>		*	*	*	*		*	*
Langur, Nilgiri	<i>Presbytis johni</i>						*		
Leopard, Clouded	<i>Neofelis nebulosa</i>								*

COMMON NAME	SCIENTIFIC NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHAMBORE	SIMILIPAL
Leopard, or Panther	<i>Panthera pardus</i>	*	*	*	*	*	*	*	*
Leopard-cat	<i>Felis bengalensis</i>		*	*		*	*	*	*
Lion	<i>Panthera leo</i>		*						
Loris, Slender	<i>Loris tardigradus</i>			*			*		
Macaque, Bonnet	<i>Macaca radiata</i>			*			*		
Macaque, Lion tailed	<i>Macaca silenus</i>						*		
Macaque, Rhesus	<i>Macaca mulatta</i>	*	*		*	*			*
Marten, Himalayan Yellowthroated	<i>Martes flavigula</i>	*							
Mole, Eastern	<i>Talpa micrura</i>	*							
Mole-rat, Indian	<i>Bandicota bengalensis</i>					*	*	*	*
Mongoose, Common	<i>Herpestes edwardsi</i>	*	*	*	*	*	*		*
Mongoose, Crab-eating	<i>Herpestes urva</i>	*						*	
Mongoose, Ruddy	<i>Herpestes smithi</i>					*	*		
Mongoose, Small Indian	<i>Herpestes auro-punctatus</i>	*			*				*
Mongoose, Striped-necked	<i>Herpestes vitticollis</i>			*			*		*
Mongoose, Brown	<i>Herpestes fuscus</i>			*					
Mouse, House	<i>Mus musculus</i>	*					*	*	
Mouse, Indian Field	<i>Mus booduga</i>	*			*	*	*		*
Mouse, Long-tailed Tree	<i>Vandeleuria oleracea</i>	*			*	*			
Mouse, Spiny Field	<i>Mus platythrix</i>						*		

COMMON NAME	SCIENTIFIC NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBORE	SIMILIPAL
Otter, Clawless	<i>Aonyx cinerea</i>	*							
Otter, Common	<i>Lutra lutra</i>	*		*			*		
Otter, Smooth Indian	<i>Lutra perspicillata</i>	*					*		*
Pangolin, Indian	<i>Manis crassicaudata</i>		*	*	*	*	*		*
Pipistrelle, Indian	<i>Pipistrellus coromandra</i>	*				*	*		*
Porcupine, Hodgson's	<i>Hystrix hodgsoni</i>	*							
Porcupine, Indian	<i>Hystrix indica</i>		*	*	*	*	*	*	*
Rat, Bandicoot	<i>Bandicota indica</i>				*		*		
Rat, Bay Bamboo	<i>Cannoxnys badius</i>	*							
Rat, Common House	<i>Rattus rattus</i>	*				*	*	*	
Rat, Indian Bush	<i>Golunda ellioti</i>	*			*	*			
Rat, Whitetailed Wood	<i>Rattus blanfordi</i>					*			
Sambar	<i>Cervus unicolor</i>	*	*	*	*	*	*	*	*
Shrew, Grey Musk or House Shrew	<i>Suncus murinus</i>	*		*	*	*	*		
Shrew, Indian Tree	<i>Anathana ellioti</i>						*		*
Shrew, Malay Tree	<i>Tupaia glis</i>	*							
Shrew, Pigmy or Etruscan	<i>Suncus etruscus</i>	*							
Squirrel, Common Giant Flying	<i>Petaurista petaurista</i>			*		*	*		*
Squirrel, Dusky Striped	<i>Funambulus sublineatus</i>						*		

COMMON NAME	SCIENTIFIC NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMHORE	SIMILIPAL
Squirrel, Fivestriped Palm	<i>Funambulus pennanti</i>	*				*		*	
Squirrel, Grizzled Giant	<i>Ratufa macroura</i>								*
Squirrel, Indian Giant	<i>Ratufa indica</i>			*	*				*
Squirrel, Malayan Giant	<i>Ratufa bicolor</i>	*					*		
Squirrel, Orangebellied Himalayan	<i>Dremomys lokriah</i>	*							
Squirrel, Particoloured Flying	<i>Hylobates alboniger</i>	*							
Squirrel, Small Travancore Flying	<i>Ptilinopus fuscicapillus</i>						*		
Squirrel, Threestriped Palm	<i>Funambulus palmarum</i>			*	*	*	*		*
Tahr, Nilgiri	<i>Hemitragus hylocrius</i>						*		
Tiger	<i>Panthera tigris</i>	*		*	*	*	*	*	*
Vampire, Indian False	<i>Megaderma lyra</i>	*					*	*	
Wolf	<i>Canis lupus</i>				*	*			*

LIST OF REPTILES FOUND IN THE EIGHT PROTECTED AREAS

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANITHAMBHORE	SIMILIPAL
Boa, Red Sand	Eryx johnei		*		*	*			
Boa, Russell's Earth	Eryx Conicus								*
Bronzeback, Painted	Ahaetulla ahaetulla	*							
Calotes, Forest	Calotes rouxi						*		*
Calotes, Southern Green	Calotes calotes						*		
Chameleon	Chameleon zeylanicus		*		*	*		*	*
Cobra, Indian	Naja, naja	*	*		*	*	*		*
Cobra, King	Ophiophagus hannah	*			*		*		
Crocodile, Marsh	Crocodilus pallustris		*	*		*		*	*
Dhman, Ringtailed	Elaphe cantoris	*							
Dragon, Hying							*		
Gamma, Eastern	Boiga gokool	*							
Gecko, Banded	Cyrodactylus Kacchensis		*						*
Gecko, Bark	Hemidactylus ieschenaulti								*
Gecko, Brook's	Hemidactylus brooki	*							
Gecko, Northern House	Hemidactylus aviviridis		*		*		*		*
Keelback green	Nacripisthodon plumbicolor			*					*
Keelback, Buffstriped	Amphiesma, stolata	*	*						

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCHI	PERIYAR	RANTHAMBHORE	SIMILIPAL
Keelback, Checkered	<i>Xenochrophis piscator</i>	*	*			*	*		*
Keelback, Striped	<i>Amphlesma stolata</i>								*
Krait, Banded	<i>Bungarus fasciatus</i>	*			*			*	*
Krait, Black	<i>Bungarus niget</i>	*							
Krait, Common	<i>Bungarus caeruleus</i>	*	*		*	*	*	*	*
Krait, Lesser Black	<i>Bungarus lividus</i>	*							
Lizard, Common Monitor	<i>Varanus bengalensis</i>	*	*		*	*	*		*
Lizard, Desert Monitor	<i>Varanus griseus</i>							*	
Lizard, Fantthroated	<i>Sitana ponticeriana</i>		*						
Lizard, Garden	<i>Calotes versicolor</i>	*	*			*	*		*
Lizard, Rock	<i>Agama hibernulatus</i>				*				
Python, Indian Rock	<i>Python molurus</i>	*	*	*	*	*	*	*	*
Shieldtail, Ocellate	<i>Uropeltis ocellatus</i>						*		
Skink, Common	<i>Mabuya carinata</i>	*	*			*	*		*
Skink, Snake	<i>Riopa punctata</i>		*	*					*
Snake, Whip	<i>Ahaetulla nasutus</i>						*		
Snake, Collared Dwarf	<i>Sibynophis collaris</i>	*							
Snake, Common Vine	<i>Anaetulla nasutus</i>			*					*
Snake, Common Wolf	<i>Lycodon aulicus</i>	*	*	*			*		
Snake, Common Worm	<i>Typhlops braminia</i>	*					*		

