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Linking Conservation with Livelihood: Lessons from Management of Gir-Protected Area in Western India

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Abstract

Recent discourse on the management of Protected Area (PA) speaks eloquently about linking the conservation efforts with development of periphery especially the pastures and community forests. The approach is particularly important in the case of the PAs having large human population in the periphery with direct stakes in resources within the PA. It has been increasingly realized that conservation of the core is contingent upon development of the periphery of the PA- the philosophy being echoed by a number of Eco-Development Projects (EDPs) across various parts of the world. India has also gone a big way in implementing EDPs for conservation of major PAs in the country. The central focus of the EDPs has been to enhance livelihood support system through regeneration of CPLRs and other resources in the peripheral villages, thereby reducing people's dependence on the PA. This is to be achieved by involving local communities in planning as well as implementation so as to obtain reciprocal commitment for conservation and protection of the PA. The experience from the various EDPs at best is mixed; a lot more is desired to be done in order to achieve the laudable goals of regeneration and conservation. One of the major constraints in the design of EDPs, notwithstanding the faulty implementation, is that the efforts for regeneration of CPLRs in the periphery are seen in isolation of the efforts, or management plan for regeneration of resources inside the PA. This kind of disjointed approach for resource management not only affects the planning exercise, but it also hampers people's involvement owning to the limited stakes and inadequate incentives for protection. It is thus plausible that linking-up of regeneration efforts within and outside the PA by treating them as an integrated ecological system may help better management and also protection of PA through people's commitment for conservation. The paper demonstrates this by exploring alternative approaches for management in the context of Gir National Park and Sanctuary in Western India.

JEL Classification: ***Q23, Q26, Q28***

Keywords : Forest conservation; Protected area; Conservation and livelihood

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Linking Conservation with Livelihood: Lessons from Management of Gir-Protected Area in Western India

Amita Shah

1. Introduction

The policy discourse on management of protected areas (PAs) has come a long way from purely conservationist strategies to participatory approaches. In between these two there is a wide range of options that combine different elements of resource sharing, market regulation and privatization. Experience from a large number of developing economies suggests that none of the pre-conceived, `blue-print' solutions may work across different PAs though, it might have worked in the situations of wilderness without much of human activities around **(**Chopra, 1998**)**. This implies that analysis of the cost of bio-diversity loss and the development of appropriate institutions and incentives should primarily be a local exercise (Perrings, 2000). The choice of PA-management approach therefore, has to be in tune with the location specific situation-ecological, socio-economic-political and financial. Also, the choice is time specific; it may undergo changes along with different stages of PA-management. Exploring options and evolving new approaches therefore are important aspects of policy formulation on PAs.

Located in western part of India, Gir is surrounded by a substantially large human as well as livestock population having direct stakes in the ecology of the PA. The region had faced severe risk of extinction of its core wild life specie i.e. lion, before it was notified as sanctuary in 1965. Subsequently a number of conservation measures were initiated, leading to successful revival of wild life within the PA (Singh and Khamboj, 1995). By the turn of the century the wildlife population had overshot what was earlier considered as carrying capacity of the PA. To a large extent the success could be attributed to effective protection and habitat development practices, featuring the PA-management plan. The next stage therefore, is to evolve sustainable strategies for regeneration and conservation of vegetation and bio-diversity in Gir. It is envisaged that evolving appropriate institutional arrangement for sharing of the regenerated resources, especially from pastures within and outside the PA, might help both-conservation as well as people's livelihood in a sustainable manner.

1.1 Market Linked Approach

One of the possible strategies is to adopt a market-linked approach, which seeks to combine important elements of the two alternative approaches noted above[1]. Essentially, the approach involves regeneration of ecology under the existing conservationist management system while incorporating people's livelihood needs/stakes as a legitimate component of the regeneration strategy. Conceptually the approach offers a fairly practical solution for reducing people's pressure on the eco-system by making adequate provision for the supply of resources like fodder, fuel wood, non timber forest produce (NTFPs), water, and silt on a sustainable basis. It envisages multi-stakeholder professional organizations to look after the resource management and sharing of responsibilities; these aspects are generally missing in the other two approaches. The approach therefore renders some kind of a supply management system with technological interventions of resource regeneration and market development. Another important feature of the approach would be to define a specific timeframe of say, 20 years within which the results should be achieved. If properly executed the strategy may turn out to be cost-effective (i.e. requiring relatively lower amount of subsidies) and at the same time, ecologically more effective (i.e. reducing degradation within a `reasonable' time frame)

Given this backdrop the paper seeks to explore alternative management strategy for Gir, which consists of large tracts of common pool resources both within and in the periphery of the PA. This is being explored in the light of a detailed mapping as well as valuation of the existing resources and the use thereof.

1.2 Objectives

The specific objectives are to examine:

(i) Present status of the ecology of Gir;
(ii) People's dependence on the PA; and
(iii) Alternative approaches for PA-management with a special focus on regeneration of pastures within and outside the PA.

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[1] For further details on the alternative approaches to PA-management, see Shah, 2003.

The paper is divided into five sections including this introduction. The next section examines the status of Gir-ecology and the major benefits flowing from the resources along with estimates of the cost of PA-management. This is followed in section 3 by a detailed account of the extent and nature of people's dependence on the PA. Section 4 discusses implications of the present patterns of resource-use as well as management, and explores alternative approaches. The last section discusses policy recommendations. The study is based on secondary as well as primary data collected from a sample of villages in the periphery and also from selected hamlets and forest settlements inside the sanctuary area[2].

2. Gir PA and the Benefits Flowing from Its Resources

Gir eco-system is the last surviving habitat for Asiatic lions. Spread over an area of 1412.1 sq.kms, Gir is one of the largest compact tracts of dry deciduous forest in semi-arid regions in the country. Apart from being the only home of the Asiatic Lion, the eco-system assumes special significance because of its tremendous regenerating, self-supporting and sustaining capacity for the rich and diverse fauna and flora (Singh and Kamboj, 1995). Recognising the special ecological features of the region it was first notified as a sanctuary in 1965 and subsequently as National Park in 1975 under the Wild Life (Protection) Act (1972).

Gir forest represents an important ecological formation in western parts of India. Apart from being the only home of the surviving Asiatic Lion it constitutes catchments of the seven major rivers thus, providing ecological security to the surrounding drought prone region. Conserving this ecosystem therefore would serve some important functions (Singh, M., 1995) as shown in Figure 1.

