

**BIODIVERSITY CONSERVATION
THROUGH ECODEVELOPMENT**

A Preliminary, Indicative, Plan for
**PALAMAU TIGER RESERVE
BIHAR**

**FIELD DIRECTOR, PALAMAU TIGER RESERVE
DALTONGANJ
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DALTONGANJ**

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for*
PALAMAU TIGER RESERVE

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Under the guidance of
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EXECUTIVE SUMMARY

1. The level of pressure and disturbance in most Indian protected areas (National Parks, Sanctuaries and Tiger Reserves of varied legal status) is high. Traditional approaches at protecting these areas need to be supplemented by ecodevelopment.
2. The ecodevelopment approach has been recognised as aiming at developing alternate sources of biomass and income, to divert pressures from the protected area. This is to be achieved in participation with the affected community, and with their support and cooperation, and involves site specific, micro level, planning and integrated area development.
3. Management planning for the protected area must be concurrent and appropriate, and must lead to the upgradation, as required, of management practices and facilities.
4. The Palamau Tiger Reserve in Bihar is 1,026 Sq Kms in area and comprises Palamau Wildlife Sanctuary and adjoining forests. There are 188 villages out of which 3 are situated in the core zone, 72 in the buffer zone and rest on the fringes within 5 Kms from the Reserve boundary, main concentration being on

northern and eastern sides. The villages falling in the core zone have a total area of 139 ha., human population of 630 and cattle population of 677 in 78 households while the villages falling in and around upto 5 km from the limits of the Reserve have a human population of over 1,12,000 and a cattle population of over 85,000 in over 20,780 households.

5. The population inhabiting this low rainfall, drought-prone area comprises mainly of six Scheduled Tribes, viz. Oraon, Birhor, Brijia, Chero, Kherwar and Munda besides few Scheduled Castes and others. The economic condition of the people is very poor and their activities include primitive agriculture and cattle keeping, and working as labourers. Their traditional economic activities provide sustenance for three to four months only. For rest of the year they are dependent on the adjacent forests. The development activities of the past have very little impact on them and even the minimum needs, particularly of safe drinking water, health-care, education etc., are yet to be adequately met.
6. The major pressure due to the villages on the Reserve are in the form of grazing, headloading, collection of small timber, fire, illicit felling and poaching. These are for their own consumption or use as well as

for sale to earn cash money. Attempt to encroach upon forest land has been a recent phenomenon.

7. Biomass need of the villagers in respect of fuel, fodder, fruit, small timber etc., are sought to be met through multi-tier agro-forestry and horticulture, and by managing right-burdened forests, wherever available, in joint participatory manner till the time and for the purpose required by the area specific need.
8. The income generation activities suggested as part of the project include the production and marketing of honey and wax, wooden and bamboo items, lac, dairy, poultry and piggery items, carpet and woolen items, vegetables and fruits and promotion of tourism. These activities would be supported and facilitated through a strong training programme, marketing organisation, tourism facilitation organisation, visitor-cum-training centres, production centres, improved communication facilities and provision for loans and seed-money, apart from other financial and material supports.
9. There would be an effort to improve the agricultural land through terracing and to take up soil and moisture conservation and storage initiatives in the form of wells, check-dams, tanks, contour bunding etc. It is also proposed to support various activities of other government & non-government agencies aiming at other

aspects of human resource development and local minimum needs, like facilities of drinking water, health-care and family welfare, education and the like.

- 10 Adequate short-term income generating activities have been identified and provided for in the project to cover up the transitional period.
11. The project would be implemented through village level ecodevelopment committees along with joint forest management agreement which would include an agreement renouncing poaching, trading in fire-wood, timber etc., and to regulate and restrict grazing according to the management requirements of the Reserve.
12. A strong awareness generation programme targeting, besides villagers and visitors, the school children of the area in order to sensitize their parents and fellow non-school-going children about local, regional, national and even global environmental issues.
13. Adequate provisions have been made for concurrent Research and Development for improving upon the quality and content of the project, and for monitoring and evaluation as well.

PREFACE

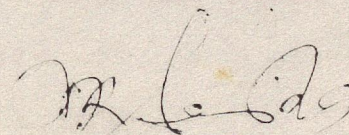
This Plan for conservation of biodiversity of the Palamau Tiger Reserve through ecodevelopment is preliminary and indicative. It gives a reasonably comprehensive idea of the potentialities of the area, people's wishes and viable development alternatives vis-a-vis demands of the biodiversity conservation.

The present plan is intended to secure funding for ecodevelopment activities of the Reserve. It has been prepared after visits to 20 sample villages out of a total of 188, located in and around the Reserve, and discussions held with a cross-section of the villagers. Once the funds are assured, site-specific participatory micro planning will start immediately.

In order to meet the deadlines of the Ministry of Environment and Forests, Government of India, this plan has been prepared in a very short time and therefore has not been rigorously edited as it should be.

If ecodevelopment succeeds, then the Reserve will increasingly be protected from unsustainable or otherwise unacceptable pressure coming from these villages. At the same time, it is expected that the implementation of this plan will progressively further locally appropriate and environmentally sustainable growth and development, besides giving the villagers a sense of identity with the Reserve.

Finally, thanks to all who helped and contributed in giving the present shape to this plan.



M.K. Sinha

Principal Chief Conservator of Forests
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Ranchi
September, 1993.

I INTRODUCTION

BIODIVERSITY CONSERVATION AND ECODEVELOPMENT IN INDIA

India is considered one of the mega-diversity countries of the world.

The Zoological Survey of India, the Botanical Survey of India and the Forest Survey of India have been studying and documenting the plant and animal diversity of the country. Of the estimated 45,000 plant species, about 15,000 species of flowering plants have been described. Estimates of other plant taxa include 5,000 species of algae, 1,600 lichens, 20,000 fungi, 2,700 bryophytes and 600 pteridophytes. There are about 75,000 species of animals including 50,000 insect, 4,000 molluscs, 2,000 fishes, 140 amphibians, 420 reptiles, 1,200 birds and 340 mammals, and other invertebrates.

A very large number of the species described are endemic to India. Among the larger animals 79 species of mammals, 44 of birds, 15 of reptiles, and three of amphibians are threatened. Nearly 1,500 plant species are considered endangered.

1.1 Protected Area Network

India has a network of 75 national parks and 419 sanctuaries. These protected areas are the main repositories of India's wild biodiversity.

Unfortunately, a very large proportion of these parks and sanctuaries are subject to major human pressures, both from development projects and industrial activities, and because of basic biomass and other requirements of the people living in and around them.

1.2 Summary of Pressures

A recent report of the Indian Institute of Public Administration (Kothari et. al., 1989) records the status of human pressures in wildlife protected areas. Some of the important findings are summarized below.

1.2.1 Rights, Leases and other Legal Uses

1.2.1.1 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:

DENSITY (No. of people per ha.)	NO. OF N/S		
	N	S	T
>10.0	0	0	33
5.0 to 10.0	0	0	33
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 0.49	11	22	33

[N = National Park; S = Sanctuary; T = Total]

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 percentage 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:

Pressure (No. of persons per ha.)	No. of N/S		
	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

[N = National Park; S = Sanctuary; T = Total]

1.2:1.2 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 sanctuaries with rights. The other common ones are firewood collection in 54%, collection of minor forest product in 47%, agriculture in 43%, and

habitation in 42% of the sanctuaries with rights.

1.2:1.3 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%) and in 13 (11%) of the sanctuaries.

The range of densities obtained is as follows:

Cattle (Table 1.2:1.3a)

Density (No. of cattle per ha.)	No. of N/S		
	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

Density (No. of goats per ha.)	No. of N/S		
	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

[N = National Park; S = Sanctuary; T = Total]

1.2:1.4 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.

1.2:1.4 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 product (NTFP).

1.2:1.6(a) 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 at present is 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.

1.2:1.6(b) Thoroughfare

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

1.2:2 Illegal Use and Activities

1.2:2.1 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.

1.2:2.2 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.

1.2:2.3 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 were significant.

1.2:3 Conflicts

1.2:3.1 Injury or Death of 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.

1.2:3.2 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.

1.3 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 authorities and the affected people bear witness to the fact that the policing approach is also considered to be undesirable.

II. ECODEVELOPMENT PRINCIPLES

Definitions

1. Ecodevelopment is a strategy for protecting ecologically valuable areas (protection 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 protection areas in a manner, or to an extent, considered unacceptable.
 - 2.2 By increasingly involving the people living in and around such protection 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 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 protection 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 as 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 protection 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 protection 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.
7. As already mentioned, ecodevelopment planning needs to be site-specific, micro level, and participatory.
8. Ecodevelopment planning is not 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.

10. Therefore, detailed, micro level, ecodevelopment planning, for this and many other reasons, should start 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 aspects, including:

12.1 Negative impacts of the protection 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 protection area (illegal or unsustainable grazing ;collection of timber, firewood and non wood forest produce; setting fire or otherwise

degrading the habitat; poaching or disturbing wild animals etc.).