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCH	PERIYAR	RANTHAMBHORE	SIMILIPAL
Snake, Diard's Worm	<i>Typhlops diardi</i>	*							
Snake, Golden Tree	<i>Chrysopelea oinata</i>						*		
Snake, Grey Cat	<i>Boiga ochracea</i>	*							
Snake, Hooded Tree	<i>Pseudoxenodon macrops</i>	*							
Snake, Indian Bronzebacked Tree	<i>Dendrelaphis tristis</i>	*	*						*
Snake, Jerdon's Blind	<i>Typhlops jerdoni</i>	*							
Snake, Malayan Whip	<i>Dryophis prasinus</i>	*							
Snake, Rat	<i>Pytas mucosus</i>	*	*	*	*	*	*	*	*
Snake, Schneider's Water	<i>Enhydryis enhydryis</i>	*							
Snake, Striped Kukri	<i>Oligodon cyclurus</i>	*							
Snake, Trinket	<i>Elaphe helena</i>	*	*						
Snake, Twinspotted Wolf	<i>Lycodon jara</i>	*							
Snake, Worm	<i>Typhlina bramina</i>						*		*
Terrapin, Indian Pond	<i>Melanocheilus trijuga</i>					*	*		*
Tortoise, Starred	<i>Geochelone elegans</i>		*				*		
Tuclo	<i>Gecko gecko</i>	*							
Turtle, Flapshell	<i>Lissemys punctata</i>		*			*			*
Turtle, South Indian Roofed	<i>Kachuga tentoria</i>								*
Turtle, softshell	<i>Trionyx gangeticus</i>							*	

COMMON NAME	LATIN NAME	BUXA	GIR	NAGARAHOLE	PALAMAU	PENCII	PERIYAR	RANTHIAMBHORE	SIMILIPAL
Viper, Green Pit	<i>Trimeresurus gramineus</i>	*		*			*		
Viper, Mock	<i>Psammodynastes pulverulentus</i>	*							
Viper, Russell's	<i>Vipera russellii</i>	*	*	*	*	*	*	*	
Viper, Saw-scaled	<i>Echis carinata</i>		*				*	*	

F. FLORA LISTS

List of Plants for Buxa Tiger Reserve

I. TREES

<i>Acacia catechu</i>	<i>Lagerstroemia speciosa</i>
<i>Acrocarpus fraxinifolius</i>	<i>Lannea coromandelica</i>
<i>Actinodaphne obovata</i>	<i>Litsaea monopetala</i>
<i>Adenanthera pavonica</i>	<i>Lophopetalum fimbriatum</i>
<i>Adina cordifolia</i>	<i>Macaranga denticulata</i>
<i>Aesculus punduana</i>	<i>Machilus villosa</i>
<i>Ailanthus grandis</i>	<i>Mallotus philippensis</i>
<i>Alangium begoniaefolium</i>	<i>Mangifera indica</i>
<i>Albizzia gamblei</i>	<i>Melia azadirach</i>
<i>Albizzia lucida</i>	<i>Meliosma simplicifolia</i>
<i>Albizzia marginata</i>	<i>Michelia champaca</i>
<i>Albizzia odoratissima</i>	<i>Morus indica</i>
<i>Albizzia procera</i>	<i>Morus laevigata</i>
<i>Alstonia scholaris</i>	<i>Myristica longifolia</i>
<i>Amoora rohituka</i>	<i>Neonauclea griffithii</i>
<i>Amoora wallichii</i>	<i>Olea dioica</i>
<i>Anthocephalus cadamba</i>	<i>Oroxylum indicum</i>
<i>Aporosa diocia</i>	<i>Pandanus fascicularis</i>
<i>Artocarpus chaplasha</i>	<i>Perasma nepalensis</i>
<i>Artocarpus heterophyllus</i>	<i>Permna bengalensis</i>
<i>Artocarpus lackoocha</i>	<i>Phoebe attenuata</i>
<i>Baccauria sapida</i>	<i>Phoebe lanceolata</i>
<i>Bauhinia malabarica</i>	<i>Polyalthia simiarum</i>
<i>Bauhinia purpurea</i>	<i>Pongamia pinnata</i>
<i>Bauhinia variegata</i>	<i>Popartia axillaris</i>
<i>Beilschmiedia roxburghiana</i>	<i>Premna mucronata</i>
<i>Bischofla javanica</i>	<i>Pterospermum acerifolium</i>
<i>Bridelia retusa</i>	<i>Pygeum acuminatum</i>
<i>Butea monosperma</i>	<i>Salix tetrasperma</i>
<i>Callicarpa arborea</i>	<i>Salmalia malabarica</i>
<i>Canarium sikkimense</i>	<i>Samanea saman</i>
<i>Careya arborea</i>	<i>Sapindus detergens</i>
<i>Casearia graveolens</i>	<i>Sapium insigne</i>
<i>Cassia fistula</i>	<i>Schima wallichii</i>
<i>Cassia siamea</i>	<i>Semecarpus anacardium</i>
<i>Castanopsis hystrix</i>	<i>Shorea robusta</i>
<i>Castanopsis indica</i>	<i>Spondias magnifera</i>
<i>Castanopsis tribuloides</i>	<i>Sterculia villosa</i>
<i>Cedrela toona</i>	<i>Stereospermum chelonoides</i>
<i>Celtis tetrandra</i>	<i>Streblus asper</i>
<i>Cephalanthus occidentalis</i>	<i>Symplocos laurina</i>
<i>Chukrasia tabularis</i>	<i>Syzigium cumini</i>
<i>Cinnamomum occidodaphne</i>	<i>Syzigium operculatum</i>
<i>Cinnamomum temala</i>	<i>Saurania roxburghii</i>
<i>Cinnemomum caudatum</i>	<i>Rauvolfia serpentina</i>
<i>Cleidion javanicum</i>	<i>Urena lobata</i>
<i>Cordia obliqua</i>	<i>Viburnum colebrookianum</i>
<i>Crataeva unilocularis</i>	
<i>Cryptomaria amygdalina</i>	
<i>Lagerstroemia parviflora</i>	

II. CLIMBERS

Acacia caesia
Acacia pennata
Bahinia vahli
Bauhinia anguina
Bridelia stipularis
Butea parviflora
Cissus adnata
Cissus elongata
Cissus repanda
Clematis gouriana
Combretum decandrum
Cryptotepis buehanani
Cryptolepis elegans
Dalbergia stipulata
Entada phaseoloides
Flacourtia indica
Holmskioldia sanguinea
Ichnocarpus frutescens
Mezoneurum cucullatum
Mikania scandens
Milletia auriculata
Milletia pachycarpa
Mimosa himalayana
Mucuna imbricata
Mucuna monosperma
Mucuna pruriens
Naravelia zeylanica
Paedaria foetida
Piper longum
Scindapsus officinalis
Smilax macrophylla
Tinospora cordifolia
Uncaria pilosa

III. GRASSES

Apluda mutica
Apocopsis paleacea
Arundinella decempedalis
Arundo donax
Carex indica
Centotheca lappacea
Chrysopogon oculatus
Cynodon dactylon
Cyperus difformis
Cyperus rotundus
Cyperus tegetum
Digitaria sanguinalis
Echinochloa crusgalli
Eragrostis diarrhena
Eulaia leschenanltiana
Fimbristylis acuminata
Fimbristylis disticha

Imperata cylindrica
Leptochloa panicea
Microstegium ciliatum
Narenga porphyrocoma
Ophiurus exaltatus
Paspalidium punctatum
Pectotis indica
Phragmites karka
Polvtoca digitata
Pycnus sulcinus
Saccharum orundinaecum
Saccharum bengalense
Saccharum ravennao
Saccharum spontaneum
Sacciolepis myosuroides
Setaria verticillata
Themeda arundinacea
Thysia gea
Thysanolaena maxima