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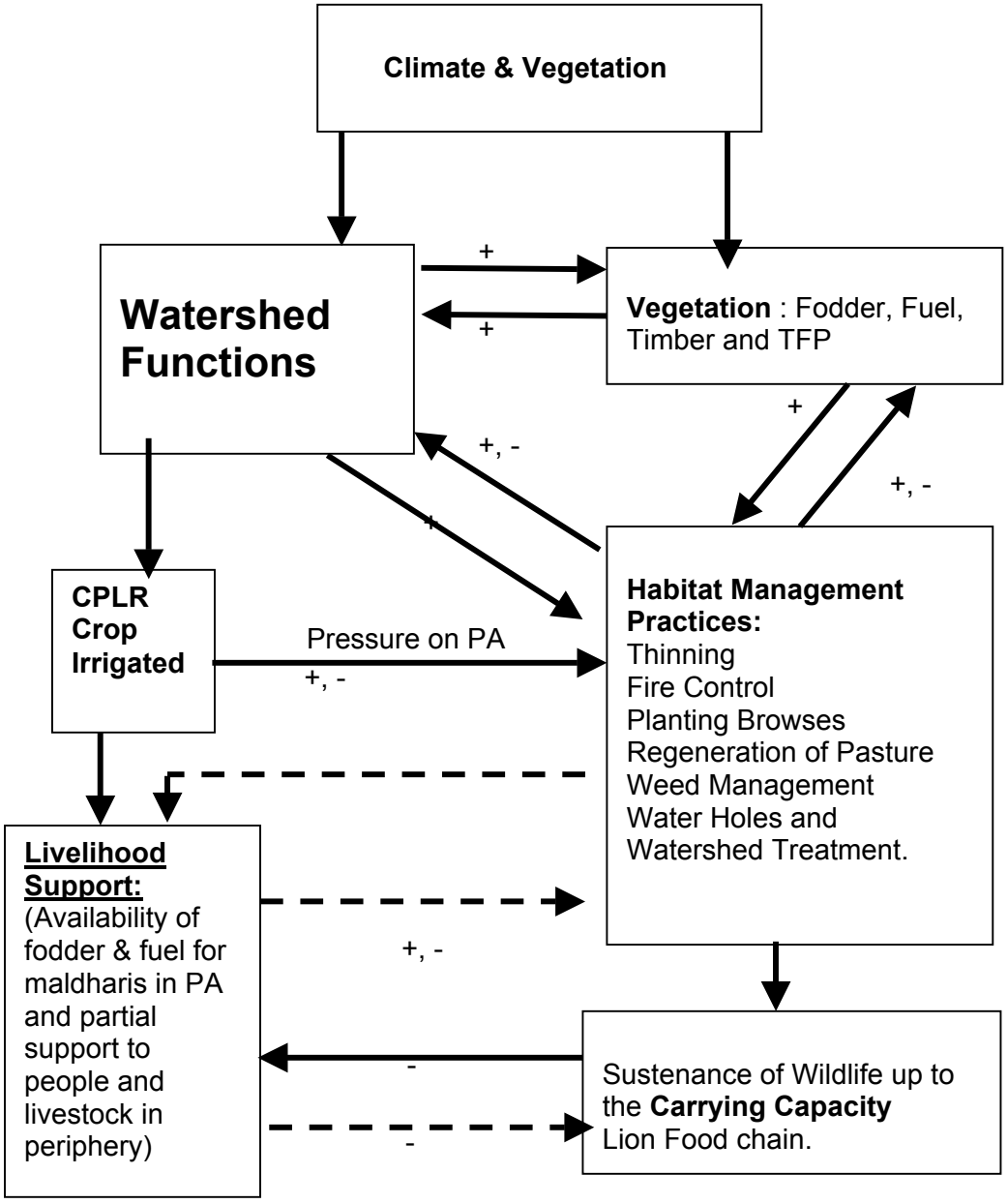
[2] Conservation Values: Largest compact tract of dry deciduous forests in the semi-arid western part of the country; Last home of `Asiatic lions', Panthera leo persica, last surviving gene pool' in nature on earth; Rich biodiversity area supporting large number of species including several endangered species; Highest concentration of top carnivores-lions and leopards (over 500), and possibly the single largest population of marsh crocodiles in the country; Catchment area of seven major rivers which sustains economic prosperity of this drought prone region; Ecological security and environmental amelioration for the region, climate, water, salinity prevention and pollution absorption; Important biological research area with considerable scientific, educational, aesthetic and recreational values; Mother of cultural and religious evolution in Saurashtra.

Figure 1: Gir-Ecology



+ : Positive Impact

- : Negative Impact

It is important to note that the region including the PA has been viewed as a fodder bank especially during drought years, attracting livestock from a number of places like the rest of Saurashtra, Kachchh, North Gujarat and even Rajasthan. While there is no systematic estimate of intrusion of people from other regions – seasonal, occasional and permanent, there are evidence which suggest that the region has been performing an important drought proofing function both formally as well as informally (Sinha, 1967). Essentially, regeneration of ecology should be based on development of watersheds covering the seven rivers flowing from the PA. In that case, the regeneration plan should also cover those areas of these watersheds, which lie out side the PA. Linking up these areas in the periphery would amount to incorporating people and their economies as integral parts of the ecology. The peripheral region and people therein thus, become important stakeholders though, their stakes may assume a relatively lower priority in management of the PA (see Figure 1).

2.1 Benefits and Costs of PA-Conservation

The close interactions and continued conflicts between people and the PA suggest the need for a major shift in the management strategy of Gir region. Before discussing that it would be useful to have a brief account of economic and ecological services rendered by the PA. This section presents a summary account of the valuation exercise conducted in a larger study undertaken by the author (See Shah, 2003).

Estimating Benefits

2.1.1 Direct Benefits

The annualized value of benefits from various economic services from the PA is estimated to be Rs. 47,705.1 lakh of which, various direct use-values like fodder, fuel wood, irrigation etc. comprises 20 per cent (See Table 1). However, if we consider the value of fuel wood that might be realized through logging or maturation as well as damage due to natural factors like cyclone etc. as having direct use value, the share of direct use value increases to about 85 per cent. Two issues are important in this context. First, the estimated fodder value is based on the national average of 3000 kgs/hectare for the Indian forest (Tewari, 1994). Local prices have been used for converting the estimated fodder production into monetary value. This was essential because the existing studies

on Gir do not provide any estimates of fodder production from the PA. The second aspect relates to the estimates of NTFPs. Since there are no systematic estimates of the production of a large number of NTFPs available from the PA, we have once again, resorted to using the national average to estimate the market values. It may however, be noted that according to the official norms (adopted by the Central Statistical Organisation), the actual production is generally 10 times the value realized in the market. We have however, not incorporated these projected values of NTFPs in our estimates. Together, these estimates lead to a downward bias in valuation of the benefits resulting from direct use of PA-resources. This is to ensure that the estimates do not become unrealistic when compared with the estimated cost of investment, necessary for regeneration of the PA.

2.1.2 Valuation of Non-Use Benefits

More than direct as well as indirect use-values, non-use benefits have special relevance in the context of a protected area. These include benefits like existence value, rarity and aesthetic value, option value, cultural value and ecological value. Assessing the monetary value of these benefits however, is difficult. Alternatively we have tried to capture people's perceptions on relative importance of the major attributes of and also on desirability of conservation of the PA. This was obtained by asking the respondents to rank the five major attributes, which can be broadly classified as Watershed Functions, Rarity of Lion, Bequest Value, Religious-Aesthetic value and Consumptive Value (grazing + fodder). The exercise is based on qualitative information collected from 162 households from four villages in the periphery of Gir-PA (for details see Shah, 2003).

It is interesting to note that apart from consumptive use, people in the peripheral villages attach significant importance to religious- aesthetic aspects of the PA, which is closely followed by watershed services, rarity and bequest value. It may be noted that the religious aspect has a close link with the overall ambience of the forest ecology and its aesthetic value. It is largely perceived that the religious spots may also lose their cultural-aesthetic importance if the forest cover in the PA gets deteriorated. To a large extent, these perceptions are in conformity with the observations made in an earlier study by Debnath et. al (2001).