- 12.3 Possibilities of minimizing both types of negative impacts through ecodevelopment (measures for protection of human, 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 protection area and the establishment of the ecodevelopment initiative.

- 12.8 Perceptions of the villagers about the protection 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 protection area (park/sanctuary/reserve) management authority, who should have adequate staff, preferably exclusive staff, to look after their part of the work.

13.2 Local level Non Governmental Organisations or, where there are no suitable local level Non Governmental Organisations, regional or national level Non Governmental Organisations 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 (chaired by the Collector and, where more than one district is involved,

the chairmanship rotated among the collectors) 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), representatives of local Non- Governmental Organisations 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 Non Governmental Organisations and specialised government agencies, will be set up to advise on specific issues (ground-water harvesting, water conservation, bee keeping, horticulture, poultry, 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 Non Governmental Organisations, in order to:

a) Provide an alternate process for financially supporting some of the ecodevelopment activities.

b) Raise additional resources for ecodevelopment activities.

c) 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.

d) 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 protection area

allowed to degrade.

21. Measures aimed at tiding over the transitional period could include making available the 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 or occasional employment in the various management activities in the protection 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 protection 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 ecocodevelopment initiatives.

Financial Arrangements

25. The timely release of ecocodevelopment funds to the Protected Area Director and, further, to the concerned voluntary agencies and village committees has to be guaranteed.
26. There also has to be adequate decentralization 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 ecocodevelopment 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 ecocodevelopment. Ecocodevelopment, as a strategy, is appropriate only for those areas where the threats are due to pressures from local (rural) communities. In area 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 ecocodevelopment might be more appropriate.

Ofcourse, an area can have both types of pressures. In such cases, ecocodevelopment 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 area for ecocodevelopment, they need to be classified as follows.

I. Areas where current, local community, needs for biomass (grass, firewood, fodder, non-timber produce etc.) are the major threats and these can be sustainably met from available resources, once these resources are better managed by closing/rotational grazing, regeneration/plantation of firewood 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, replacement of local breeds of cattle with high yielding breeds, or introduction of smokeless chulhas, 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 problems.

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 area (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 the 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 can not be tackled without involvement of local communities, while the most difficult ones can be overcome if the people are willing to cooperate.

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.

III THE PROJECT AREA

THE PALAMAU TIGER RESERVE

HISTORY

Prior to the creation of the Palamau Tiger Reserve its forests were open to grazing. A few cattle camps existed and the entire forest area was ravaged by annual fire. Poaching too continued unabated. Such biotic interferences caused ecological imbalance in the area resulting in deterioration of forests and decrease in wildlife population. It was at this stage that the Palamau Tiger Reserve with an endangered population of 22 tigers was created with launching of the Project Tiger at the initiative of the Government of India, Ministry of Agriculture and Irrigation, vide notification No:-J.11025/1/72-FRY (WEF) dated 4th June, 1974.

LOCATION AND APPROACHES

Palamau Tiger Reserve is situated in the 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 Madhya Pradesh state boundary. The Headquarters of the Reserve is located in Daltonganj, 25 km from Betla, the main entry point to the Reserve.

The nearest important railhead is Daltonganj. However, one less important railway station, Chhipadohar, falls within the Reserve boundary. Betla is approachable by road from Ranchi, 180 km away, which is also the nearest airport. A landing strip for small aeroplanes is there which is 6 km away from Daltonganj and 20 km from Betla.

LEGAL STATUS, AREA AND ZONING

The Palamau Tiger Reserve came into existence on 4th June, 1974. The Reserve has an area of 1026 sq km, 213 sq km of which being core area and rest buffer area. 29 sq km of buffer near Betla is being maintained as tourist zone. There is an intention to increase this tourist area to 53.75 sq km. An area of 979 sq km of the Reserve has been declared as a sanctuary by the Government of Bihar vide notification no.1224 dated 17th July, 1976. The intention to constitute an area of 224.37 sq km as the Betla National Park was issued by the Government of Bihar way back in 1986 but the final notification is pending the procedures stipulated in Wildlife (Protection) Act, particularly the settlement of village rights in one small Protected Forest.

The Forests of the Reserve comprise the Reserved and Protected Forests. Historically, the Reserved Forests of today include, besides the Reserved Forests gazetted under the Indian Forest Act 1878, the Protected Forests declared as such under the same Act and the Khalsa or Khasmahal Forests which were earlier under the administration of the Civil Department. The process of notifying those Protected Forests, i.e., Old Protected Forests, and the Khalsa Forests as the Reserved Forests under the Indian Forest Act, 1927 was completed in 1978. Owing to their peculiar history, these Old Protected Forests and Khalsa Forests as well as the Reserved Forests declared after 1923 are burdened with general rights, privileges and concessions prevalent in the Protected Forests of Chhotanagpur. However, the present day class of right burdened Protected Forests, i.e., New Protected Forests, are some patches of raiyati forests adjoining the Khalsa Forests and Ex-Zamindari Forests which, following the vesting of Zamindaries under the Land Reforms Act, were declared as such under the Indian Forest Act, 1927 vide various notifications between 1953 and 1966, after duly completing the regular forest settlement proceeding.

The Reserve encompasses 53,286.58 ha of Reserved Forests, 2,951.43 ha of Old Protected Forests, 8,995.86 ha of Khalsa Reserved Forests and 37,367.41 ha of New Protected Forests.

Four Territorial Forest Divisions contribute variable areas in constituting the Reserve, the major one being the Daltonganj South Forest Division. The division-wise details of these forests are given in the Table below.

TABLE: 3.1

DIVISION-WISE DETAILS OF FORESTS OF PALAMAU TIGER RESERVE

Name of Forest Division	Area in Hectares				Total
	R.P.	KRF	Old PF	New PF	
1 Daltonganj (S) Division	46,205.62	8,726.36	2,951.43	19,515.10	77,398.51
2 Latehar Division	5,920.35	269.50	-	3,367.02	9,556.87
3 Garhwa (S) Division	-	-	-	14,063.63	14,063.63
4 Ranchi West Division	1,160.61	-	-	421.66	1,582.27
Total	53,286.58	8,995.86	2,951.43	37,367.41	1,02,601.28 or 1026 sq km.

Efforts are on to transfer the areas of Latehar, Garhwa South and Ranchi West Forest Divisions to the administrative control of the Reserve since 1987.

The area of the Reserve falls in three districts. Approximately 16 sq km is in Gumla district,

approximately 140 sq km. in Garhwa, and rest in Palamau district. The forest area falling in Garhwa is likely to become inaccessible due to submergence on completion of the on-going North Koel Reservoir Project. Most of the villages in this part, relevant for the Reserve's ecodevelopment project are under rehabilitation at present, therefore they have been excluded from the project.

Division-wise details of forest area falling in the Palamau Wildlife Sanctuary is given in the table below.

TABLE : 3.2

DIVISION-WISE FOREST AREA OF PALAMAU WILDLIFE SANCTUARY

Name of Forest Division	Area in ha.
1 Daltonganj (S) Division	73,896.19
2 Latehar Division	8,427.87
3 Garhwa (S) Division	15,603.13
TOTAL	97,927.19 or 979 sq km.

Boundary: The Palamau Tiger Reserve has no well-delineated boundary, but its constituent forests have. The boundaries of the Reserved and erstwhile Old Protected Forests have been shown on the ground by means of either earthen pillars or

wooden posts. Agave has been planted along the boundary lines and around the boundary pillars in many cases. The boundary lines vary in width from 8' to 25'. The boundary pillars are supposed to be repaired regularly and boundary lines cleared annually before the fire season, but they are not in very satisfactory condition on account of inadequacy of fund for the purpose. Again, the boundary lines of the erstwhile Khalsa Forests create confusion as maps do not tally to the actual demarcation on the ground. These forests as well as the New Protected Forests also lack annual clearance of boundary lines and regular repair of boundary pillars.

ECOSYSTEM AND BIODIVERSITY VALUES

Altitudinal Range, Terrain and Drainage

The tract is undulating, the important hills being Murhu, Netarhat, Huluk and Gulgul. The altitude varies from 300 mts. to 1140 mts. (Gulgul) and the southern part of the Reserve are very steep, usual direction of metamorphic hill ranges being east-west. The northern part is comparatively less hilly and slopes are gentle. Some flat area along river beds and on hill tops are met with but they are not extensive.