IV. BAMBOOS

Bambusa nutans
Bambusa polymorpha
Bambusa tulda
Dendrocalamus hamiltonii

V. CANES

Calamus acanthospathus
Calamus flagellu Grif
Calamus guruba
Calamus leptospadix
Calamus leptospadix
Calamus tenuis
Daemonorops jenkinsianus

List of Plants for Gir National Park

Acacia catechu
Acacia leucophloea
Acacia nilotica
Acacia senegal
Adina cordifolia
Aegle marmelos
Anogeissus latifolia
Azadirachta indica
Bauhinia racemosa
Bombax ceiba
Butea monosperma
Carissa opaca
Cassia fistula
Cassia tora
Chrysopogon fulvus
Cocos nucifera
Dalbergia sisoo
Dendrocalamus strictus
Dichanthium annulatum
Diospyros melanoxylon
Emblica officinalis
Helicteres isora
Lantana camara
Morinda tomentosa
Neuracanthus sphaerostachys
Pongamia pinnata
Sehima sulcatum
Soymida febrifuga
Sterculia urens
Syzygium cumini
Tectona grandis
Terminalia bellirica
Terminalia crenulata
Wrightia tinctoria
Xeromphis spp.
Zizyphus mauritiana
Zizyphus spp.

List of Flora for Nagarahole National Park

Trees [mp, mp2, Q1]

Ailanthus triphysa
Albizia odoratissima
Albizia spp.
Anacardium occidentale
Anogeissus latifolia
Artocarpus heterophyllus
Artocarpus spp.
Bauhinia racemosa
Bombax ceiba
Bridelia crenulata
Bridelia spp.
Buchanania lanzan
Butea monosperma
Careya arborea
Cassia fistula
Chloroxylon swietenia
Chukrasia velutina
Cordia spp.
Dalbergia latifolia
Dalbergia paniculata
Derris indica
Dillenia pentagyna
Dillenia spp.
Diospyros melanoxylon
Dipterocarpus indicus
Embllica officinalis
Eucalyptus spp.
Ficus spp.
Ficus virens
Gardenia spp.
Garuga spp.
Gmelina arborea
Grewia tiliifolia
Haldina cordifolia
Holigarna spp.
Hopea parviflora
Kydia calycina
Lagerstroemia microcarpa
Lannea coromandelica
Machilus spp.
Mangifera indica
Meyna laxiflora
Naringi crenulata
Ougeinia oojeinensis
Pterocarpus marsupium
Pterocarpus spp.
Radermachera xylocarpa
Santalum album
Sapindus spp.
Schleichera oleosa
Semecarpus anacardium

Shorea roxburghii
Stereospermum personatum
Strychnos nux-vomica
Syzygium cumini
Syzygium spp.
Tamarindus indica
Tectona grandis
Terminalia alata
Terminalia bellirica
Terminalia chebula
Terminalia paniculata
Wrightia tinctoria
Xeromphis spinosa
Xeromphis uliginosa
Ziziphus mauritiana
Ziziphus spp.
Ziziphus xylopyrus

Other Plants [mp, mp2, Q1]

Acacia caesia
Acacia sinuata
Asparagus racemosus
Bambusa arundinacea
Bridelia spp.
Calycopteris floribunda
Chromolaena odorata
Clematis spp.
Coffea spp.
Cordia dichotoma
Curcuma spp.
Cymbopogon citratus
Cymbopogon flexuosus
Dendrocalamus strictus
Desmodium spp.
Eleusine coracanaica
Entada phascoloides
Globba spp.
Grewia hirsuta
Helicteres isora
Hemidesmus indicus
Heteropogon contortus
Holarrhena antidysenter
Imperata cylindrica
Jasminum spp.
Lantana camara
Lantana spp.

Nicotiana tabacum
Oryza sativa
Phoenix humilis
Smilax spp.
Sorghum bicolor
Spatholobus parviflorus
Themeda cymbaria
Themeda spp.
Themeda triandra
Ventilago spp.
Vernonia spp.
Vitis spp.
Xeromphis uliginosa
Zea mays
Zingiber spp

List of Flora for Palamau Tiger Reserve

TREES

Acacia catechu
Acacia lenticularis
Aegle marmelos
Alangium salvifolium
Albizia lebbek
Albizia procera
Alstonia scholaris
Anogeissus latifolia
Anthocephalus chinensis
Bauhinia malabarica
Bauhinia racemosa
Bauhinia roxburghiana
Bauhinia variegata
Bombax ceiba
Boswellia serrata
Bridelia retusa
Bridelia squamosa
Buchanania lanzan
Bursera serrata
Butea monosperma
Callicappa arborea
Canthium didymum
Casuarina graveolens
Cassia fistula
Chloroxylon swietenia
Cleistanthus collinus
Cochlospermum religiosum
Cordia dichotoma
Dalbergia latifolia
Dalbergia paniculata
Dillenia pentagyna
Diospyros melanoxylon
Diospyros montana
Ehretia laevis
Emblica officinalis
Erithrina suberosa
Eugenia caryophyllifolia
Ficus arnotiana
Ficus tomentosa
Flacourtia indica
Gardenia gummifera
Gardenia latifolia
Gardenia pentagyna
Garuga pinnata
Gmelina arborea
Grewia tilaefolia
Holoptelia integrifolia
Hymenodictyon excelsum
Kydia calycina
Lagerstroemia parviflora
Lannea coromandelica

Madhuca indica
Madhuca latifolia
Mallotus philippensis
Mitragyna parvifolia
Morinda pubescens
Nyctanthes arborescens
Ougenia obovata
Pterocarpus marsupium
Saccolobium tomentosum
Salix tetrasperma
Schleichera oleosa
Semecarpus anacardium
Shorea robusta
Soyumba febrifuga
Sterculia urens
Stereospermum chelonoides
Symplocos racemosa
Syzygium hainanense
Terminalia alata
Terminalia arjuna
Terminalia bellirica
Terminalia chebula
Vitex peduncularis
Ziziphus xylopyrus

SHRUBS, HERBS & OTHERS

Antidesma acidum
Blumea alata
Blumea fistulosa
Blumeopsis flava
Carissa spinarum
Chorophytum laxum
Combretum nanum
Conyza aegyptica
Conyza leucantha
Crotolaria hirta
Curcuma angustifolia
Cynoglossum glochidiatum
Dicliptera bucuroides
Elephantopus scaber
Eulophia dalia
Euphorbia nivulia
Flemingia chappera
Flemingia paniculata
Gardenia turgida
Grewia hirsuta
Helicteris isora

Hemigraphis latebrosa
Holarrhena antidysenterica
Indigofera hamiltoni
Justica japonica
Justica simplex
Lantana camara
Lobelia zeylanica
Myrraya paniculata
Ochna obtusata
Pavetta crassicaulis
Pentanema indicum
Petalidium brlerioides
Phoenix acaulis
Pimpinella wallichiana
Piper longum
Randia dumetorum
Ruellia suffruticosa
Rungia parviflora
Sophora bakeri
Strobilanthus auriculatus
Symphorema polyandrum
Tamarix dioca
Vernonia aspera
Vicoa indica
Wendlandia tinctoria
Woodfordia fruticosa

CLIMBERS

Acacia canescens
Acacia torta
Asparagus racemosus
Bauhinia vahli
Butea superba
Clematis gauriana
Combretum decandrum
Erycibe paniculata
Gloriosa superba
Milletia extensa
Olax scandens
Smilax prolifera
Ventilago madraspatana