2.1.3 Cost of PA-Management

The estimated budget for a five year period between 1995-96 and 2000-01 is Rs. 5,957 lakh of which Rs. 1,874 lakh (i.e..45%) is contributed by Eco-development Project (EDP), supported by the Global Environment Facility (See Table 2). The average budget for the year is estimated to be Rs. 1191.4 lakhs. It may however, be noted that the proportion of the total resources allocated for undertaking specific measures that have direct bearing on regeneration of the PA, is about 52.4 per cent. Compared to this, a significantly large proportion of the budget is allocated for infrastructure and recurring expenditure. Moreover, it is plausible that even the funds allocated for carrying out various regeneration measures, may not yield direct impact on regeneration. For instance, the amount spent on tourism, socio-economic and village eco-development could be spent in a manner that may not directly improve vegetation and other ecological aspects within the PA. A similar pattern is also observed in the case of actual expenditure. It may be noted that allocation as well as expenditure on soil-water conservation (SWC) is quite small i.e. less than 4 per cent.

It is possible that the PA-region is receiving benefits from several other developmental schemes such as Watershed Development, supported by Ministry of Agriculture or Rural Development, Government of India. We do not have estimates of expenditure from other schemes related to natural resource development in the region. The basic point however, is that even if there are other schemes in operation, they tend to operate in isolation of the management plan for the PA. This may imply that the gains from Integrated Forestry Management may not yield better result especially, in absence of proper integration between SWC-measures and forest management.

Since Eco-Development Project constitutes a major proportion (i.e. 31.45 per cent) of the total expenditure, it is pertinent to examine profile of the activities, planned or actually carried out, under this project. If a major part of expenditure under the project goes on to support development of amenities and infrastructure at village level, or for meeting the requirements like land leveling, deepening of bore well, purchase of agricultural employment/inputs, or obtaining alternative sources of fuel and building material, at household level, regeneration of pastures (vidis) as well as degraded forest are likely to be pushed back to lower priorities. Encroachment of pastures and illegal grazing in degraded forest in the peripheral villages is yet another issue that may constrain utilization of fund for

some of the important activities like livestock management, fodder development, nutrient enrichment etc.

Overall, a comparison of monetary benefits and costs suggests that the former is significantly higher than the average budgetary allocation for PA- management plan. Even if we compare the value of direct–use benefits, the estimates are fairly higher the actual expenditure. A summary of the major benefits and costs has been summarized in Box 1.

Box 1: Summary Benefits and Costs (Rs. Lakh at 1995-96 Prices)

Value of Benefit		Value of Cost	
Details	Value	Details	Value
Direct Use	9669.14	Average Budget for Management per year	1191.40
Indirect Use	37883.00	Crop Damage	419.80
Opportunity Cost*	39524.98	Loss of livestock	143.16
Loss of Crops to replace the fodder	2592.00		
Potential loss of fodder	1170.33		
Soil Loss	9793.25		

* Refers to the value of land under alternative use i.e. for crops and plantation. This is the cost of lost opportunity, which may be treated as minimum value of conservation

3. PA and the People

There are three sets of human settlements within and in the periphery of Gir. These include neses (clusters of cattle herders i.e. Maldharis), forest settlements, and revenue villages. The first two are located in the sanctuary whereas revenue villages are located on the periphery of the PA. It may be noted that people in neses have greater access to resources within the PA and therefore considered to be the most crucial category from the viewpoint of the PA management. The Forest Settlements are next in terms of people's access to the PA resources. The revenue villages, as such do not have any `legal' access or rights to obtain any direct use value from resources within the PA. Obviously therefore, the analysis of people's dependence on the forest will have to keep in mind the two separate categories of people- those living within and outside the PA. In what follows, we discuss the nature and extent of forest-dependence among these two

categories of people, and identify issues that emerge from interface between the two.

3.1 People Inside the PA

At present, there are about 54 hamlets (neses) and 14 Forest Settlements in Gir-PA. Together they inhabit a population of about 8,000 persons and 11,000 livestock. While these people living inside the sanctuary draw upon the various resources such as fodder, fuel, land, water, NTFP, timber etc. for satisfying their livelihood needs, they also seem to be contributing towards sustenance of the ecology. Two important aspects are often noted in this context. First, grazing of livestock with a well laid out seasonal rotation helps sustaining bio-diversity of grasses; this may also help reducing the incidence of forest fire, which has a high probability of occurrence under the dry-hot weather in the region. Another ecological function seems to have been performed by the people is that of keeping up the chain of herbivorous species, in absence of which, damage to the peripheral agro-economic system and crops might have been more severe.

Recognising the conflicts between wild life and people inside the PA has led to a policy approach, which seeks to relocate these people outside the PA as noted in the special scheme prepared for Gir-Sanctuary way back in the early seventies, and subsequently in the management plan prepared during the mid-nineties. In the same vein, the management approach focuses mainly on protection measures and vigilance against interference by the local communities as well as other vested interests from industry, mining and developmental activities. Together this has led to the usual scenario of conflicts between people and the PA or between conservation and livelihood. The conflicts become more severe during droughts. What has aggravated the situation is- `inappropriate' use of land as well as water resources in the peripheral villages. This is reflected by the fact that 33 per cent of the forest area in and around the PA are degraded and/or highly degraded [Singh and Kamboj, 1995]. Apart from these, the PA has a network of about 600 kms. of road length and 15 kms of railway tracks. More than 2 lakh vehicles pass through Gir every year causing problems of noise as well as air pollution on the one hand and damages to wildlife on the other. Presence of a number of religious places adds to these problems.

3.2 Cattle Herders in Neses: Resource Use and Damages

Cattle herders (Maldharis), residing inside the PA, face maximum resistance from the forest management team, as they have relatively higher dependence on forest resources especially, fodder, as compared other communities residing in forest settlements. Unlike Maldharis, the residents of forest settlements, are involved in crop cultivation hence, their dependence on livestock is very limited. Maldharis, on the other hand, keep large size of cattle herds, for which free grazing is the common norm. As a result, way back in the early seventies, the Maldharis had to face involuntary resettlement out side the PA. Unfortunately, the resettlement process was so unfavourable that many of them refused to move out, and some of those who did get resettled, eventually returned back to their hamlets inside the PA (Singh, Choudhary, 2000). We have tried to assess benefit-cost for these nearly 3-5000 people who continue to stay within the PA.

Table 3 presents estimates of benefits and costs accruing to Maldharis living in neses within the PA. The benefits are mainly in terms of greater access to forest resources as compared to those living outside the PA. Against these, the costs are mainly in terms of lack of physical infrastructure, social and economic alienation, and conflicts with the forest department. It may be noted that the loss of livestock forms a only marginal proportion i.e. about 4-5 per cent of their total stock every year. Since a substantial part of the livestock-loss is likely to be consisting of less productive cattle (as the more productive cattle are better protected and taken care of), the actual loss could be treated as a `rent' for occupying the housing space within the PA.