Geology and Soils

- a) Laterite occurs on plateau above 100 mts. The soil is high level lateritic clay or clay loam and is generally shallow.
- b) Quartzite is generally represented on hills of regular outlines including some of the highest hills where there is no laterite. The overlying soil contains quartz pebbles. The soil is truly loam mixed with quartz pebbles and has sand in the surface layers. It is shallow except in the valleys.
- c) Gneiss occupies hilly ground and lower slopes of hills. The overlying soil is sandy loam which is deeper in valleys and shallow on hill slopes.
- d) Amphibolite occupies low broken hilly grounds. The soil is sandy loam, with high proportion of sand and is slightly calcareous. It is usually shallow but deep pockets do occur in valleys.
- e) Gondwana contains Mahadeva and Baker sand stones. The soil is shallow loam or loamy which becomes more clayey when shale is present.
- f) Alluvial areas are limited to flat valleys of the Koel and its larger tributaries. They

form sandy loams of good depth. They are very fertile but found over limited areas.

Climate

The area comes under the tropical climatic zone with four distinct seasons, namely, Winter from mid November to mid February, Summer mid February to mid June, Rainy mid June to mid September and Autumn mid September to mid November.

The summer months are quite hot with the mercury rising upto 48°C but the winter months are equally cold with the mercury dropping down to about 1°C in some places. Frost occurs in some pockets every year and affects the vegetation especially in the valleys of Koel near Bagechampa in Baresand Compartment. Fog remains thick allowing visibility only upto a short distance during the months of January and February in the southern portion. The northern fringes experience western hot wind, locally called 'Loo', during the summer.

The rains are mainly from the south-west monsoon and confined to 3 months i.e. mid June to mid September. The mean annual rainfall is 1036 mm, the southern part of the Reserve receiving more

rainfall than the northern portion. From the records, it transpires that over the last 40 years, the mean annual rainfall has diminished from 1200 mm to 1036 mm. The old records indicate that the area is affected by drought from time to time. Severe drought occurs almost every five years, sometimes two consecutive years. In recent past a severe drought occurred in 1967. Last year also it was of the same intensity and is likely to continue as the rain has so far been deficient this year too

Hydrology and Water Bodies

The Koel river, running from south eastern portion of the Reserve to the northern side, divides the Reserve into almost two equal halves. The three main tributaries of the Koel which pass through parts of the Reserve are Auranga, Burha and Pandra. The general drainage is from south to north towards the river Sone. The Burha is the only perennial river, whereas others dry up in summer. Rest of the rivulets are seasonal and usually dry up after December.

There are only a few perennial sources of still water, Kujrum pond, Kamaldah lake, Barwahi dam, Harindegwa dam etc. Out of these only first two retain water during droughts.

Forests:

The Reserve falls within the Chhotanagpur plateau biogeographic realm. Its forests lie mostly in the deciduous zone, except those in the southern portion, in the valley 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 miscellaneous species. Percentage of sal increases as one proceeds towards south of the Reserve and almost gets pure sal forests on Netarhat Plateau. The northern part of the Reserve has almost pure miscellaneous forests. See ANNEXURE-IV.

Forest Types

Moist High Level Peninsular Sal, 3C/C₂(i):

This type is found on the Netarhat plateau and Huluk which form plateau of 1000 or more in altitude.

Upper Canopy :The crop consists of almost pure sal (*Shorea robusta*) with a few other species such as *Terminalia tomentosa*, *Pterocarpus marsupium*, etc. Sal is stunted, being of quality IV or lower. The soil is laterite.

Middle storey: *Indigofera pulchella*, *Moghania spp.*, *Mallotus philippinensis*, *Holarrhena antidysentrica* etc.

Ground Flora : *Bothriochloa montana*, *Apluda mutica*, *Chrysopogon montanus*, *Themeda spp.*, *Chloris spp.*, *Heteropogon contortus* etc.

Moist Peninsular Low Level Sal, 3C/C₁(ii):

This type is found in forests around Maromar and Baresand. The quality of sal is better being of quality-III or even quality-II. The associates are almost the same as in the high level sal forests.

Northern Secondary Moist Deciduous Forest, 3C/S₁:

This is also found in forests around Maromar and Baresand. It is of very limited occurrence and part of it, about 400 ha, has been felled to raised teak.

Upper canopy: *Terminalia tomentosa*, *Pterocarpus marsupium*, *Adina cordifolia*, *Portium serratum*, *Mileusa velutina*, *Bridelia retusa*, *Dillenia pentagyna*, *Syzigium cumuni* etc. are dense, taller

and better than their counterparts in dry type.

Undergrowth:- *Acacia lenticularis*, *Sterculia villosa*, *Cordia Macleodi* etc., are also found though they are uncommon. Grasses are the same as in sal forest.

Dry Peninsular Sal, 5B/C₁₀:

This type is found in many compartments of Baresand and Kumandih. Some Compartments of Saidupe, Rol & Piri Reserve Forests and certain Protected Forests also have sal forests.

Upper Canopy :The crop consists of almost pure sal (*Shorea robusta*) with a few other species such as *Terminalia tomentosa*, *Pterocarpus marsupium*, *Adina cordifolia*, *Anogeissus latifolia* etc.

Middle storey: *Indigofera pulchella*, *Moghania spp.*, *Mallotus philippinensis*, *Holarrhena antidysentrica* etc.

Ground Flora : *Bothriochloa montana*, *Apluda mutica*, *Chrysopogon montanus*, *Themeda spp.*, *Chloris spp.*, *Heteropogon contortus* etc.

This type occurs on shallow soils, derived usually

from crystalline and metamorphic rocks and wherever the soil moisture conditions are unfavorable for the development of moist sal. The soil often rests directly on hard impervious rocks.

Northern Dry Mixed Deciduous Forests, 5B/C₂:

This type occurs almost throughout the area except Netarhat plateau, interspersed with the type described above.

Upper Canopy: *Terminalia tomentosa*, *Anogeissus latifolia*, *Albizia lebbek*, *Diospyros malanoxylon*, *Buchanania lanzan*, *Bridelia retusa*, *Bauhinia* spp., *Chloroxylon swietenia*, *Lagerostroemia parviflora*, *Bombax ceiba*, *Mitragyna parviflora*, *Lanea coromandelica*, *Holoptelia integrifolia*.

Ground Flora: *Heteropogon contortus*, *Apluda mutica* and *Imperata arundinacea*. Bamboo (*Dendrocalamus strictus*) occurs as understory in several areas.

These forests are mostly in the secondary seral stages and may be classified under 5/2S1 i.e. secondary dry deciduous forests. The transition between this type and the most deciduous type, is

often drawn out but usually they are found in different localities. The soil is dry, poor and shallow.

Aegle Forests, 5/E₁:-

This type is of very limited occurrence and is found in the dry parts of the forests between Kerh and Bhainsakhar. The associates are those of the dry mixed deciduous forests.

Dry Bamboo Brakes, 5/E₂ :

This type occurs in Betla, Kumandih, Tongari, Maromar, Surkumi, some compartments of Baresand, etc. The bamboo is *Dendrocalamus strictus* which occurs pure or as understory in a thin miscellaneous forest. The grasses mentioned above are found here also.

Plantations

Teak plantations raised near Betla Fort sometime between 1894 to 1900 are said to be the oldest teak plantations of the State. Since then a large number of plantations have been raised in the forests of the Reserve, both before and after its creation, but unfortunately many of them have failed or have been damaged by the wild Elephants and other wild animals. Worst is the case of Teak

plantations of Betla area which have suffered not only due to Elephant damage but by theft also. The future of the remaining plantations also appears gloomy due to above factors. Besides, another zone of teak plantations raised long back and known as Teno and Maromar teak plantations in Baresand 1, 9, 10, 11 and 14 have met with the same fate of destruction by Elephants and other wild animals. Bamboo plantations in Betla, Saidupe and Baresand compartments and in other forests have also suffered due to Elephant damage and browsing by wild animals. Remaining bamboo plantations have merged with the existing bamboo forests. Besides, a number of plantations of Sal, Semul and other miscellaneous species, viz., *Eucalyptus* and *Acacia moniliformis* had also been raised. Most of them have failed except the plantations raised outside the Elephant operating zone.

Fungal Diseases :The common fungi causing diseases of forest species found in the Reserve are *Cercospora* spp. (shot-hole of sal), *Fomes caryophylli* (pox rot of sal), *Fusarium solani dalbergiae* (wilt of sisham), *Ganoderma lucidum* (root rot of sisham), *Marasmius sarmentosus* (thread blight of sal), *Maravalia achroa* (die-

back of sisham), *Polyporus gilvus* (root rot of sisham, siris, khair and bijasal), *Polyporus shoreae* (Patridge root rot of sal), *Trametes incerta* (heart rot of sal), *Xylaria polymorpha* (Xylaria root rot) etc.

Grassy Blanks:- Many forests had been under shifting cultivation prior to their reservation. Some villages such as Huluk, Gangtar etc., were shifted during reservation. The fields thus left by the villagers and parts of the forests that had been cultivated regularly, are still devoid of any tree growth and they now form small grassy blanks within the forest. The grasses are mostly *Saccharum munja*, *Vetiveria zizanioides*, *Chrysopogon montanus*, *Themeda spp.*, *Apluda mutica*, *Heteropogon contortus*, etc. These grassy blanks are favourite grazing grounds of wild ungulates like Gaur, Sambhar and Chital.