GRASSES

Andropogon sp.
Apluda varia
Arundinella setosa
Chrysopogon lanceolatus
Cymbopogon martini
Cyperus nivens
Elaliopsis binata
Eulalia argentea
Fimbristylis sp.
Heteropogon contortus
Imperata cylindrica
Oplismenus compositus
Panicum sp.
Saccharum spontaneum
Themeda arundinacea
Themeda caudata
Themeda quadrivalvis
Thysanolaena maxima

List of Plants for Pench Tiger Reserve

TREES

<i>Acacia catechu</i>	<i>Ficus benghalensis</i>
<i>Acacia leucophloea</i>	<i>Ficus cunia</i>
<i>Acacia nilotica</i>	<i>Ficus glomerata</i>
<i>Adina cordifolia</i>	<i>Ficus hispida</i>
<i>Aegle marmelos</i>	<i>Ficus lacor</i>
<i>Ailanthus excelsa</i>	<i>Ficus microcarpa</i>
<i>Alangium salvifolium</i>	<i>Ficus religiosa</i>
<i>Albizia lebbek</i>	<i>Flacourtia indica</i>
<i>Albizia odoratissima</i>	<i>Gardenia gummifera</i>
<i>Albizia procera</i>	<i>Gardenia latifolia</i>
<i>Anogeissus latifolia</i>	<i>Gardenia resinifera</i>
<i>Anona squamosa</i>	<i>Gardenia turgida</i>
<i>Anthocephalus cadamba</i>	<i>Garuga Pinnata</i>
<i>Azadirachta indica</i>	<i>Gmelina arborea</i>
<i>Bauhinia malabarica</i>	<i>Grewia tiliaefolia</i>
<i>Bauhinia purpurea</i>	<i>Hetropogan roxburghii</i>
<i>Bauhinia racemosa</i>	<i>Holoptelia integrifolia</i>
<i>Bauhinia retusa</i>	<i>Hymenodictyon excelsum</i>
<i>Bauhinia variegata</i>	<i>Ixora arborea</i>
<i>Boswellia serrata</i>	<i>Jacaranda acutifolia</i>
<i>Bridelia retusa</i>	<i>Kydia calycina</i>
<i>Buchanania lanzan</i>	<i>Lannea coromandelica</i>
<i>Butea monosperma</i>	<i>Legerstroemia parviflora</i>
<i>Careya arborea</i>	<i>Limonia crenulata</i>
<i>Casaria elliptica</i>	<i>Litsaea glutinosa</i>
<i>Casaria graveolens</i>	<i>Madhuca indica</i>
<i>Cassia fistula</i>	<i>Mangifera indica</i>
<i>Chloroxylon swietenia</i>	<i>Melia azadirach</i>
<i>Cleistanthus collinus</i>	<i>Miliusa velutina</i>
<i>Cochlospermum religiosum</i>	<i>Minusops elengii</i>
<i>Cordia dichotoma</i>	<i>Mitragyna parvifolia</i>
<i>Cordia macleodii</i>	<i>Morinda tinctoria</i>
<i>Dalbergia latifolia</i>	<i>Moringa oleifera</i>
<i>Dalbergia paniculata</i>	<i>Morus laevigata</i>
<i>Dalbergia sissoo</i>	<i>Ougenia oojenensis</i>
<i>delonix reiga</i>	<i>Phoenix humilis</i>
<i>Dillenia pentagyna</i>	<i>Pithecolobium dulce</i>
<i>Diospyros melanoxylon</i>	<i>Polyalthia longifolia</i>
<i>Diospyros montana</i>	<i>Pongamia pinnata</i>
<i>Ehretia laevis</i>	<i>Prosopis juliflora</i>
<i>Elaeodendron glaucum</i>	<i>Pterocarpus marsupium</i>
<i>Emblica officinalis</i>	<i>Randia dumetorum</i>
<i>Erythrina indica</i>	<i>Randia ulginosa</i>
<i>Erythrina suberosa</i>	<i>Salmalia malabarica</i>
<i>Euphorbia nerifolia</i>	<i>Santalum album</i>
<i>Euphorbia nivulia</i>	<i>Scherebera swietenoides</i>
<i>Feronia limonia</i>	<i>Schleichera oleosa</i>

Semecarpus anacardium
Sesbenia grandiflora
Soymida febrifuga
Sterculia urens
Syzygium cumini
Tamarindus indica
Tamarix dioica
Tectona grandis
Terminalia arjuna
Terminalia bellirica
Terminalia chebula
Terminalia tomentosa
Vitex penduncularis
Wrightia tinctoria
Wrightia tomentosa
Zizyphus mauritiana
Zizyphus xylopyra

SHRUBS, HERBS & OTHERS

Achyranthes aspera
Adhatoda vasica
Ageratum conyzoides
Alangium salvifolium
Anona squamosa
Antidesma diandrum
Argemone maxicana
Calotropis gigantea
Calotropis procera
Capparis aphylla
Carissa opaca
Cassia auriculata
Cassia tora
Chlorophytum tuberosum
Claulena lansium
Colebrookia oppositifolia
Curculigo orchoides
Datura stuamorium
Desmodium cephalotod
Dichrostachys cinerea
Dodonaea viscosa
Dolichos lablab
Embelia robusta
Euphorbia tirucalli
Gardenia lucida
Grewia hirsuta
Gymnosporia spinosa
Helicteres isora
Holarrhena antidysenterica
Indigofera cassioides
Ipomoea batatas
Jatropha curcas

Lantana camara
Nerium indicum
Nyctanthes arbortristis
Petalidium baleriodis
Phoenix acaulis
Pogostemon plectranthoides
Randia dumetorum
Solanum nigrum
Strobilanthes auriculatus
Syzygium heyneanum
Tamarix dioica
Thespesia lampas
Vanda roxburghii
Woodfordia fruticosa
Xanthium strumarium

CLIMBERS

Abrus precatorius
Acacia pinnata
Asparagus racemosus
Bauhinia vahlii
Butea superba
Celastrus peniculata
Cissus rapanda
Cuscuta reflexa
Dendrophoe falcata
Ichnocarpus frutescens
Milletia auriculata
Mucuna pruriens
Smilax zeylanica
Tinospora cordifolia
Vallis solanacea
Ventilago calyculata
Viscum nepalense
Vitis quadrangularis
Zizyphus goenoplia

GRASSES

Alloteropsis cimicina
Andropogon pumilus
Apluda mutica
Aristida adscensionis
Aristida funiculata
Bothriochloa pertusa
Bothriochloa intermedia

Bothrichlora odorata
Brachiaria ramosa
Brachiaria reptans
Chloris barbata
Coix gigantea
Cymbopogon martinii
Cynodon dactylon
Dactyloctenium aegypticum
Dendrocalamus strictus
Dicanthium annulatum
Digitaria granularis
Digitaria setigera
Dinebra retroflexa
Echniocloa colomum
Elusine indica
Eragrostis bifaria
Eragrostis diarrhena
Eragrostis pilosa
Eragrostis poecoides
Eragrostis tenella
Eragrostis uniloides
Eulaliopsis binata
Hackelachloa granularis
Heteropogon contortus
Imperata cylindrica
Isachne globosa
Iseilema laxum
Oplismemes burmanii
Oryza rufipogon
Paraphoils incurva
Paspalidium flavidum
Phragmites karka
Rotaboelia exalta
Rotaboelia perforata
Saccharum spontaneum
Sehima nervosum
Setaria glauca
Setaria intermedia
Setaria pumila
Sorghum helcense
Sporobolus diander
Themeda quadrivalvis
Themeda triandra
Thysanolaena maxima