It is observed that the estimated value of the benefits in terms of direct use of forest resources is Rs. 1147.81 lakh per annum. Against this, the cost bone by the Maldharis works out to be Rs. 112.5 lakh. The net benefit is Rs. 1,035.31 lakhs. Alternatively, we worked out the net returns from selling of milk and farmyard manure. This worked out to be Rs. 906. 98 lakh per annum. These estimates clearly suggest that the Maldharis derive significant economic benefits from the PA. Conversely, it implies that shifting them out would require a fairly attractive compensation package that may ensure at least similar if not the same level of livelihood support after the resettlement. Or else, these Maldharis should be convinced to cooperate with the conservation objectives through participatory

processes for awareness generation and improved compliance, given the existing norms of `rights and restrictions[3].'

3.3 Peripheral Economy and Interface with PA

The periphery of Gir consists of 99 villages in the radius of 5-7 kms. Table 4 provides information about these villages with varying distances from the PA-boundary. In 1991 these villages had 26,397 households with a population of over 1.52 lakhs. By now, the human population would have increased to about 1.8 lakhs using the average growth of 2% per annum. According to the official estimates these households own about 95,000 livestock.

To a large extent, this population (human + livestock) depend on various ecological as well as economic services provided by the PA. The most important among these are water (i.e. the seven rivers originating from Gir) and fodder (with high degree of bio-diversity and quality) which sustains a large number of faunal diversity species including milch animals. Together these resources have acclaimed a special agro-ecological significance to the region, which is the only green fertile patch of land in the dry/semi-arid region in the western part of Gujarat. In turn, this has been reflected by the relatively higher productivity of land as well as livestock, cultivation of high valued crops like sugarcane as well as mango (and other horticulture) plantation, and scenic beauty with a number of religious places in the region.

However, agricultural in the peripheral villages is facing certain challenges. For instance better availability of ground water and soil moisture in the region has led to increased extent of water intensive crops like sugarcane and cotton. This has resulted in depletion of ground water and drying up of streams. This, in turn, has

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[3] Of course, both these are highly contested issues. While some ecologists as well as social activists perceive these people and their domestic livestock as parts of the ecology of Gir, there are however, some differences of opinion among the PA-managers. For, it is often argued that the people (especially, Maldharis i.e. cattle herders) living within the PA are recent settlers and, are largely responsible for degradation of floral bio-diversity as well as for forest fire. It is also felt that the domestic livestock, providing easy prey for the lion, has led to distorting the genetic characteristics of this core wildlife specie. In turn it forces lions to go out of the PA in search of the domestic animals and thus results in increased damages to the property and people in the peripheral region.

increased the risk for the wildlife since a large number of wells and water holes have to be created in order to provide adequate drinking water for them inside the PA (Ramachandran, et.al, 2001).

Finally, natural disasters like cyclone and droughts have also affected the balance between ecology (including wildlife) and human requirements. For instance, a devastating cyclone during 1982-83 had destroyed about 28 lakh timber trees besides other shrubs and plants. Similarly, frequent droughts and the resultant water scarcity in the region have led to stunted growth and sparse vegetation in the large tracts of degraded (345.5 sq.kms.) and highly degraded areas within the PA (122.2 sq.kms). Besides this, there are other factors such as natural calamities, causing degradation within and in the periphery of the PA[4].

Overall therefore, Gir forest has undergone significant changes over the past two centauries, leading to drastic reduction in the forest area as well as its resources (Singh, 1997). It is noted that "encroachment and destruction of natural surroundings of the PA, increasing population of carnivore and herbivore and increasing disturbance to wild animals force them (i.e. lion) to move outside and to cause crop damages and killing of livestock. Hence the man-animal conflicts are increasing, threatening the wildlife in turn" [Singh and Kamboj (1995); also see Sinha, (2001)].

3.4 Population Growth, Changing Land Use and CPLRs

As noted above the rich ecological resources of the region are surrounded by densely populated human settlements. Between 1971 and 1991, the population increased at the rate of 2.19 per cent per annum. This is slightly lower than the district average of 2.23 percent and the state average of 2.74 per cent per annum. Prima facie, this observation supports the generally held view that the PA-ecology attracts more human as well as livestock population in the immediate periphery i.e. in the radius of less than 3 kms. Prima facie low level of population

[4] The compensation package prepared in the early seventies, consisted of 3 hectares of cultivated land with proper treatment, access to CPLRs @ 16 hectares per 100 livestock, a plot of 600 sq. meters for housing and cash subsidy for construction cost, seed and agricultural equipments, and other amenities. The cost of the package works out to be about 2. to 3 lakh (at 1994-95 prices) per household. This is fairly small compared to the annual flow of benefits derived from the PA.

growth in these talukas could be attributed to two important changes that have taken place since the mid-seventies. First, due to protection measures people's access to forest resources has declined (though, not stopped) over time. Second, decline in the quality and quantity of Common Property Land Resources (CPLRs) has led to out-migration to the nearby urban centers. While these propositions are difficult to ascertain in absence of detailed investigation, we have tried to find plausible explanations by examining some of the important changes during 1971-1991 in the peripheral villages (See Table 5). These are:

i. Proportion of forest to the total area has increased by 18 and 15 percent in the nearby and distant villages respectively.

ii. Against this, there has been a decline in the area not available for cultivation. However, a major part of the increase in forest area seems to have come from conversion of village pastures into forest vidis at the time of demarcation of the PA and subsequently while redefining the boundary.

iii. Irrigation has also increased substantially but, more so in the distant villages. In 1991, the total area under irrigation was 8,088 ha among 77 nearby villages vis-à-vis 6,237 ha. in 20 distant villages.

iv. As a result, area under crop also increased in 52 out of the 99 villages. In the remaining 47 villages, net-cropped area (NCA) had declined by 20, 646 hectares. To a large extent, this decline is mainly due to demarcation of the PA boundary. It is observed that as many as 32 villages in the periphery had lost more than 100 hectares of private cultivated land in each village, besides several villages having lost their CPLRs under section 4 of the Land Acquisition Act.

Increased irrigation in the region along with regeneration of the PA should imply higher rate of population growth vis-a –vis the district or the state average. But this, as we noted earlier, is not the case. If so, the lower growth rates in peripheral villages suggest two possibilities in terms of population movements. That is people in the distant villages are either pushed into the nearby villages and/or have been pushed out of the region probably due to declining size and quality of CPLRs in these villages. Given the fact a large number of villages have also lost a part of the cropped land, out-migration from the peripheral villages appears to be a more predominant phenomenon than the movement nearer to the PA.

The issue of CPLRs has been probed further by obtaining information from 29 villages in the periphery. The information has been collected through repeated visits and informal discussions with individuals as well as groups of people in these villages. This was essential because the issue of CPLRs is very sensitive and highly politicized. In turn it makes it difficult to get accurate information on the size and status of CPLRs. The situation becomes more complex as many of these villages have continued conflicts with Forest Department due to inclusion of CPLRs within the PA-boundary. Notwithstanding these limitations we have tried to capture some of the basic information pertaining to CPLRs in these 29 villages (see Table 6). It is observed that the size of CPLRs has declined substantially in 18 out of 29 villages. To a large extent this has happened due to notification of village pastures as forest area within PA. Moreover, there is a significant problem of encroachment of CPLRs by the village communities. As a result, 7 out of the 29 villages have no or very small (i.e. <10 hectares) area left as gaucher (or pasture) land. Another 14 villages have about 10-50 hectares of pastureland. It is therefore, crucial that these pastures are properly regenerated and managed so that people in these villages do not have to depend much on the PA.