Aquatic: There is not much aquatic vegetation as there are only a few perennial sources of still water. The impoundments near Kujrum, Kamaldah, Barwahi, Harindegwa etc., are the only permanent tanks which contain water throughout the year. In some of the river beds *Tamarix dioica*, *Saccharum*

munja etc., are found in the water-logged areas which dry up during the summer months. Among regular aquatics *Ceratophyllum* spp., *Hydrilla* spp., *Valisnaria* spp. and some plants of Cyperaceae family are found along river banks that are frequently submerged.

For details of important plant species see ANNEXURE-VII and for various traditional medicinal uses of local plants see ANNEXURE-VIII.

Fauna and its Habitat:

A large variety of wildlife is found in the Reserve. The mammals are represented by 47 species belonging to 39 genera and 21 families, of which 8 species are rare and listed in Schedule I and another 10 in Schedule II of the Wildlife (Protection) Act. Some of the important species of mammals besides Tiger are Rhesus macaque, Hanuman langur, Indian pangolin, Indian wolf, Bengal fox, Wild dog, Sloth bear, Small Indian civet, Indian grey mongoose, Striped hyaena, Jungle cat, Leopard, Elephant, Wild boar, Chital, Sambhar, Barking deer, Gaur, Nilgai, Indian black-naped hare, Indian crested porcupine, and a number of species of squirrels, rats, mice, bats and shrews. For details see ANNEXURE-V.

Of more than 170 species of birds reported from the Reserve, Indian Shikra and Peafowl are listed in Schedule I of the Wildlife (Protection) Act. Cotton teal, Spotbill duck, Storks (2 spp.), Lapwings (2 spp.), Egrets (2 spp.), Black and Grey Partridge, Pigeons (4 spp.), Crested serpent eagle, Kingfishers (3 spp.), Bee eaters (3 spp.), Owls (2 spp.), Vultures (3 spp.), Wagtails (5 spp.), Wood-peckers (3 spp.), Crow pheasant, Nightjars, Parakeets (3 spp.), Babblers (2 spp.), Shrikes (2 spp.), Scarlet minivet etc., are few other important ones. For details see ANNEXURE-VI.

Among reptiles represented in the Reserve the important ones are four species of lizards including Monitor lizard and Chamelion, and eight species of snakes including Indian Python. For details see ANNEXURE-V.

Three species of amphibians, namely, *Rana cyanophlyctis* (Skipper frog), *Rana limnocharis* (Indian cricket frog) and *Uperodon systoma* (Balloon frog) are reported from the Reserve. The species of *Rana* are economically important, hence, included in Schedule IV of the Wildlife (Protection) Act.

Among fishes represented here include Katla, Rohu, Mirgal, Kalbasu, Bata and Magur. For details see ANNEXURE-V.

Among invertebrates, the insect fauna is also diverse. It is represented by 69 species of beetles, 10 species of butterflies, 32 species of grasshoppers, 10 species of dragon and damsel flies, 3 species of Neuropterans besides a host of other varieties of insects. Insects causing damage to forest crops are, *Drosicha stebbingii* (sal), *Hapalia machaeralis* (teak defoliator), *Hoplocerambyx spinicornis* (sal borer), *Hyblaea puera* (teak leaf skeletonizer), *Icerya aegyptica* (teak), *Pammene theristis* (sal) etc. Apart from insects, 7 species, each of Crustaceans and Arachnids, and species of sponge are also reported from the Reserve.

Habitat: Based on the parameters like, cover density, height of forests, soil factor, food productivity, plant indicators, interspersions etc., the habitat of the Reserve can be classified into 4 types:-

1. **Sal Forests:** Found in many compartment of Baresand and Kumandih, some compartments of Saidupe, Rol and Piri Reserved Forests and certain Protected Forests like Bhawarbandha, Ladi etc.
2. **Miscellaneous Forests:** These occur throughout the area.
3. **Bamboo Forests:** It is almost pure in some localities but in general it occurs under low density cover of miscellaneous forests.
4. **Grasslands:** These are the grassy blanks as described earlier.

As a result of protective and other management practice, the vegetation has improved in the Reserve and provides better fodder and cover conditions for the wild animals. Water development has been commensurate with fodder and cover development. This can be effectively judged by comparing the status of vegetation in Palamau Tiger Reserve with that in the adjoining forests outside the Reserve. The tiger population has now started spilling over to adjoining forests.

Seasonal movement: The movement of the wild animals in this Reserve is predominantly regulated by their food and water needs. For instance, Chital, Sambhar and Wild boar use to congregate in large number near cultivated land during crop season. During rains and winter months the elephants leave their abode in Maromar - Lat area and move northwards to Betla. During summer, the elephants go back to Baresand-Maromar where there remains adequate water and shade for their daily need and comfort. But in recent past, development of more water facilities in Betla has begun to attract more and more elephants and they have started staying there for longer periods.

Biodiversity and other values of the Reserve

1. Biological diversity in the Reserve is outstanding with considerable varieties of vegetation and animal wildlife and their habitat. However, its biological resources are yet to be surveyed and documented properly. See ANNEXURE-IV to VII.
2. The Reserve supports 8 spp. of mammals, 2 spp. of birds and 1 spp. of reptile, listed in Schedule I; four spp. in Schedule II Part I and five spp of mammals and five species of reptiles in Schedule

II Part II of Wildlife (Protection) Act. All these spp. are endangered.

3. The Reserve has several traditionally used plants of medicinal importance, the real value of which is yet to be assessed.
4. The vegetation of the Reserve controls charging of ground water and checks run off volume and speed in the catchment of three important rivers of the region.
5. It is relatively least disturbed ecosystem in Bihar.

POPULATION

The villages located inside the Reserve can be categorized into two, on the basis of the zonation of the Reserve into core and buffer. While the buffer zone forest-locked villages have been treated in succeeding paragraphs, core zone villages are being described here.

There are three forest villages in the core zone the details of which are given in the table below.

TABLE :3.3.

CORE ZONE VILLAGES -- AREA AND POPULATION

Village	Area in ha.	No.of households	Population	Scheduled Tribes	Cattle population
1. Ramandag	70.50	40	297	Oraon, Kherwar, Korwa, Lohar	268
2. Latoo	41.05	20	148	Oraon, Korwa, Munda, Kisan	183
3. Kujrum	27.31	18	185	Oraon, Brijia	226
Total	138.86	78	630		677

Source: Proposed Relocation Plan For Core Zone
Villages, Palamau Tiger Reserve, 1990.

As is clear from Table 3.3 the villages are tribal ones. They are forest villages which were settled on forest land for securing supply of labour force required for various forestry operations. Now these villages have lost their significance and people here depend on agriculture, cattle keeping and wage labour for their sustenance. Their presence in the core causes a lot of disturbance in the wilderness. However, it has not so far been possible to relocate them outside the Reserve. The general condition of the people in these villages is miserable.

LAND USE

The forest land under the occupation of the said villages have been put to agricultural and residential uses. The villagers meet their firewood and smallwood needs from and graze their cattle in nearby forests. Rest of the core area remains undisturbed as no forestry operation or other human interference is allowed there.

As far as the non-wildlife utilization of buffer zone forests is concerned it varies from one territorial Forest Division to other. While the forests belonging to Daltonganj (South) Forest Division are exploited for bamboo and minor forest produce like Kendu leaves, Harre, Bahera, Mahulan leaves etc., rest of the forests belonging to Latehar and Garhwa (South) Forest Divisions are exploited for timber as well.

STAFF AND EQUIPMENT:

Staff: Following table shows staffing pattern .

TABLE: 3.4

STAFFING PATTERN

Sl.No.	Name of Post	No. of post under Centrally sponsored Scheme	No. of post under Non Plan	Total
1.	Field Director, C.P.Rank)	1	-	1
2.	Dy. Director, (D.C.P. Rank)	1	-	1
3.	Asstt. Director (ACF Rank)	-	1	1
4.	Range Officer	3	1	4
5.	Forester	9	4	13
6.	Forest Guard	40	25	65
7.	Head Clerk cum Accountant	1	-	1
8.	Office Assistant	4	2	6
9.	Stenographer	1	-	1
10.	Wireless Technician	1	-	1
11.	Lab. Assistant	1	-	1
12.	Artist	1	-	1
13.	Jeep driver	3	1	4
14.	Attendant	1	-	1
15.	Mahawat	1	-	1
16.	Orderly Peon	7	1	8
17.	Sweeper	1	-	1
18.	Khansama	-	1	1
19.	Chowkidar	1	7	8
20.	Canteen Boy	-	1	1
21.	Bunglow chowkidar	-	6	6
Total		77	50	127

Vehicles: The Reserve has 3 petrol and 1 diesel jeep, 1 fourteen-seater tourist van, 2 three tonne capacity mini trucks and six motorcycles. Except for mini trucks all have become quite old and their maintenance and running costs, particularly that of petrol jeeps, have become cost prohibitive.