List of Plants for Periyar Tiger Reserve

GENERAL LIST

<i>Acampe ochracea</i>	<i>C. malabaricus</i>
<i>Acronychia pedunculata</i>	<i>Cullenia exarillata</i>
<i>Actinodaphne malabarica</i>	<i>Curcuma pseudomontana</i>
<i>Aeschynanthus perrottetii</i>	<i>Cymbopogon citratus</i>
<i>Ageratum adenophorum</i>	<i>Cynanchum callialatum</i>
<i>Aglaia lawii</i>	<i>Cyperus pangorei</i>
<i>Alpinia malaccensis</i>	<i>Cyrtococcum longipes</i>
<i>Anaphalis lawii</i>	<i>Dalbergia latifolia</i>
<i>Anaphyllum wightii</i>	<i>Debregeasia ceylanica</i>
<i>Andrographis neesiana</i>	<i>Dalbergia oppositifolia</i>
<i>Angiopteris evecta</i>	<i>D. pentaphylla</i>
<i>Anogeissus latifolia</i>	<i>D. sissoides</i>
<i>Aphanamixis polystachya</i>	<i>Dendrobium bambusaefolium</i>
<i>Artocarpus heterophyllus</i>	<i>Dendrophthoe trigona</i>
<i>Artocarpus hirsutus</i>	<i>Derris brevipes</i>
<i>Arundinella ciliata</i>	<i>D. heyneana</i>
<i>A. purpurea</i>	<i>Desmodium tringulare</i>
<i>Asplenium falcatum</i>	<i>Dimeria ornithopoda</i>
<i>Asystasia dalzelliana</i>	<i>Dimocarpus longan</i>
<i>Atylosia lineata</i>	<i>Dimorphocalyx laurianus</i>
<i>Baccaurea courtallensis</i>	<i>Dioscorea bulbifera</i>
<i>Barleria acuminata</i>	<i>D. tomentosa</i>
<i>Begonia malabarica</i>	<i>Drosera indica</i>
<i>Belosynapsis vivipara</i>	<i>D. peltata</i>
<i>Bhesa indica</i>	<i>Dumasia villosa</i>
<i>Bischofia javanica</i>	<i>Egnolfia asplenifolia</i>
<i>Bombax ceiba</i>	<i>Elaeocarpus munronii</i>
<i>Burmannia pusilla</i>	<i>E. serratus</i>
<i>Calamus spp.</i>	<i>E. tectorius</i>
<i>Calophyllum apetalum</i>	<i>Elaphoglossum beddomei</i>
<i>Canarium strictum</i>	<i>Elatostema lineolatum</i>
<i>Capparis moonii</i>	<i>Emilia sonchifolia</i>
<i>Cassia intermedia</i>	<i>Epithema carnosum</i>
<i>Cayratia pedata</i>	<i>Eriocaulon sp.</i>
<i>Centrosema pubescens</i>	<i>Eucalyptus grandis</i>
<i>Ceropegia beddomei</i>	<i>Euonymus dichotomous</i>
<i>C. intermedia</i>	<i>Exacum tetragonum</i>
<i>C. metziana</i>	<i>Ficus beddomei</i>
<i>C. oculata</i>	<i>Garcinia wightii</i>
<i>Chassalia curviflora</i>	<i>Gastrochilus dalzellianus</i>
<i>Christisonia tubulosa</i>	<i>Glochidion ellipticum</i>
<i>Cissus discolor</i>	<i>G. tomentosum</i>
<i>Clidemia hirta</i>	<i>Glycine javanica</i>
<i>Costus speciosus</i>	<i>Gnetum ula</i>
<i>Crotalaria grahamiana</i>	<i>Gomphandra tetrandra</i>
<i>C. heyneyana</i>	<i>Gomphostemma keralensis</i>
<i>C. multiflora</i>	<i>Goniothalamus wightii</i>
<i>C. salicifolia</i>	<i>Gordonia obtusa</i>
<i>C. walkeri</i>	<i>Grewia tiliaefolia</i>
<i>Croton caudatus</i>	<i>G. umbellifera</i>

Gynura nitida
G. pseudochina
Helecteres isora
Helixanthera wallichiana
Heracleum courtallense
Homonoia riparia
Hopea glabra
Hoya pauciflora
H. retusa
Humboldtia vahliana
Hydnocarpus laurifolia
Impatiens goughii
I. leptura
I. maculata
I. parasitica
I. verticillata
I. viscosa
Ipomoea deccana
Ixora brachiata
Jasminum azoricum
Knema attenuata
Lantana camara
Lasianthus prostratus
Lepisanthes umbellata
Leptacanthus rubicundus
Litsea coriacea
L. bourdillonii
Mallotus beddomei
Medinilla beddomei
Meiogyne ramarowii
Meliosma simplicifolia
Mesua ferrea
Milletia rubiginosa
Minusops elengi
Mitracarpum villosus
Mucuna hirsuta
Mussaenda belilla
Myristica dactyloides
Naegelia wallichiana
Neanotis decipiens
Nilgirianthus barbatus
N. beddomei
N. punctatus
Ochlandra travancorica
Oleandra musaefolia
Ophioglossum gramineum
Ophiorrhiza eriantha
Osbeckia gracilis
Pavetta indica
Peperomia dindigulensis
P. wightiana
Persea macrantha
Phlebophyllum spicatum
Phoenix loureirii
Phyllanthus emblica
P. macraci

Piper hymenophyllum
P. longum
P. nigraachyon
P. nigrum
P. trichostachyon
Plectranthus wightii
Polyalthia fragrans
Polygonum spp.
Polystichum biaristatum
Prunus ceylanica
Pseudocyclosorus ochthodes
Psilotum nudum
Psychotria flavida
P. nigra
Pterocarpus marsupium
Radermachera xylocarpa
Rhinchoglossum notonianum
Rhynchotechum permolle
Rottboellia cochinchinensis
Sarcandra chloranthoides
Semecarpus travancorica
Shuteria vestita
Smithia bigemina
S. blanda
Sobubia trifida
Solanum ciliatum
Sonerila rheedii
Sonerila sp.
Spermacoce latifolia
Strobilanthes asperimus
Strychnos vanprikii
Symplocos macrophylla
Syzygium cumini
Syzygium malabaricum
Tabernaemontana heyneana
Tectona grandis
Tephrosia pulcherrima
Terminalia chebula
T. paniculata
Tetrameles nudiflora
Tetrastigma leucostaphylum
T. sulcatum
Themeda cymbaria
T. tremula
T. triandra
Thottea siliquosa
Thunbergia mysorensis
Tournefortia heyneana
Trichilia connaroides
Turpinia malabarica
Utricularia graminifolia
U. uliginosa
Vaccinium neilgherrense
Vateria indica
Vernonia indica
Vigna dalzelliana

Vigna radiata
Xylia xylocarpa

Dendrobium macrostylum
Zeuxine longilabris

ORCHIDS

Acampe ochracea
Aerides ringens
Bulbophyllum neilgherrense
B. tremulum
Calanthe masuca
Calanthe triplicata
Chiloschista pusilla
Coelogyne breviscapa
Cottonia peduncularis
Cymbidium aloifolium
Dendrobium aqueum
D. bambusaefolium
D. herbaceum
D. nanum
Eria nana
E. reticosa
Flickengeria nodosa
Gastrochilus dalzellianus
Goodyera procera
Habenaria crinifera
H. heyneana
H. longocorniculata
Habenaria perrottetiana
H. plantaginea
Liparis nervosa
L. viridiflora
Luisia birchea
L. zeylanica
Malaxis densiflora
M. rheedii
Oberonia anamalayana
O. denticulata
O. ensiformis
O. iridifolia
O. platycaulon
Pachystoma senile
Pecteilis gigantea
Peristylus densus
P. goodyeroides
P. aristatus
Pholidota pallida
Podochilus falcatus
Polystachya concreta
Satyrium nepalense
Schoenorchis jerdoniana
Sirhookera lanceolata
S. latifolia
Vanda testacea