How far people in the periphery actually depend on the forest resources? What is the extent of their dependence on these resources? What is the nature of conflict over these resources? And what is their perception about future plan for regeneration of pastures and vidis within and outside the PA? These issues have been examined through a sample survey of four villages, 4 neses and 2 forest settlements in Gir-PA[5]. In what follows we present a summary of the major observations based on the secondary as well as primary data.

We have tried to examine these aspects by conducting a house listing in eight revenue villages, four neses and three forest settlements. The exercise was conducted by combining a survey method with informal discussions by forming groups of the homogeneous categories of households. The information is also supplemented by functionaries of outside agencies having close familiarity with

[5] The primary survey consisted of sample households selected from five categories viz; large farmers with irrigation (LI); small farmers with irrigation (LI); farmers without irrigation (UI); landless (LL); and traditional herder communities (LH). The sample households were selected by adopting a stratified random sampling procedure. Table 1.2 presents distribution of the sample households in different categories.

the village communities over a long period of time. The main observations emerging from this exercise have been discussed in the subsequent analysis.

3.5 Livestock and Fodder

It is observed that as large as 45 percent of the households in the peripheral villages do not own land. Similarly, 32 percent households in these villages do not own any livestock. This is quite significant. The households in neses and FSs are not permitted to own land though, land is made available to households in the FSs for cultivation on lease. The large proportion of landlessness in revenue villages however, reflects dynamic changes in the land market where many of the traditionally cultivating communities like Kolis are coming from other (less irrigated) regions to till the land of other households in the Gir region. Thus it is possible that a part of these landed households in the study villages are owners of land in their own villages.

Notwithstanding this specific feature of a part of the landless households, what we have generally observed in the study region is a fairly close relationship between those without land and those without livestock. This, of course, leaves out the traditional herder community, which owns substantial number of livestock, at times without much of a land base. These communities traditionally depend on the village pasture and/or the PA for sustaining their livestock. Among the remaining households, average number of milch animals is found to be fairly small i.e. 2.4, 11.8 and 23.3 in revenue villages, FSs, and neses respectively. These estimates are worked out by considering only those households, which had some livestock. The gross average would be even further lower than this.

Prima facie, the limited ownership of livestock in the peripheral villages would suggest lower dependence on the PA for fodder. While it is difficult to get a realistic estimate of people's dependence on the PA, findings from our primary survey suggest that nearly 35 per cent of the households in the peripheral villages obtain up to 50 per cent of their fodder requirement from the forest vidis. Only 13 percent obtain more than 50 percent of the fodder requirement from these resources. The remaining 48 percent did not report accessing fodder from the forest. As noted earlier, a part of these 48 per cent households may not have any livestock; the proportion of households without any livestock was found to be 32 per cent. This implies that only 16 per cent of the households owning livestock

did not depend on forest for their fodder requirements. These estimates seem to be fairly reasonable.

Overall the findings, notwithstanding the lower livestock population per household, suggest substantial dependence on the PA for meeting at least a part of the fodder requirement even in the peripheral villages. Obtaining a realistic estimate of the total livestock population thus, becomes crucial for assessing the total dependence for fodder among the peripheral villages. In absence of this, the micro level estimates, based on the households' reported access to the PA, may not help working out the aggregate estimates of the actual availability of fodder from the PA and people's dependence on that.

3.6 Fuel wood

Compared to fodder, people's dependence on PA for fuel wood is much higher as already shown by the IIFM study and also our house listing. However, at a closer investigation and the information obtained through informal discussions with the people it is learnt that nearly 80 per cent of the households in peripheral villages depend on PA for the fuel wood requirements. This excludes households belonging to socially as well as economically better-off communities viz; Patel, Brahmin, Luhana, Ismailis, and Mahajans. The above phenomenon has been further confirmed by the available estimates suggesting that as large as 74 percent of the fuel wood requirement of households in the peripheral villages is being met by fodder collection from the forest or, through market purchase, a large part of which is likely to have come from the forest.

Of course, fuel wood collection varies significantly across households as observed during our survey in the sample villages. Basically, the dependence on forest would depend on the households' capacity to shift to alternative sources like kerosene, cooking gas (LPG) and bio-gas. While most of the households in the peripheral villages use kerosene, it constitutes only a part of their requirements for fuel. To a large extent these households obtain a fixed quota of kerosene i.e. 10 liters per month at a subsidized rate. This might be sufficient at the most for one third of their requirement. For the rest, these households depend on fuel wood either through direct collection from the forest or through purchase from market/other households.

According to recent estimates, fuel wood requirement per household is 6 kgs. per day. For the 26,397 households in 1991 the total requirement would work out to be 57,809 tones per year. Assuming that fuel wood constitutes half of the total requirement of these households, the demand for fuel wood in the periphery would be 28,904 tones per year. This is based on the assumption the remaining fuel requirement is met by kerosene, dung cake and LPG etc.

Thus the total requirement and the estimates demand by the peripheral villages (subtracting the kerosene, dung, LPG) are 57,809 tones and 28,904 tones per year. These estimates are fairly lower than the estimated availability of fuel wood (of the tune 1.87 lakh tones per year) from the PA (i.e. sanctuary area). This kind of vast difference between the total requirement and the estimated availability, notwithstanding the limitations in estimation of the later, would suggest substantial amount of fuel wood extraction for commercial purposes. This corroborates the estimated requirement by the people from a larger periphery covering 150 villages. According to this the required fuel wood is 1.17 lakh tones per year. It appears reasonable to argue that a large part of the fuel wood requirement of these 150 villages is met by the Gir-PA through collection and/or market purchase.

3.7 Timber

Extraction of timber is strictly prohibited. However there are occasional evidences where people from the periphery indulge into illegal felling either directly or indirectly. Such instances often surface during informal discussions with people where it is reported that about 5-7 per cent of the village community in the immediate periphery of Gir (i.e. <3 kms. radius) are involved in such activities. These households/individuals often belong to economically and socially very vulnerable groups of the society. However what is concerning is that their involvement in such activities, at times, is triggered by some of the resourceful households in the villages often having political patronage. The economically vulnerable individuals fall prey to the `greed' of the resourceful persons in the time of extreme distress when they need cash income. On other instances they do undertake this risky activity because of their sheer need and ability to maneuver the protection system. It is thus essential to distinguish the circumstances that lead and make it possible to extract timber from the PA.

3.8 Differential Pattern of Dependence among Households

The above observations along with our informal interactions with the village communities suggest a broad pattern of interface between people and PA across different categories of households in the periphery of the PA (See Box 2). Prima facie, we have categorized these households into three: First consists of the resource poor households with no or small piece of land and limited livestock. The next category consists of middle level agriculturalists with medium size of land and livestock ownership. The third category represents households with large land holdings and/or livestock and also socio-political power. It is postulated that households in the first and the third categories `depend' significantly on the PA- the former does that out of the `need' to meet their subsistence requirements, and the latter out of the `greed' to maximize their earnings. Apart from the economic base, the actual dependence is also determined by household's capacity to manipulate `rules and rulers' of the PA.