Wireless: There are 16 fixed, 5 mobile and 9 hand WEBEL wireless sets .

Telephone: There are five telephone sets for four connections.

Other Equipments: The Reserve has few audio visual, photography, wildlife viewing and sundry equipments besides 5 rifles and 14 double barrel guns.

Management Plan: The Management Plan for the Palamau Tiger Reserve was prepared in 1987 by Sri. R.C. Sahay, the then Field Director. The Plan is valid from 1987-88 to 1996-97.

MANAGEMENT OF FOOD, WATER AND COVER:-

WATER

The distribution of water in the Reserve can be categorised as follows:

- a) Flowing Water
- b) Stationary Water
- c) Ground Water

Flowing Water: Three rivers, namely, the

Koel, Auranga and Burha flow for most part of the year, but unfortunately these rivers are located on the fringes, except the Koel which cuts across parts of the Reserve. With the completion of the North Koel Reservoir Project the water regime in some parts of the Reserve is likely to improve.

Stationary Water: Prior to the creation of the Reserve only two impoundments, i.e., one at Kujrum and one at Kamaldah in Betla compartment - I, existed which retained water all through the year. Thereafter two masonry dams were constructed across Madhuchuan Nulla in Betla compartment-II and Barwahi in Saidupe Compartment - III, but these also go dry in summer. Naturally some more earthen dams and masonry dams had to be constructed and it was done between 1975 to 1978. There are now in all 23 earthen and 4 masonry dams, all under regular maintenance.

Ground Water: Soon after the creation of the Reserve a survey was carried out in all the nalas to locate water bearing rocks. The survey indicated places where water could be found even in June with some deepening. At

some places where water was not available in a radius of 3 kms troughs made of galvanized iron sheets were embedded and water filled in manually in morning and evening. But as a result of closure to grazing, strict fire protection measures and digging of contour trenches in catchments of nalas, water availability has improved and water troughs were not required till 1992 drought.

Existing water management technique consists of maintenance of 302 water holes and desilting of tanks, dams etc. The water holes are cleared and disinfected from time to time. Previously water used to be transported in peak summer months but later on after locating water holes on sub-surface aquifers and maintaining them by digging, water scarcity has minimised. Even then water still remains a limiting factor in the Reserve. In areas of high cattle pressure like that of Betla and Garu water holes are also maintained for cattle .

FOOD

Pasture Development:

Over 1424 ha of both natural and created

grass land is being maintained every year in Betla Compartment -2, Saidupe Compartment - 1, 3, 4, 6 and 7, Baresand Compartment-1, 3, 4, 7, 8 and 9. The area under grass land is far short of desirable standard of 10% of the total area in order to have fodder for herbivores in plenty and also for creating necessary edge effect.

Weed Control:

There are two important weeds *Lantana* and *Flemingia chapper*. *Lantana* is spreading in open areas and is hampering regeneration and grass growth, although it provides good cover to predators and gallinaceous birds. About 300 ha of the core area is being taken up every year for *Lantana* eradication by manually uprooting and then burning it. The other weed, *Flemingia chapper*, found extensively in Baresand block is cut back before seeds ripen.

Burning Regime, Cutting and Seeding:

All the grasslands under maintenance are burnt every alternate year. The area where *Vetiveria zizanioides* and *Saccharum munja* grow, burning is done every year in controlled manner.

Browse Development:

Coppice shoots are avidly browsed by wild herbivores. Young shoots are induced wherever possible by cutting palatable shrubs.

Control on Grazing and Collection of Minor Forest Produce:

No forestry operation is allowed in the core area. However, departmental extraction of bamboo and minor forest produce in the buffer area and controlled grazing in its parts are permitted.

Mineral Nutrition:

While doing survey for locating waterholes, natural salt licks were also looked for. 120 such natural salt licks were located and developed. In addition, artificial monolick blocks are also placed near water holes and in grass lands, particularly in areas deficient in salt-rich earth in order to provide both micro and macro nutrients to wild animals.

COVER:

Timber Harvesting:

No timber is harvested either in core or in the buffer area belonging to Daltonganj South Division. However, harvesting is continuing in buffer areas falling in Latehar and Garhwa (South) Forest Divisions and efforts are on to stop it completely.

Fire Protection:

Fires in the Reserve are accidental as well as intentional. Accidental fires start with somebody throwing burning butts of cigarettes or biris while travelling or passing by. Many times fire starts due to carelessness of collectors of flowers, fruits, seeds, honey etc. Few bad elements in villages kindle fire intentionally for getting new grass leaves for cattle, and sometimes to press for employment or for getting employment in fire-fighting.

The fire control measures taken in the Reserve include cutting and burning of roadsides, firelines, and boundary lines before the onset of fire season. During fire season immediate detection and extinction of

fire is concentrated upon. For the purpose of immediate detection all the 12 strategically located watch towers are kept manned round the clock while fire watchers patrol the area. In case of any fire it is attended without loosing any time.

On an average 1.29% of the total area of the Reserve is affected by forest fire annually. Year-wise burnt area for the last few years is given in Table 3.5.

TABLE:3.5
ABSTRACT OF FIRE REPORT

Year	Area burnt in Core in Sq.km	Area Burnt in Buffer in Sq. km.	Total Area Sq.km.
1987	1.39	8.42	9.81
1988	8.67	7.94	16.61
1989	9.54	15.33	24.87
1990	2.22	5.57	7.79
1991	4.38	9.11	13.50
1992	11.82	5.48	17.30
1993	3.09	6.04	9.13

Transport and Communication:

One metalled black topped road passes almost through the middle of the Reserve. Few regular busses ply between Daltonganj and Mahuadanr. Another road, partly black topped, traverses through very small south eastern

part, leading to Banari in Ranchi District, but this road remains fair weather one till date. Several staff posted in interiors like Henar, Adhe, Rud, Madgari, Latoo, Kujrum etc., have to trek long distances to catch buses. Also, the Reserve has its own over 350 km length of murrum roads.

There is an adequate and effective wireless network comprising of fourteen fixed stations with WEBEL VHF JBS sets, five mobilophones fitted in vehicles and nine hand sets, all in frequency of 77.275 Mhz, for passing on messages of fire, poachers, outbreak of disease and other emergencies.

Daltonganj, the Reserve Headquarters, and Betla, the entry point to the Reserve, are on the telephone network, the former with S.T.D. facilities.

Roads and Control on Traffic:

Check-posts have been established with the sole purpose of checking illicit poaching on vehicles in the Reserve. There are nine manned barriers, situated on the Daltonganj - Mahuadanr road. Baheratanr, Amwatikar, Lat,

Daldalia, Rud and Vijaypur barriers are situated on other forest roads. Besides, there are about 23 unmanned check posts to bar entry into the core area. The keys of unmanned gates are generally kept with the Range Officer or Beat Officer concerned. For entry in the core area, Field Director's permission is required.

Patrolling Party

Special patrolling by armed party and trackers are carried out during Holy, Dushehra, X-mas and other festive occasions to look for on-foot-poachers and search out snares and traps set by villagers, besides armed as well as unarmed patrolling by forest staff in ordinary times to prevent commission of offences relating to felling, poaching, illicit grazing and fire. Year-wise cases of felling and poaching detected and action taken is given in the Table 3.6 and 3.7.

TABLE: 3.6

CASES OF ILLICIT FELLING AND ACTION TAKEN

Year	Cases Detected	Materials Seized	Persons Prosecuted	Remarks
1987-88	4	Sagwan Logs	16	
1988-89	1	Sagwan Logs	4	
1989-90	11	Bamboo, Sagwan, Bel, Sidha, Karam	54	All the cases have been sent to court for necessary action.
1990-91	17	Bamboo, Sagwan, Eucalyptus, Sidha, Karam, Kahua	56	
1991-92	5	Sagwan	26	
1992-93	24	Sagwan, Gamhar, Karam	37	

TABLE: 3.7

WILDLIFE CASES DETECTED AND ACTION TAKEN

Year	No. of Cases	Species	No. of Persons Prosecuted	Remarks
1987-88	2	Wildlife trophy, Chital	5	
1988-89	5	Wild boar-2, Chital-3, Sambhar stag	35	All the cases have been sent to court for necessary action.
1989-90	7	Chital-2, Sambhar-3, Gaur-1, Not killed-1	59	
1990-91	4	Sambhar	26	
1991-92	3	Chital-3	10	
1992-93	2	Tigress Bison	2	

Disease Control:

Separate Veterinary Unit has not yet been set up in the Reserve but the State Veterinary Department assists the Reserve in vaccination, postmortem and other such works. Annual prophylactic vaccination is done against Foot and Mouth Disease, Black Quarter and Anthrax in the village cattle through the Animal Husbandry Department. No serious outbreak of any disease has yet taken place in the although stray deaths of Gaurs and Chitals due to above diseases occur sometimes. Every wildlife death is reported to the Block Animal Husbandry Officer and postmortem is carried out to ascertain the cause of death. In case of outbreak of Foot and Mouth Disease in the wild animals the water holes are disinfected by making mud puddle with Phenyl, Alum, Gamaxene etc. around them. Annually about 7000 cattle are vaccinated against various diseases.