List of Flora for Ranthambhore Tiger Reserve

GENERAL LIST

<i>Abru precatorius</i>	<i>Blyxa echinosperma</i>
<i>Abutilo asiaticum</i>	<i>Boerhavia diffusa</i>
<i>Abutilo indicum</i>	<i>Borrera stricta</i>
<i>Acacia catechu</i>	<i>Bosewellia serrata</i>
<i>Acacia leucophloea</i>	<i>Bridelia squamosa</i>
<i>Acacia nilotica</i>	<i>Canscora diffusa</i>
<i>Acacia senegal</i>	<i>Cappari decidua</i>
<i>Acalipha indica</i>	<i>Cappari seqiaria</i>
<i>Acalypha ciliata</i>	<i>Cardiospermu halicacabum</i>
<i>Acanthospermu hispidium</i>	<i>Casia farnesiana</i>
<i>Achyranthe aspera</i>	<i>Casia occidentalis</i>
<i>Adhatoda vasica</i>	<i>Cassia absus</i>
<i>Adina cordifolia</i>	<i>Cassia fistula</i>
<i>Aegl marmelos</i>	<i>Cassia pumila</i>
<i>Aerva lanata</i>	<i>Cassia tora</i>
<i>Aerva sanguinolenta</i>	<i>Cayratia trifolia</i>
<i>Aerva tomentosa</i>	<i>Celastru paniculatus</i>
<i>Aeschynomen indica</i>	<i>Celosia argentea</i>
<i>Ailanthu exelsa</i>	<i>Ceraptophyllu demersum</i>
<i>Albizia odoratissima</i>	<i>Chlori dolichostachya</i>
<i>Aternathera sessilis</i>	<i>Chlori virgata</i>
<i>Alysicarpu bupleurifolius</i>	<i>Chrysopogo polyphyllous</i>
<i>Alysicarpu vaginalis</i>	<i>Cleom viscosa</i>
<i>Amarenthu spinosus</i>	<i>Clerodendru multiflorum</i>
<i>Amarethu tricolor</i>	<i>Clitoria ternatea</i>
<i>Amichophacelu forsakalaie</i>	<i>Cocculu hirsutus</i>
<i>ampelocissu latifolia</i>	<i>Commelina undulta</i>
<i>Anisochilu carnosus</i>	<i>Commicarpu verticillatus</i>
<i>Anisomele indica</i>	<i>Commiphora wightii</i>
<i>AnnonÆ squamosa</i>	<i>Corchoru aestuans</i>
<i>Anogeissu latifolia</i>	<i>Corchoru capsularis</i>
<i>Anogeissu sericea</i>	<i>Corchoru oliotoriu</i>
<i>Anogessu pendula</i>	<i>Corchoru tridens</i>
<i>Apluda mutica</i>	<i>Corchoru trilocularis</i>
<i>Arthraxo prionodes</i>	<i>Cordia dichotoma</i>
<i>Asparagu recemosus</i>	<i>Cordia gharaf</i>
<i>Atylosia scarabaeides</i>	<i>Crateva adansonii</i>
<i>Azadirachta indica</i>	<i>Crotalaria burhia</i>
<i>Bacopa monnieri</i>	<i>Crotalaria medicaginea</i>
<i>Balanite aegyptiaca</i>	<i>Crotalaria triquaetra</i>
<i>Bambusa arundinacea</i>	<i>Ctenolepi cerasiformis</i>
<i>Barleria cristata</i>	<i>Cucumi setosus</i>
<i>Barleria cuspidata</i>	<i>Cuscuta reflexa</i>
<i>Barleria prionites</i>	<i>Cyanoti cristata</i>
<i>Bauhinia recemosa</i>	<i>Cymbopogo martinii</i>
<i>Bauhinia tomentosa</i>	<i>Dalbergi paniculata</i>
<i>Bauhinia varietata</i>	<i>Dalbergi sissoo</i>
<i>Bergia ammannioides</i>	<i>Datur fastuosa</i>
<i>Biden biternata</i>	<i>Dendrocalamu strictus</i>
<i>Blumea mollis</i>	<i>Derri indica</i>

Desmodiu rapandum	Impatien balsamina
Desmodoiu triflorum	Indigofera astragalina
Dichanthiu annulatum	Indigofera caerulea
Dichrostachy cinerea	Indigofera inlifolia
Dioscorea bulbifera	Indigofera tinctoria
Diospyro cordifolia	Indigofera trita
Diospyro melanoxylon	Indoneesiella echiodes
Diospyru montana	Ipomea eriocarpa
Diplocyclo palmatus	Ipomea muricana
Dipteracanthu patulus	Ipomea nil
Dopatriu junceu	Ipomea sindica
Dyerophytu indicum	Ipomoea equatica
Echinochloa colonum	Ischaemu rugosum
Eclipta prostrata	Kickxia remosissima
Ehretia laevis	Kydia calycina
Elitraria acaulis	Lactuca remotiflora
Emblica officinalis	Lannea coromandelica
Emilia sonchifolia	Launea sarmentosa
Enicostema hyssopifolium	Lemna pauciosata
Eragrosti gangetica	Lepidagathi cristata
Eragrosti nutans	Leuca aspera
Eriochloa procera	Lcuca cephlotes
Erythrina suberosa	Linnophila indica
Eucalyptu sp.	Limonia acidissima
Euphorbia nerifolia	Linderni ciliata
Euphorbia parviflora	Linderin multiflora
Evolvulu alsinoides	Linderni pyxidariya
Facourtia indica	Ludwigia adscendens
Ficu benghalensis	Ludwigia perennis
Ficu racemosa	Luffa acutangula
Ficu religiosa	Macrotyloma uniflorum
Ficu tomentosa	Mallotu philippensis
Fimbristyli schoenoides	Mangifera indica
Glinu lotides	Martynia annua
Gloriosa superba	Maytenu emarginata
Glossocardia bosvallea	Mlanocenhri jacquemontii
Gmelina arborea	Melhanian futteyporensis
Gnaphaliu luteoalbum	Melia azedarach
Gomphrena celosoides	Melochia corchorifolia
Grewia columnaris	Miliusa tomentosa
Grewia damine	Mimosa rubicaulis
Grewia flavescens	Mitragyna parvifolia
Grewia tenax	Mollug pentaphylla
Gymnema sylvestre	Momordica balsmina
Hackelochla granularis	Momordica charntia
Helictere isora	Momordica dioica
Heliotropiu ovalifolium	Moringa oleifera
Hemarthria compressa	Mucuna pruriens
Heteropogo contortus	Mukia madaraspatana
Hibiscu lobatus	Murdannia vaginata
Hibiscu ovalifolius	Naing crenulata
Holarrhena antidysenterica	Neptuni oleracea
Holoptelea intergrifolia	Nymphae pubscens
Hydroplea zeylanica	Nymphea nouchali
Hygrophila auriculata	Nymphoide cristatum
Ichnocarpu frutescens	Ocimu canum