Box 2: Differential Interface across Households

Type of Households	Asset Base	Potential/ Actual Benefits from the PA	Losses due to the PA	Likely Response to the EDP
Poor	Landless or marginal farmers with no or limited livestock	Fuel wood, NTFP, Illegal grazing for small ruminants	Limited	Good response if (a) alternative grazing space is provided; and (b) alternative fuel is affordable
Middle range of Farmers	Moderate land and livestock	Moderate use for fuel wood	Moderate to high (depending on the location of the farmers)	Good response if, effective protection to farms is provided
Better off	Large land holdings and livestock	Fodder	High	Limited response because the loss of fodder benefit might exceed the limited protection which could be provided under the project

Understanding this dynamics is very crucial for evolving right kind of incentives as well as compensation packages for different categories of households so as to reduce their dependence on the PA. It is crucial to note that whereas all the households have similar access to the forest resources in practice the access varies significantly depending upon the socio-economic and political base.

3.9 Negative Externalities

Despite the direct benefits from the PA, people in the periphery face severe problems of the wild life damaging the crops. This aspect has already been discussed while estimating the economic cost emanating due to conservation of the PA. However, apart from the actual damage to the crops, people have to face lot of hassles for protecting their crops especially, during night hours. Majority of people reported that they have to keep guarding their crops from various herbivores such as blue bull, chital and wild boar. The problem starts right from the time when the crop is sown. Farmers have to keep awake through out the night for protecting the fields as the herbivores cover as much as 20-25 kms. of area both times while going as well as while returning early morning.

To a large extent, the phenomenon of herbivores going out to the field is an outcome of the degraded as well as improper vegetation within the PA. Availability of irrigation and might have aggravated the situation. The result therefore, is migration of lions in search of the herbivores. While it has been argued that lions have always been moving out in the radius of 20 –25 kms. its frequency has increased due to the frequent droughts. It may be noted at this stage that the increased frequency of droughts is more a manifestation of the high rate of soil and water erosion rather than a result of the declined rainfall in the region. Hence, in absence of proper measures for watershed management inside the PA, the vegetation is likely to remain low, which in turn, pushes the herbivores outside the PA. Lions happen to follow this food chain and in the process gets into conflicts with the people or the livestock. Interestingly, people in the sample villages reported that they would rather have lions on their fields so that the herbivores keep away! Breaking this cycle therefore, would require appropriate management of vegetation inside the PA, which in turn, necessitates proper measures for soil and water conservation.

The recent debate among the management team however, views increased vegetation as non-conducive for lion-habitat. But, this argument needs further

qualification. It appears that increased vegetation density has taken place mainly due to plantation activities in the National Park Area. This kind of vegetation is preferred only by Sambar. Other herbivores prefer more of open grassland with shrubs found in the sanctuary area in the western part of the PA. Given the degradation (rather than increased density) of vegetation the western region may not be able to sustain more herbivores so as to be able to increase the lion population beyond 150 or 160. This is perhaps, why one observes that the increase in lion population in the past few decades has taken place mainly in the eastern region. This however, still does not imply that improving the density of vegetation especially, grass and shrubs in the sanctuary area is non-suitable for habitation of lion. Resolving this issue is very crucial for, increased vegetation and its proper management (including `cut and carry' operations for collection of grass, weed-management etc.) has a significant bearing on economic benefits derived by people in the periphery. These issues have been discussed in the subsequent sections.

4. Alternative Approaches for PA-Management

The Present Status

The foregoing analysis of various economic and ecological services derived from PA and people's interface with resources therein has highlighted some important issues that need special attention while exploring alternative approaches for its future management. The issues pertain to: (a) habitat management which is conducive for the `core' wildlife specie; (b) regeneration of vegetation that could sustain wildlife and also people's needs subject to the carrying capacity of the ecosystem; (c) sustainability of resource-use; (d) institutional mechanism for sharing of resources; and (e) effectiveness of the protection measures. In fact, all these issues are closely inter-related, hence should be seen in a comprehensive manner rather than as isolated entities while designing management plan for the PA.

The forest department of Government of Gujarat has already worked out second phase of the management plan, envisaging a special focus on regeneration of pastures, and significant expansion of the home range in order to sustain a population of about 500 lions (Singh and Pathak, 2000). This of course, involves a detailed planning for resource management, people's livelihood and

implementation strategy. Given the need for regeneration of vegetation within and outside the PA, and the critical role of soil-moisture and water thereof, we have tried to explore alternative land + water use planning for the region. This is based on three basic principles: First, soil-water conservation assuming a top priority; Second, a more balanced allocation of water-resource within and outside the PA; Third, using a part of regenerated resources from the PA as incentives for reducing the pressure by checking haphazard and 'illegal' use of forest-resources on the one hand, and over exploitation of ground water on the other.

We have identified alternative approaches for land-water use and the requisite resource sharing mechanism as well as other subsidies/support to compensate the loss of income in the short/medium term. Subsequently implications of each of these alternatives have been mapped out for three sets of stakeholders viz; farmers with irrigation, farmers without irrigation and landless; and the cattle herders (Maldharis). This, of course, should be treated as indicative planning for regeneration, conservation and sharing of resources in the region.

Two considerations are important while exploring alternative strategy for PA-management: First, Gir-ecology has a vast tract of degraded and highly degraded areas, hence vegetative regeneration is crucial. The second aspect pertains to involvement of people in the periphery for effective conservation or protection of the ecology. Together these considerations bring to the core the issue of land regeneration and land-use planning. Assessment of benefits and costs presented earlier may provide a basis for exploring alternative strategy that could address these issues.

Evolving an alternative land-use (and vegetation) plan, essentially requires setting up of a suitable mechanism of accessing (or sharing) these resources with the people whose livelihood needs are closely linked with the ecological status of the PA. At present, the existing legal structure does not recognise stakes of the people especially, in the periphery. This, as we have seen in the previous section, is not in tandem with the ground realities that have obtained over a period of time. Non-recognition of people's rights thus, leads to a situation of a legal status quo where people continue to access the forest resources, but without the formal system taking note of that. What is worse is, the existing legal framework of `command and control' gives way to the usual scenario where protectors themselves turn out as appropriators; in a non-transparent system such as this, the chances of being caught is fairly low. The formal perception

therefore, treats this as `stray incidences' of illegal activities rather than a regular practice as a part of the people's livelihood base. What makes this worse is the fact that such extractions take place not only at the instance of those who `need' them for their survival but, also by those who have economic-social-political power to get into faulty alliances without being caught for their illegal activities. Exploring alternatives for more effective management in future should therefore, try to look into the changing pattern of people's resource base within and outside the PA, people's livelihood requirements, and the illegal alliances for extracting resources from the PA. This section tries to look into these issues with a view to identify alternative approaches for PA-management. The analysis has been carried out with the help of primary data collected from a sample of households in the study region.

4.1 People's Livelihood Base: The Present Scenario

Land, Irrigation and Livestock

The analysis in the previous section had indicated certain patterns in terms of population movements, changing land-use pattern, and people's dependence on forest. We propose to take this analysis further by looking at the livelihood base among five major categories of households covered by the primary survey. The following observations depict important features of the livelihood patterns and implications for resource-management within the PA.

i. A large proportion of the farmers (i.e. about 81 per cent) with irrigation pursue livestock as supplementary source of income, whereas many of those without irrigation and the landless cannot afford to have livestock. The proportion of households having income from livestock is 63 per cent among farmers without irrigation and 27 per cent among landless. Thus, livestock as a source of income is associated more closely with access to irrigation rather than land.

ii. Landless households depend more on the prospects of agriculture by seeking employment on farm. This, in turn, is influenced more by access to irrigation rather than to fodder and livestock. What is however, surprising is that 9 per cent of the landless households reported collection of forest produce as the source of income (among others) and another 13 per cent reported trading, which is also likely to be related to the various forest produce. Thus landlessness, as expected, is closely associated with dependence on forest.

iii. Similarly a large proportion of households from traditional herder communities have to depend on agriculture. This might imply that livestock alone is no more an adequate source of employment and /or income even among these communities. This observation is substantiated by relatively smaller size of livestock owned by these households. Declining access to CPLRs as well as fodders from the PA might be an important factor responsible for this phenomenon.