Accidents:

Diesel spraying and grass cutting is done between Railway tracks that pass through the Reserve so that the palatable grasses near

and between the Railway tracks do not attract wild animals and they are not caught in accidents. Some deaths of Gaurs have taken place in such accidents in the past.

Welfare Measures:

For crop protection, besides distributing kerosene oil, dry cells and crackers are distributed to scare wild animals (Elephant, Chital, Boar) away from crop fields. The crop watchers are also engaged through village panchayats. Cases of crop damage in the Reserve area are compensated at the rate of Rs.100/- per ha. Year-wise crop damage and compensation paid during the last few years is given in the Table 3.8.

TABLE:3.8

**YEAR-WISE CROP DAMAGE BY WILD ANIMALS
AND COMPENSATION PAID**

Year	Crop Damage in Acres	Compensation in Rupees
1987-1988	24.00	2,400.00
1988-1989	67.35	6,735.00
1989-1990	15.75	1,575.00
1990-1991	43.68	4,368.00
1991-1992	--	---
1992-1993	7.93	793.00

Similarly, cases of cattle killed in the Reserve area by carnivores is compensated at the rate of half the market price whereas that of loss of human life at the rate of Rs.20,000.00. Treatment cost in case of human injury and repairing cost in case of house damage also are borne by the Reserve. Year-wise cattle killed by carnivores in the Reserve and compensation paid during last few years is given in the Table 3.9.

TABLE:3.9

YEAR-WISE CATTLE KILLED BY
CARNIVORES AND COMPENSATION PAID

Year	Cattle Killed by			Total	Compensation
	Leopard	Tiger	Others		Paid in Rs.
1.	2.	3.	4	5.	6.
1987-88	80	141	-	221	98,065.00
1988-89	122	151	-	273	1,40,450.00
1989-90	156	139	-	295	1,34,025.00
1990-91	171	122	-	293	1,48,000.00
					(+3,050.00)
1991-92	109	139	8	257	1,77,300.00
1992-93	131	156	-	287	2,27,325.00

Few water holes in the buffer are allowed to be used by the village cattle. Recently, few ecodevelopment works like elephant proof fencing of villages, construction of checkdams for irrigation purposes, fodder development, distribution of energy efficient chulhas and superior fruit plants have been taken up to improve the lot of the villagers.

Monitoring Changes in Wildlife Population:

Census of wild animals is carried out every year, its method varying from animal to animal. For Sambhar, Chital, Barking deer, Nilgai, Wolf, Wild dogs etc., track sampling is done. For this purpose parallel tracks 400 mts. apart have been laid out and counting of animals seen within 30 mts. on either side of the track is done beginning from one end on fixed date and time all over the Reserve. This way about 15% of the total area is gone over and the resulting data are extended for the whole of the Reserve.

In case of large animals like Elephants and Gaur, direct counting method is employed in which every unit is gone over, herds located

and counted every day for three consecutive days. On the fourth day final counting is done. However, in case of Tiger and Leopard, pug mark counting method is applied and for the purpose the Reserve has been divided into 80 units.

All the census operations are carried out in summer when there are few live sources of water and it is easier to locate them. While Elephant census is done in June, others are completed in May every year. The results of 1993 census are given in the Table 3.10.

TABLE:3.10
CENSUS RESULTS, 1993

Sl.No.	Species	Number
1	Chital	15,232
2	Sambhar	2,758
3	Wild boar	7,741
4	Wild dog	435
5	Barking deer	2,092
6	Gaur	721
7	Elephant	119
8	Tiger	52
9	Leopard	60
10	Sloth bear	118
11	Four horned antelope	6
12	Nilgai	138
13	Langur	31,079
14	Rhesus monkey	35,098
15	Hare	937

Trend in Wildlife Population

In 1974 the Reserve started with a dwindling population of 22 tigers with an irregular sex ratio, whereas in 1993 the population has increased to 52 with main prey species Chital increasing from 9000 to 15,232 over the same period. Similarly, the bird life has also shown a considerable variety as the check list given in ANNEXURE- VI will reveal. There is an increase in the number of migratory birds. Hitherto unsighted reptiles and rodents are once again being seen all over the Reserve.

The trend of wildlife population over the past few years is given in the Table 3.11.

TABLE:3.11

TREND IN WILDLIFE POPULATION IN PALAMAU TIGER RESERVE

Species	1987	1988	1989	1990	1991	1992	1993
Tiger	54	55	59	62	52	55	44+8
Leopard	46	52	48	56	54	60	60
Chital	15358	14348	15226	15939	15285	15688	15232
Sambhar	3623	3775	3022	3194	2711	2580	2758
Gaur	625	682	734	724	778	727	721
Elephant	83	97	108	112	110	115	119
Nilgai	-	118	125	99	52	112	138
Wild dog	77	121	164	297	145	495	135
Barking deer	1257	1590	1458	1782	1900	1867	2092

Research Activities

Through there is tremendous scope for studying various aspects of vegetation and wildlife, this area of activity has remained so far neglected in want of staff and fund.

Tourism & Nature Interpretation

The tourist zone is confined to Betla and Kerh area and is about 53.74 sq km. This area is situated in the extreme north of the Reserve and hence tourism poses no threat. Accommodations are available at Betla and Kerh for every category of tourists with canteen facilities. Well laid out roads and view strips facilitates easy sighting of wild animals. Usual park regulations are strictly followed. There are a number of watch towers for photography free of cost. Some animal trails have been identified for elephant rides. No tourist is allowed to move inside without an authorised guide.

The number of visitors to the Reserve during the last six years is given in the Table 3.13.

TABLE:3.12

NUMBER OF TOURISTS VISITING
PALAMAU TIGER RESERVE

Year	Indian	Foreigner	Total
1987	32,688	150	32,838
1988	46,680	106	46,786
1989	37,968	71	38,039
1990	31,970	90	32,060
1991	34,064	32	34,096
1992	34,649	70	34,719

Finance

Year-wise expenditure on establishment and works during the last few years is given in the Table 3.13 and 3.14.

TABLE:3.13

EXPENDITURE ON ESTABLISHMENT IN PALAMAU PROJECT TIGER

Year	Non-plan in Rs.	Plan in Rs.	Total in Rs.
1.	2.	3.	4.
1987-88	4,39,253	12,99,784	17,39,037
1988-89	6,86,516	14,26,365	21,12,881
1989-90	6,94,790	15,60,474	22,55,264
1990-91	8,56,164	19,18,000	27,74,164
1991-92	14,70,838	16,47,149	31,17,987
1992-93	14,94,133	20,70,800	35,64,933

TABLE:3.13
EXPENDITURE ON WORKS IN PALAMAU TIGER RESERVE

Year	Non-Plan in Rs.	Plan in Rs.	Total in Rs.
1987-1988	12,63,015	20,66,483	33,29,498
1988-1989	15,36,877	19,06,253	34,43,130
1989-1990	9,58,708	25,83,450	35,42,158
1990-1991	14,78,797	33,13,173	47,91,970
1991-1992	21,59,026	23,72,802	45,31,828
1992-1993	17,07,534	1,07,29,200	1,24,36,734

Human Activities in and around the Reserve

1. Core Zone Villages:

The core zone is dotted by three forest-locked tribal "FOREST VILLAGES" of Ramandag, Latoo and Kujrum, with approximately 139 ha of forest land under their occupation. The human and cattle population in these villages are 630 and 677 respectively in 78 households. These forest villages have now lost their relevance due to cessation of all forestry operations in the core zone and are causing a lot of undesirable disturbance in the wilderness. So far it has not been possible to relocate them outside. However, a relocation plan prepared in consultation with the villagers concerned is under consideration of the Central Government.