Oldenlandia corymbosa
Oldenlandia pumila
Oplismenus burmanii
Oryza nivara
Oxystelma secamone
Panicum paludosum
Paspalidium flavidum
Pedaliu murex
Pennisetu pedicellatum
Pergularia daemia
Peristrophe bicalyculata
Phoenix sylvestris
Phyllanthus asperulatus
Phyllanthus virgatus
Physalis minima
Pistia stratiots
Pitecellobium dulce
Plumbago zeylanica
Prosopis chilensis
Prosopis cineria
Pseudoraphis spinescens
Pupalia lappacea
Rhus mysorensis
Rhynchosia capitata
Rhynchosia minima
Rhynchosia pulverulenta
Rostellularia diffusa
Rostellularia quinqueangularia
Rottaboelia exaltata
Salmalia malabarica
Salvadora oleoides
Salvadora persica
Sapindus emarginatus
Sclerocarpus africanus
Sabania bispinosa
Securinega leucopyrus
Setaria intermedia
Setaria pallidifusca
Setaria pallidifusca
Setaria verticillata
Sida cordata
Smithia conferta
Solanum nigrum
Sphaeranthus indicus
Spirodela polyrrhiza
Sterculia urens
Striga lutea
Striga angustifolia
Syzygium cumini
Syzygium heyneanum
Tamarindus indica
Tamarix aphylla
Telosma pallida
Tephrosia villosa
Terminalia alata
Terminalia arjuna

Terminalia bellirica
Themeda quadrivalvis
Themeda triandra
Trapa natans
Trichodesma amplexicaule
Trichosanthes bracteata
Trichosanthes cucumerina
Tridax procumbens
Triumfetta pentandra
Triumfetta rhombodea
Typha angustata
Utricularia inflexa
Vallisneria spiralis
Vernonia cineria
Vetiveria lawsonii
Vetiveria zizanioides
Vicoa indica
Vigna aconitifolia
Vigna mungo
Vigna radiata
Vigna trilobata
Waltheria indica
Wrightia tinctoria
Wrightia tomentosa
Xanthium indicum
Zisiphu mauritiana
Zisiphu trinervia
Zisiphu xylopyra
Zornia gibbosa
Lidenbergia muraria

List of Plants for Similipal Tiger Reserve

<i>Abrus precatorius</i>	<i>Basella tubra</i>
<i>Acacia arabica</i>	<i>Bassia latifolia</i>
<i>Acacia catechu</i>	<i>Bauhinia pupurea</i>
<i>Acacia leucophlea</i>	<i>Bauhinia retusa</i>
<i>Acacia torta</i>	<i>Bauhinia variegata</i>
<i>Achras sapota</i>	<i>Beta vulgaris</i>
<i>Acryranthes aspera</i>	<i>Boerhavia diffusa</i>
<i>Actinodaphne angustifolia</i>	<i>Bombax malabaricum</i>
<i>Adina cordifolia</i>	<i>Borassus fiabellifer</i>
<i>Aegle marmelos</i>	<i>Bougainvillea spectabiles</i>
<i>Aganosma caryophyllata</i>	<i>Bougainvillea glabra</i>
<i>Agava americana</i>	<i>Brachiaria remota</i>
<i>Ageratum conyzoides</i>	<i>Brassica campestris</i>
<i>Ailanthus excelsa</i>	<i>Brassica juncea</i>
<i>Alangium lamarckii</i>	<i>Brassica oleracea</i>
<i>Albizia lebbbeck</i>	<i>Bridelia pubescens</i>
<i>Albizia procera</i>	<i>Bridelia retusa</i>
<i>Allium cepa</i>	<i>Bridelia stipularis</i>
<i>Alphonesla enbtriciosa</i>	<i>Bryophyllum calycinum</i>
<i>Alstonia scholaris</i>	<i>Buchanania lanzan</i>
<i>Alstonia venenatus</i>	<i>Butea monosperma</i>
<i>Amarantus paniculatus</i>	<i>Butea superba</i>
<i>Amoora spectabilis</i>	<i>Caesalpinia digyna</i>
<i>Amorphopallus campenulus</i>	<i>Caesalpinia pulcherrima</i>
<i>Anacardium occidentale</i>	<i>Cajanus indicus</i>
<i>Anans sativus</i>	<i>Calamus guruba</i>
<i>Andrographis paniculata</i>	<i>Calendula officianalis</i>
<i>Aneilema scapiflorum</i>	<i>Callistemon linearis</i>
<i>Anogeissus acuminata</i>	<i>Calotropis procera</i>
<i>Anogeissus latifolia</i>	<i>Cannabis sativa</i>
<i>Anona reticulata</i>	<i>Capparis horrida</i>
<i>Anona squamosa</i>	<i>Capsicum annumum</i>
<i>Anthocephalus cadamba</i>	<i>Capsicum cerasiformis</i>
<i>Antidesma acuminata</i>	<i>Capsicum frutescens</i>
<i>Antidesma buniis</i>	<i>Capsicum nigra</i>
<i>Antidesma ghaesembilea</i>	<i>Careya arborea</i>
<i>Aporosa dioca</i>	<i>Carica papaya</i>
<i>Arachis hypogea</i>	<i>Cassia fistula</i>
<i>Ardisia depresa</i>	<i>Cassia siamea</i>
<i>Ardisia solanasea</i>	<i>Casuarina equisetifolia</i>
<i>Areca catechu</i>	<i>Caedrela toona</i>
<i>Argemone mexicana</i>	<i>Celtris tetrandra</i>
<i>Aristida setacea</i>	<i>Cephalandra indica</i>
<i>Aristolohia indica</i>	<i>Chasalis curviflora</i>
<i>Artabotrys hexapetalus</i>	<i>Chloroxylon tomentosum</i>
<i>Artocarpus integrifolia</i>	<i>Citrullus vulgaris</i>
<i>Asparagus racemosus</i>	<i>Citrus medica</i>
<i>Aspidopteris hutchinsoni</i>	<i>Cleistanthus collimus</i>
<i>Azadirachta indica</i>	<i>Cleistanthus patulus</i>
<i>Baccaurea sapida</i>	<i>Clematis smilacifolia</i>
<i>Bambusa arundinacea</i>	<i>Clerodentron infortunatum</i>
<i>Barleria prioritis</i>	<i>Clerodentron serratum</i>
<i>Barringtonia acutangula</i>	<i>Clitoria ternatia</i>

Cochlospermum gossypium
Cocos nucifera
Coffea bengalensis
Colocasia artiquorum
Combretum decandrum
Combretum ovalifolium
Commelina bengalensis
Corchorus glitorius
Coriandum sativum
Costus speciosus
Crataeva religiosa
Croton oblongifolius
Cucumis melo
Cucumis sativus
Cucurbita pepo
Curcuma angustifolia
Curcuma aromatica
Curcuma longa
Curcuma zedoaria
Cycas circinalis
Cycas revoluta
Cyperus rotundus
Daedalcanthus nervosus
Datura strumorium
Daucus carota
Delbergia latifolia
Delbergia sissoo
Delbergia tamarindifolia
Dendrocalamus strictus
Desmodium polycarpum
Dillenia pentagyna
Dimeria ornithopoda
Dioscorea alata
Dioscorea bulbifera
Dioscorea wallichii
Diospyros embryopteris
Diospyros melanoxylon
Diospyros montana
Dolichos lablab
Drosera indica
Echinocloa colonum
Echinocloa frumentacea
Eicharnia crassipes
Elaeocarpus robustus
Elaeocarpus wallichii
Elephantopus scaber
Emblica officinalis
Entada scandens
Eragrostis viscosa
Erigolosum rubiginosum
Erycibe pariculata
Erythrina suberosa
Eucalyptus maculata
Eugenia fruticosa
Eugenia jambolana
Eugenia jambos