Together these observations substantiate the earlier findings that households on the two ends of the spectrum in terms of access to land and irrigation tend to depend more on forest resources. Whereas, those with land and irrigation tend to access fodder for their livestock, the landless (excluding herders) may depend on forest mainly for NTFP, illegal extraction of timber, collection of fodder, etc.

4.2 Status of Ground Water and Shift in Cropping Pattern

The decline in ground water table has been fairly widespread as reported in Table 7. In fact, those in the nearby villages recognised the problem more clearly than in the distant villages that are likely to be in the proximity of the command area of irrigation dams in the region. Obviously therefore, the extent of irrigation is higher in the distant villages (41%) vis-à-vis the nearby villages (17%). While we do not have details of cropping pattern in all 99 villages in the periphery, the observation about relatively better access to irrigation in the region suggests predominance of some of the more water intensive crops like sugarcane, cotton, castor, groundnut, wheat etc. Since the nearby villages constitute a large proportion i.e. about 68 per cent of the net-cropped area within the region, the pressure for using ground water is likely to be much more stronger than in the distant villages. If so, it may exert a negative impact on ground water resources within the PA. An important way out is to change the cropping pattern from more water intensive to less water intensive crops especially, in nearby villages.

We have tried to explore this option by obtaining perceptions of the sample farmers. While a large number of farmers agreed that the present cropping pattern is not conducive for ground water situation in the region, they were not willing to accept the proposed changes in cropping pattern. For most of them felt that shifting to mango-plantation in place of sugarcane or, groundnut instead of cotton will adversely affect their net returns. Nevertheless, a large number of farmers did recognize the fact that there has been a significant overuse of water

and that; there is a scope for improving water-use efficiency. Table 8 depicts people's perceptions about the measures that could help checking ground water depletion in the region. It is interesting that farmers though, unwilling to change their cropping pattern, recognise alternative crop-mix as an important mechanism for mitigating the problem of depletion of ground water. Incidentally, water-harvesting measures turned out as the most important aspect in this context.

A central point, which has emerged out of the above discussion, is that: the PA-management needs **land plus water use planning** where management of water (rather than land) should take a lead. However, before we discuss this issue in further details, we take a brief account of people's perceptions about the preferences for regenerating CPLRs and pastures outside as well as within the PA.

4.3 Use of CPLRs and Perceptions about Their Regeneration

Table 9 presents information about use of Common Property Resources (CPRs) in the study-villages. It is observed that a large proportion, i.e. 62 per cent of households access fodder/fuel from the village pastures, whereas 46 per cent also access the forest-vidis. This is substantially high considering the fact that about 22 per cent of the households do not have milch animals and 14 per cent of the households do not have any livestock. Moreover, it is likely that the actual use of forest vidis is under-reported. This kind of extensive use of CPLRs and forest vidis, when seen in conjunction with limited number of livestock per household, reinforces the need for better management of these resources especially, when an alternative strategy for cropping pattern and land + water-use is being explored.

4.4 Regeneration of Village Pastures

We have tried to obtain people's perceptions about their preferences for regeneration of CPLRs and also for reducing pressure on the PA. This is based on discussions with the households covered under the survey and also with the village communities. It was noted that whereas a majority of people in villages in the western zone of the preferred development of fodder alone, those in the eastern zone, felt that fodder + plantation might be a good strategy for regeneration of village pastures. This apparently suggests importance of livestock in the former vis-à-vis the latter, suggesting mutually reinforcing impact

of irrigation and preference for availability of fodder in Gir-West. Those having relatively low access to irrigation as in the case of Gir-east may like to access NTFPs from the CPLRs since their livelihood base is fairly low. Prima facie, this kind of preferences, viewed in the light of a proposed water-use planning, would imply increased allocation of water for fodder in Gir-West and for plantation in the case of Gir-East. It is encouraging that reducing the pressure on PA has turned out to be the most important reason for increased development of the CPLRs/forest vidis. This is followed by increased income from livestock, and then by drought relief.

4.5 Regeneration of Pastures on Forest Land

We tried to understand people's perceptions about improving the status of the forest and especially by reducing the pressure thereof. Among the various measures suggested, management of fodder collection and distribution, development of village-pastures, providing alternative source of livelihood and protection were reported as important steps.

While these are some of the usual responses with respect to PA-management, what is important is to note that a large proportion of people (i.e. 60 per cent) perceived economic + ecological services from the PA as non-sustainable given the present scenario of PA-management and people's pressure on resources thereof. Evidently, large farmers with irrigation and households from herders' community do not share this perception. This kind of divergence in perceptions indicates differential stakes across households with different socio-economic characteristics. It is however, encouraging that there is almost a consensus on desirability of conservation measures for sustenance of the ecology, especially because the present management system is viewed as highly satisfactory. We have tried to ascertain what kind of support people would expect in case the restrictions on resource-use from the PA are further tightened so as to attain order to achieve better protection of the PA. The responses, in a way, reflect people's willingness to accept complete ban on accessing the PA-resources. The responses in their relative importance are availability of alternative employment and income, setting up of a system ensuring smooth supply of fodder and fuel, access to land (private as well as common), provision of alternative sources of fuel, and development of agriculture (see Table 10).

The above responses indicate two important aspects. First, people attach significant value to conservation of the PA, and seek alternative arrangements for its effective management. And second, in absence of an adequate livelihood base as well as development of CPLRs, they continue to depend on the PA, despite their realization that the use is non-sustainable.

It is in this backdrop, we have tried to recapitulate main features of the status of various resources within the PA, and the problems faced in management thereof. This has been presented in Box 3.

Box 3: Status and Issues Pertaining to PA-Resources: A Recapitulation

PA-Resources (present stock)	Status	Issues
Wild life (No.) Lion 300 to 320 Ungulates 36,555	• Increased number	• Possibility of exceeding the carrying capacity • Increased damages to crops/ livestock • Need to develop coastal corridors • Problem of water for drinking
Timber (Teak + Non-teak): (No. in lakh) Teak 27,192 Non-teak 63,448	• Low density and slow regeneration after the cyclones in the mid-eighties	• Teak not suitable for the ecology • Appropriate mix of trees and browsing species so as to maintain medium density
NTFPs + Medicinal plants: Ambala, Harde, Jamun, Gum, Timru etc.	• Substantial diversity	• Need for regeneration and regulated management • Support livelihood among landless
Fodder: Estimated productivity: 3000 kgs./Ha or 1500 kgs./Ha Total production (T/Year) 4,11,423	• Large tracts of degraded and highly degraded areas • Balancing of vegetation for habitation of wildlife and livestock.	• Degradation due to: Natural conditions (drought) Increased pressure Ineffective protection • Declining size of CPLRs in peripheral villages due to: Loss of CPLRs to PA Encroachment Continued degradation • Limited intervention in terms of collection and distribution thereby leaving a large proportion of the fodder resources to