2. Buffer Zone Villages:

There are 72 villages in and another 113 around

the buffer zone of the Reserve with a human population of over 1,12,000 and a cattle population of over 85,000 in over 20,780 households. Earlier these villages with small human and cattle population were in great harmony with the forest and the Forest Department. The overall atmosphere was that of goodwill, the reason being plenty of employment given over eight months of a year by the Department in forestry operation. The wages earned by the villagers formed the basis of their economy while their primitive agriculture and animal husbandry played merely a supplementary role. Most of these villages had forests in which they enjoyed their rights to meet their firewood, smallwood and grazing needs. But over the years both the human and cattle population has swollen up greatly and their resource needs have grown manifold thereby causing overuse and consequently depletion of right burdened forests. The economic condition of these villages with limited land, water and right burdened forest resources worsened on another count also, that is the great reduction in employment opportunities due to cessation of many forestry activities with the creation of the Reserve. Under the circumstances of greatly increased demands for fuel, fodder, timber, water,

land and employment with grossly inadequate alternatives, these villagers now make more demands on the resources of the Reserve, thereby coming into conflict with authorities. The situation is further complicated by the progressively increasing incidents of damages to their life and property caused by the increasing population of wildlife though compensated inadequately. Now a sense of alienation and resentment has replaced the previous atmosphere of goodwill, and very often conflict over the use and control of the said resources becomes law and order problem and sometimes results in physical confrontation between the people and the authorities. The prevalence of country-made firearms and now the presence of extremists in some areas has added a new dimension to it.

The offences in hinterland arise out of economic realities. The people had a tradition of hunting in olden times but have now adjusted to anti-poaching regulation, however occasionally such attempts are made by them. Besides the said offences, illicit felling for trade as well as domestic need of firewood and timber is a problem of peripheries only. Some bad elements kindle fire in the forest out of resentment against the

Reserve or for securing employment in extinguishing it. By and large, the majority of population is docile. The phenomenon of encroachment on forest land by the tribals for cultivation purpose is of recent origin in the area. At least three cases of such attempts have come up over the last three years. According to reliable sources some extreme organisations are playing friend, philosopher and guide to these offenders.

In view of the above circumstances the Reserve has drawn up this ecodevelopment plan for these villages aiming at economic uplift of the villagers by developing their own resources in consonance with the conservation ethics and in the process generating adequate number of wage labour in lean seasons.

Management Constraints and Future Strategy to Remove Them

There are two sets of Management Constraints in the Reserve.

1. Constraints caused by increasingly intensifying Reserve-human conflict.

2. Constraints imposed by the nature and inadequacy

in the facilities.

1. Constraints caused by increasingly intensifying Reserve-human conflict.

Over the years the intensity of the Reserve-local population conflict for use of and control over resources of the Reserve has intensified and is likely to retain this undesirable tendency in near future. The root-cause of this conflict is not difficult to identify. Due to undesirably higher growth in human and cattle population in villages around the Reserve over the years the demand for employment opportunities and for fodder, small timber etc has grown manifold. The situation has worsened due to inadequate development expenditure by other development departments of the Government in the past and it remains as such at present. Over the last three years there has been attempts to encroach upon forest land of the Reserve mainly for extensive agriculture, which has for the present been stalled by way of educating and persuading them. There is no dearth of well - meaning and good people in these villages but they too, on being

contacted, ask for greater development investment for resource development and employment generation.

The task of ameliorating the above constraints is so gigantic that the Reserve finds its present resources inadequate to tackle them in totality. However, the Reserve on its part proposes to tackle the situation by increasing Ecodevelopment expenditure in coming years aimed at development of resources like small irrigation facilities, perennial horticultural crops, fodder development and other community assets including drinking water facilities, village roads and buildings for schools, primary health centres, etc.

The much needed employment opportunities will be created in the process of development of above resources which after their development will generate employment from within the system.

2. Constraints imposed by nature and inadequacy of facilities

Water is the most important limiting factor

in the management of the Reserve. The status of soil moisture and duration of surface flow in nalas have definitely improved on account of measures taken in the past since the creation of the reserve but the area is frequently hit by drought and the availability of water and fodder diminishes. To tackle this limiting factor it is proposed to create permanent resources of minimum required number of borewells for making available water in waterholes and sprinkle-irrigation of grasslands in critical areas and during severe droughts.

Again difficulties are being felt in protection of forests from illicit grazing, felling and deliberate fires and wildlife from poaching as the Reserve does not have its own armed squad of trained personnel and the police assistance does not reach in time even when asked for. to strengthen the protection system it is proposed to raise own armed squads of ex-servicemen for patrolling. A proposal to this effect has been submitted to the state Government

B. THE PALAMAU TIGER RESERVE SURROUNDINGS

POPULATION

There are 72 villages in the buffer zone of the Reserve and an additional 113 around it within 5 km radius. The total area of these villages is 76,640 ha., and are placed administratively under six Development Blocks. The total population in these villages has been projected at over 1,12,000 in over 20,780 households, on the basis of 1981 population figure at the growing rate of 26% per decenium. Majority of population in these villages are those of Scheduled Tribes.

The block-wise primary census report is given in ANNEXURE I & II.

LAND USE

The land use pattern in the six blocks which 185 villages belong to, is given in ANNEXURE III.

LEGAL STATUS AND LAND TENURE

There are two types of land ownerships, individual owners having hereditary rights over their holdings and the State Government. The villagers generally cultivate their own land. Few do it on

others land as sharecroppers while those having no land or very small land work as labourers.

EXISTING DEVELOPMENT PROGRAMMES

Most of the government development departments are working in the project area. There is Palamau District Rural Development Authority which does the rural development works through government departments like agriculture, soil conservation, minor irrigation, animal husbandry, small industries etc. The development programmes include IRDP, TRYSEM, DPAP, JRY etc. There is a network of rural branches of banks for advancing loans for various approved purposes .

There is one North Koel Reservoir Project which is nearing completion, but the reservoir is downstream and will not benefit the villagers of the Project Area. Similar is the case with another proposed Auranga Reservoir Project.

C. LOCAL DEPENDENCIES ON THE RESERVE

Rights and Concessions

All the Reserve Forests constituted prior to 1923 were gazetted free of rights but the forests which were reserved subsequent to that year are burdened with major or minor rights. The Protected Forests and the Khalsa Forests are burdened with the general rights prevailing in the New Protected Forests of Chhotanagpur. These rights and concession are continuing till date and are difficult to withdraw all of a sudden.

The tenants of the villages near the Reserve Forests are allowed to graze their cattle (except sheep and goats) free of charge, subject to restrictions which may be thought fit by the Forest Officer in charge. The tenants are also allowed to remove free of cost brush wood, grasses, bamboos and edible flower and fruits including that of Mahua from these forests.

In case of Old Protected Forests and Khalsa Forests, the villagers concerned are allowed to take: (i) timber, poles and bamboos for their domestic use, (ii) timber and poles for their agricultural implements, (iii) fencing materials,

(iv) Mahua flowers, edible fruits and roots, (v) fire wood, and (vi) rearing of lac and tasar on payment of royalty.

So far as the new Protected Forests are concerned the nature and number of rights allowed to the villagers vary from village to village and these are enumerated in Khatian Part- II, the record of rights. In general, the rights are in respect of timber, poles and bamboos for bonafide domestic and agricultural uses; the collection of fire wood, dead and dried fallen trees; grazing with exception of goats and sheep; collection of chope, fruits and flowers including that of Mahua; and rearing of lac. These rights are allowed to be exercised with certain restrictions in order to safeguard the health of the forest and regeneration in annual coupes. Besides these rights as mentioned in the records of rights, there are certain customary rights which have also been allowed and which are to be enjoyed by the villagers subject to the control of the Forest Officer Incharge. Such rights are in respect of collection of brushwood for fencing, way to places of worship and cremation ground etc.

Dependencies

1. Grazing

The forests of the Reserve adjacent to the villages which have been traditionally serving as the grazing ground for their livestock, support population larger than the carrying capacity and this has led to degradation of these forests. Now they are tempted to graze their cattle in forests where grazing is not permitted. Also, sometimes they kindle fire in the forest to get tender grass leaves for their cattle.

2. Removal of Fuelwood, Smallwood, Bamboo etc.

Fuelwood is the main source of energy for cooking purpose in the entire area. Most of the local requirements and that of nearby towns are met from parts of the Reserve and some forests outside it. Similar is the case with smallwood including bamboo.

These items are collected by villagers for domestic uses as well as for sale to generate cash income.

3. Collection of Non Timber Forest Produce

The villagers collect flowers, fruits, seeds, honey etc., from the forests of the Reserve. They venture into prohibited areas also. This causes

considerable disturbance to the Reserve. In many cases Mahua flower and honey collection leads to forest fires.

4. Employment

The area is deficient in employment opportunities. There is no forest working of any kind in the core zone and, even in buffer zone, only few forest working and Minor Forest Produce collection is allowed, the Forest Department including the Reserve remains the principal wage labour generator. However, the quantum of persondays generated falls far short of what is generally required, particularly during lean seasons.

In most cases unemployment compels the poor villagers to indulge in illicit felling and trading in timber and poaching. Sometimes they kindle fire in the forest in order to get employment in fire-fighting.