Eugenia lanceaefolia
Eugenia opperculata
Euonymus glaber
Feronia elephantum
Ficus benghalensis
Ficus cunia
Ficus glomerata
Ficus religiosa
Ficus scandens
Flacourtia cataphracta
Flacourtia ramontchi
Flemingia chappar
Fragaria indica
Garcinia cowa
Garcinia xanthochymus
Gardenia florida
Gardenia gummifera
Gargua pinnata
Gelonium multiflorum
Globba racomosa
Glochidion lancesolarium
Glochidion zeylanicum
Gmelina arborea
Gnetum scandens
Gossypium arboreum
Gossypium hirsutum
Gouanta leptostachya
Grewia disperma
Grewia elastica
Grewia sapida
Grewia tiliaefolia
Hedychium coronarium
Hemidesmus indicus
Hepatoplerrum venulosum
Heteropogori contortus
Heynea trijuda
Hibiscus esculentus
Hibiscus rosasinesis
Hilarrhena madablota
Holarrhena antidyenterica
Holoptlea integrifolia
Homalium nepalense
Hydrilla verticillata
Hydrocotyle asiatica
Hymenodictyon excelum
Hypenicum japonicum
Hypericum gaitii
Hyptianthera stricta
Hyptis suaveolens
Indigofera pulchella
Ipomoea batatas
Ipomoea carnea
Ipomoea reptans
Ixora parviflora
Ixora undulata
Jasminum arborescens

Jasminum flexile
Jasminum sambac
Kydia calysina
Laganaria vulgaris
Lagerstroemia flosreginae
Lagerstroemia parviflora
Lannea coromandelica
Lantana camara
Lathyrus sativas
Lawsonia inermis
Leea acuminata
Leea crispa
Lens esculenta
Leucas aspera
Limonia acidissima
Linocira intermedia
Lippia geminata
Litsaea sibefera
Litsea polyantha
Lycopersicum esculentum
Macaranga denticulata
Macaranga peltata
Macilus villosa
Mallotus philippinensis
Mangifera indica
Melia composita
Mesua ferrea
Michelia champaca
Milusa velutina
Miletia auriculata
Mimosa himalayana
Mimosa pudica
Mimusops elengio
Minosops hexandra
Mirabilis Jalapa
Mitragyna parvifolia
Momordica charantia
Moringa oleifera
Mucuna pruricus
Murraya exotica
Musa sapientum
Nelumbium speciosum
Nerium odorum
Nyctanthes arbortristis
Nymphaea alba
Nymphaea nouchali
Nymphaea stellata
Ochna squarrosa
Ocimum sanctum
Ofiospora cordifolia
Opuntia dillenii
Oryza sativa
Oughinia dalbergioides
Paederia foetida
Pandanus foetidus
Pandanus tectorius

Panicum trypheron
Pavetta indica
Peperomea reflexa
Perilla ocimoides
Phaseolus calcaratus
Phaseolus madiatus
Phaseolus vulgaris
Phoenix sylvestris
Phylloclamys spinosa
Pinus longifolia
Piper longum
Piper nigrum
Piper tricium
Pistia stratiotes
Pisum sativum
Pogostemon pleactranthoides
Pollinidium angustifolium
Polyalthia cerasioides
Polyalthia simiarum
Polygala erioptera
Pongamia glabra
Potamogeton indicus
Premna calycina
Premna coreacea
Premna integrefolia
Prosopis spicigera
Psychotria adenophylla
Psychotria denticulata
Pterocarpus marsupium
Pterospermum heyneanum
Puella suffruticosa
Punica granatum
Pygeum acuminatum
Raphanus sativus
Rauvullia serpentina
Reptapleum venulosum
Rhanus nepalensis
Rhapindepura decursiva
Rosa alba
Rosa chinensis
rosa involucrata
Rosa macrophylla
Rubus ellipticus
Rumex vesicarius
Saccharum officinarum
Salix tetrasperma
Santalum album
Sapium insigno
Saraca indica
Sauropus pubescens
Schleichera oleosa
Scleria clata
Schrebera swietenoides
Schrebera swietenoides
Semecarpus anacardium
Setaria pulicata

Setaria verticillata
Shorea robusta
Smilax microphylla
Smilax prolifera
Smilax zeylanica
Solanum giganteum
Solanum melongina
Solanum tuberosum
Soymida febrifuga
Spathodea campanulata
Spinacia aleracea
Spondias magifera
Sterblus asper
Sterculia colorata
Sterculia urens
Sterculia villosa
Streospermum suaveolens
Strespermum angustifolium
Stronilanthus jeyporensis
Strychnos nuxvomica
Styrax serrulatum
Symbolocos recemosa
Symbolocos spicata
Syzygium cumini
Tabernaemontana coronaria
Tamarindus indica
Tecoma undulata
Tectona grandis
Terminalia arjuna
Terminalia bellirica
Terminalia catapa
Terminalia chebula
Terminalia tomentosa
Themeda quadrivalvis
Thevetia neriifolia
Thuja orientalis
Todalia acullata
Tragia involucrata
Trapa bispinosa
Trewia nudiflora
Trichosanthes cucumerina
Tridax procumbens
Triticum sativum
Trochosanthes dioica
Trocosanthes angina
Turpinia pomifera
Uvaria hamiltoni
Vallaris heynei
Ventilago maderaspatana
Vinca rosea
Vitex glabrata
Vitex negundo
Vitex peduncularis
Vitex pubescens
Vitus pedata
Wendlandia trinitoria

Wendsandia exerta
Woodforida fruticosa
Xylia xylocarpa
Zea mays
Zingiber officianale
Zizyphus fruticosa
Zizyphus oenoplia
Zizypus jujuba

ORCHIDA

Acanthephippium sylhetense
Aerides maculosa
Aerides multiflora
Aerides odorata
Bulbophyllum cariniflorum
Bulbophyllum crassipes
Bulbophyllum micranthum
Bulbophyllum polyrhizum
Cleisostoma ramosum
Cymbidium alofolum
Cymbidium dayanum
Cymbidium ebureneum
Dendrbium aphyllum
Dendrobium Pygmeoum
Dendrobium bicameratum
Dendrobium calllceolaria
Dendrobium cathcartii
Dendrobium crependatum
Dendrobium firmbriatum
Dendrobium formosum
Dendrobium herbaceum
Dendrobium ierdonianum
Dendrobium macrostachyum
Dendrobium moschatum
Dendrobium nobile
Dendrobium nutans
Dendrobium peguanum
Dendrobium pierardii
Dendrobium transparens
Dortitis wightii
Eria bambusifolia
Eulophia nuda
Geodorum dilatatum
Geodorum densitlorum
Hebenaria commelinifolia
Habeneria brachyphylla
Habeneria canstricta
Habeneria crossifolia
Habeneria goodyeroides
Liparis bituberculata
Liparis longipes

Liparis nervosa
Liparis vestita
Liparis viridiflora
Liparis resupinata
Luisia brachystachya
Luisia fliformis
Luisia inconspicua
Luisia teretifolia
Luisia trichorhiza
Malaxis densiflora
Melaxis latifolia
Melaxis rheedii
Oberonia ensiformis
Oberonia falconeri
Oberonia iridifolia
Oberonia recurva
Oberonia verticillata
Pholidota imbricata
Saccolobium longifolium
Saccolobium ochraceum
Saccolobium papillosum
Saccolobium praemorsum
Tainia hookeriana
Thunia alba
Thunia venesa
Tropidia angulosa
Tropidia carculigoides
Vanda parviflora
Vanda roxburghii
Vanda tesellata
Vanda testacea
PTERIDOPHYTES
Adiantum lanulatum
Azolla pinnata
Doryopteris ludens
Elechnum orientale
Equisetum debile
Lastrea cochleata
Lycopodium squarrosum
Marasilia major
Marasilia minuta
Niphobolus stigmatosus
Pteris aquilina
Salvinia natans