D. ISSUES AND CONSTRAINTS

The population inhabiting this low-rainfall, drought-prone area comprises mainly of six scheduled tribes, viz. Oraon, Birhor, Brijia, Kherwar and Munda and one scheduled caste Bhuiyan. Their houses are mud-built and

thatched or tiled ones. Their economic activities include marginal agriculture, cattle keeping and working as labourer if opportunity comes up. For meeting many of their agricultural, fodder and other household needs, they depend on nearby forests. Development activities have very little impact on them. The economic condition of the people is still very poor.

One of the most significant features of the village economy is that people are in the habit of keeping large number of inferior livestock. The veterinary health care facilities too are very poor. The Reserve keeps watch on the incidence of any abnormal disease or epidemic and carries out vaccination of livestock against them. The milch cattle are very low yielding, and no attention is paid by villagers on improvement of their livestock. Their main aim of having large number of cattle is to get bullocks and cowdung manure. Goats serve the purpose of meat and money needed for festivities and in calamities. There being no traditional pasture in the area, the entire livestock is grazed in forests, mainly Protected Forests

and parts of some Reserved Forests. Heavy reduction in uneconomic cattle population and their replacement with high yielding ones is desirable but it is not possible in a few years time. Again extraction of fodder from the forests instead of grazing their cattle there, is neither in the local habit nor feasible at the moment in view of the sheer number of livestock. The pressure on these grazing zones is getting accentuated as no consideration is being paid to the quality of the cattle and linkage facilities while advancing loans for the purpose by the concerned agencies, the result being that new uneconomic cattle are being added to the area. Quite often cattle are killed or lifted by carnivores which, though compensated, in the Reserve area, is an irritant between the Reserve and the local population. Cattle kills outside the Reserve remain uncompensated by the concerned authorities in want of government provision.

Agriculture though marginal and unprofitable, gives a psychological sense of security to the cultivators. Many households have their landholding more than their requirement. But,

the technology employed is traditional with no element of irrigation, inorganic fertilizers and high yielding varieties of seeds suitable for the area. Organic manure obtained even after keeping large number of uneconomic cattle, proves inadequate. However, there is tremendous scope for creating irrigation facilities by obstructing multitude of criss-crossing nalas in the area which after being supported by technology suited to the area may improve the lot of the villagers. In many areas mature crops are damaged every year by wild animals, mainly elephants, however it is compensated, though inadequately, at the rate of Rs. 100/- per acre. Such damages outside the Reserve remain uncompensated by concerned authorities in want of fund.

Fire wood is needed by the villagers not only for cooking purposes but for supplementing their inadequate clothing during winter and for watching their crops against possible damages by wild animals. Dried and fallen firewood materials are collected by men, women and children from Protected Forests and parts of Reserved Forests, though illegally,

but that has been in practice for long. On a rough estimate, each household needs 60 quintals of firewood annually and a conservative estimate of firewood productivity of an average forest in the buffer area is 10-15 quintals per hectare per year. So the situation as regards firewood requirement of the villagers living inside the Reserve is not alarming and buffer zone forests are capable of meeting them, provided the firewood is not exported to other firewood deficient surrounding villages and other areas of the district.

The villagers need bamboo and poles for repairing their houses, atleast biennially. Had the health of 23,000 ha. of the protected forests been good, this requirement would have been met adequately, but, at the moment all the Protected Forests are not in a state of health that permits laying out of right-holders' coupe. Again different Protected Forests have different degrees of pressure on them. So the people make up the deficit by extracting dried smallwood, sometimes even green ones, illegally from the nearby Reserved Forests. Atleast half the number of

villages are deficient in small timber.

Children deserve special mention since they occupy a very important position in their family economy. They collect firewood, go after their cattle in the forests to graze them and watch their houses in event of their parents going to earn wages which is generally available for very brief periods each year. They are malnourished and due to their position in the family economy, their enrolment, and if enrolled, the attendance in schools is very poor.

Employment opportunities for the villagers in the area are very few. They find employment in various activities of the Forest Department and some other development schemes which, particularly the latter, are not well spread over in terms of space and time so as to provide wage-earning opportunity uniformly to all villages and for longer period of time. In the cultivation period of June to October, they work on their own fields the return from which they are not always sure of. Under these circumstances people are tempted to indulge in illegal

activities in forests to earn their livelihood.

By and large majority of the people in the area are docile but the offenders amongst them are in good number, and the new factor of prevalence of countrymade guns in the area has added new dimension to the protection problem.

Reasons behind the indulgence of people in forest and wildlife offences vary from compulsion to greed, and generally unemployment forces them to undertake such activities. Their need for money compels them to sell firewood and timber in nearby deficient villages and Daltonganj city and to fell trees for their distant well off masters who gain maximum from such offences, and if caught, only these poor offenders get punished. The firewood and small timber depots run by the State Trading wing of the Forest Department are inadequate in number as well as ununiform in dispersal, but improvement on this line will not do since prices are too high to manage for the villagers.

The Reserve has no problem of vehicular poaching but there have been instances of poaching and trapping of wild animals by local people, reasons being unemployment and greed. Again, if the Reserve fails to employ the previous wage-earners, they indulge in kindling fire in the Reserve to press for their re-employment.

Distribution-wise, organised felling is a phenomenon of north-eastern border area of the Reserve. The pressure on this so far well protected zone has increased with the disappearance of nearby forests. Similarly, the possibility of migration of wild-animals, particularly the deers, to areas outside the Reserve and being poached there is not ruled out.

People depend mainly on three types of water sources for meeting their drinking and other household needs; wells, tubewells and seasonal streams. For reasons of tube wells going often dry soon after they are sunk, probably because they are not made to strike deeper perennial aquifers, wells are more

desired and relied upon. Most of the existing wells in the area are not sufficiently deep and are choked up, hence many of them dry up in summer. Damaged parapets and worn out interior pointing facilitates contamination during rains. There is lack of public water-testing and treatment facility. In the absence of the said water sources or for the reason of these sources being inconveniently distant, people rely on seasonal streams which are often contaminated.

People suffer from water-borne diseases during rainy season, diarrhoea being the most common. Malaria and tuberculosis have become endemic to the area. Unavailability of timely treatment even for common ailments, causes occasional death besides adversely affecting their earning capacity.

It is a frank admission that underneath the problems faced by the Reserve in its conservation efforts lies a conflict over the control and use of resources between the Reserve and the locals. While inspecting any case of crop-damage caused by elephants, people are quite often heard saying in anger

and frustration " You either confine your elephants and other wild animals inside your forests or open your forest to our use." Clearly, they do not feel these natural resources to be of their's. The situation is further complicated by their poverty and lack of employment opportunities. The present day conservation efforts become absolutely negative for them. The inadequate alternative sources of fuel, fodder timber and employment often force them to make more fierce demands on the resources of the Reserve. They ask for employment but at the moment Reserve can offer only a limited opportunities though there is no dearth of labour intensive works to be done.

ANNEXURE - I

TABLE: BLOCK-WISE POPULATION DETAILS, 1981

Sl no.	Name of village	No. of occupied residential houses	No. of house-holds	Total Population (including institutional and houseless population)			Scheduled Caste			Schedu Tribes	
				P	M	P	M	P	M	P	
1	Barwadih	9205	10239	52992	27845	25147	5371	5005	12805	12300	
2	Garu	2915	3074	16379	8491	7888	719	649	6766	6410	
3	Manika	7298	8278	47074	23819	23255	5512	5289	11034	10857	
4	Chainpur	15728	17343	102249	52337	49912	11895	11504	10193	9811	
5	Mahuadanr	6981	7434	44015	21857	22158	682	646	17685	18143	
6	Daltonganj	9173	10782	61533	31696	29837	7192	7054	6021	6004	

Source: Palamau District Census Handbook, 1981

ANNEXURE - II

TABLE : BLOCK-WISE OCCUPATIONAL STRUCTURE, 1981

Sl.No.	Name of village	Main workers											
		Total Main workers		Culti-vators		Agricu-ltural Labou-rers		Household industry- Manufacturing, processing, servicing and repairs		Other workers		Margin worker	
		M	P	M	P	M	P	M	P	M	P	M	P
1	Barwadih	14531	2283	6251	424	2919	1514	314	49	5047	296	528	1898
2	Garu	4789	1274	3286	187	738	906	80	7	685	174	9	134
3	Manika	13029	5105	7512	1770	1290	3161	122	31	1105	143	576	2324
4	Chainpur	27448	14612	14290	5840	9516	8280	436	184	3206	308	37	614
5	Mahuadanr	11340	4289	8096	2595	1922	1379	331	77	991	238	116	1351
6	Daltonganj	15299	3775	5790	673	4111	2485	579	105	4819	512	577	2223

NOTE:

- a) Main Worker: If a person has worked for 183 days or more during the reference period he has been treated as a Main Worker
- b) Marginal Worker: If a person has worked for less than 180 days or 6 months during the reference period he has been treated as a Marginal Worker.
- c) Non-worker: If a person did not work at all (not even one day) during the reference period he has been treated as a Non-worker.

Source: Palamau District Census Handbook, 1981