		be exploited by the people
Fuel wood: Total availability (T/Year) 1,87,500	• Substantial supply and heavy dependence by the people even through market channels	• Need to regulate supply through appropriate channels so that people can find some employment-income without over exploiting the resources • Promoting alternative sources of fuel through proper incentives
FYM: Production (T/Year) 78,488	• Large quantity of supply	• Selling out by Maldharis for very low revenue-realization • Selling of fertile soil by Maldharis • Scope for restricting the sales and retaining a part of it within PA • Scope for composting and value addition
River streams and seven dams: Total cultivable command area 39,010 (Ha)	• Major source of irrigation and income from agriculture as well as livestock outside the PA	• Limited measures for SWC • High level of soil-moisture erosion in the catchments, aggravating the problems of low regeneration of vegetation • Depletion of groundwater to due over use by farmers • Imbalance between availability of water within and in periphery of the PA i.e. between the upstream and the downstream • Private control of groundwater and lopsided incentive structures against the measures for efficient use of water
Livestock: 13-14,000 within PA 95,000 in the periphery	• Declining livestock popu-lation though systematic estimates are not available	• Livestock population inside the PA is well within the carrying capacity • Infiltration of livestock from outside PA perhaps consisting of less productive livestock • Grazing vs. stall feeding • Landless and small farmer without irrigation not being able to afford livestock

People: Population Periphery 1.8 lakh Maldharis in PA 35,000 FSs	• Shifting of population to the nearby villages partly due to declining NCA and CPLRs in distant villages	• Recognise the value of conservation but continue to exploit resources due to: Prevalence of the `Tragedy of the Commons' Conflicts with the FD-staff Need + Greed of the people
The PA-Management: The next plan is under preparation	• Fairly good understanding of the problems and significant achievement in the first phase of conservation	• Problems of second generation, policy formulation • Absence of proper data base on resources, stakeholders and dependents • Faulty alliance between people and protectors • Water scarcity as critical constraint for regeneration efforts • Budgetary constraints
Funders: National + global	• Support through eco-development project	• Inadequate consultation with stakeholders and managers
Researchers & global comm.-unities interested in bio-diversity: Various disciplines	• High level of awareness and large number of quality research	• Need for synthesis • Projection for fund raising and tourism • Absence of a policy dialogue

4.6 Exploring Alternative Management Scenarios

The above description of resources, status and issues for management of Gir-PA, highlighted critical importance of improving vegetation in a manner that can simultaneously address the twin objectives of ecological regeneration and livelihood support. While the PA-management realises this critical need, there is perhaps, inadequate recognition of people's stakes in the resources especially, fodder and fuel. As a result, it tends to maintain an artificial boundary between the pastures within and outside the PA while preparing a regeneration plan. The alternative approaches may therefore focus on conservation, allocation and utilization of water resources within and outside the PA i.e. in the upstream and downstream of the watersheds in an integrated manner.

Prima facie, the objective function of a watershed-based planning in the region should be to maximize surplus resources to support livelihood of the people in a sustainable manner. Here, `surplus resources' is to be defined with respect to the requirement of an optimum size of the core specie i.e. lion and the ecological chain thereof. This kind of co-existence of wildlife and people (+ their livestock) is increasingly being accepted in the on-going debate on especially in the context of developing countries with sizeable population dependent on PAs (Parker, 1983). This has given way to a wide range of alternative arrangements for PA-management by evolving collaborations between the statutory conservation bodies and private landowners (Biglake, 2000)[6].

The recent literature on PA-management highlights a wide range of management approaches to deal with the issues of the functional relationship between parks and agriculture on the one hand, and competition between wildlife and livestock on the other. Also there has been an increasing emphasis on privatization and/or people's participation in PA-management. What has however, remained relatively less explored is identification of an appropriate combination of public-private partnership where the former retains the overall responsibility and regulatory role of protection within which specific functions have to be carved out for private initiatives through development of markets as well as institutions. This is important because depending on regulation and restrictions alone may lead to conflicts, corruption and over-exploitation. And, too much of emphasis on people's participation may also result in neglect of some of the basic functions of conservation, habitat management, and long-term sustainability.

In what follows, we present alternative approaches for PA-management with specific focus on three sets of communities viz; farmers with irrigation; resource poor households, and Maldharis.

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6 (i) About 33 percent of the forest area is degraded or highly degraded and above 44 per cent of the area with trees has a density of less than 0.2. (ii) Proportion of teak in the total timber tree has declined from 45 to 38 per cent. (iii) A large part of the PA belongs to the category of moderate to severe soil erosion. (iv)Water table in peripheral region has declined. (v) Fodder collection though, increased over time, is subject to very high year-to-year fluctuations.

4.6.1 Farmers with Irrigation (and Livestock)

There has been a significant increase in irrigated area in the periphery of Gir. The present use of irrigation has two major problems. First, in the absence of proper SWC-measures in the upstream region, increasing irrigation in the downstream is often at the cost of its availability within the PA. And second, water-use is quite inefficient in terms of both – used for irrigation as well as selection of crops. Thus, the issue of water availability centers rounds its allocation between PA and the periphery; and across households within the periphery. Two alternatives can be explored with respect to the allocation of water following from a watershed based planning where soil-water conservation within PA is considered to be the first step and the top priority. As an immediate impact of increased soil-water conservation measures, availability of water (surface + ground) resources might decline in the periphery. This could be compensated through two alternative approaches as described below:

Box 4: Approaches for Alternative water Use

Components	Alternative Water-Use Approaches	
	I	II
Crop-mix	Same crops with predominance of cotton, sugarcane, mango plantation, groundnut and wheat	Change to less water intensive crops like: Groundnut → Castor Sugarcane → plantation/groundnut Cotton → Castor Groundnut → Bajri + Fodder Wheat → Bajri + Jiru
Water-use	Improve the field channels to reduce waste, Adoption of modern methods of irrigation (like drip, sprinkler), Agronomic practice	Reduce number of watering Improved efficiency of irrigation Reduced demand for farm labour Reduced availability of crop residue Fencing to reduce crop-damage
Live-stock	Reduced number and/or improved quality of livestock	Reduced quality/number of livestock
Increased fodder-supply from PA	Improved quality of livestock	Improved quality of livestock and reduced no. of livestock
Income and compensation/ subsidy	More or less same from crops Subsidies on modern methods of irrigation Reduced income from live-	Same/reduced income from crops Subsidies modern on irrigation methods comp. More or less same income with reduced number of livestock

	stock Employment on SWC	Compensation for the loss of income through supply of plantation material, compost from PA, fencing on farms, bio-gas/LPG etc. at a `reasonable price'.
Cost to PA-manage-ment in the short-run	Increased cost of SWC-measures Increased subsidy on irri. methods Support for bio-gas/LPG etc.	SWC-measures Increased subsidies on irrigation methods Supply of fodder and other material at `reasonable price'. Cost of compensation against net loss in income crop
Benefits to PA in the long term	Moderate increase in vegetation Pressure for grazing may continue at moderate level Crop-damage may continue	Significant increase in vegetation, Pressure for growing may reduce Crop damage reduces due to fencing etc.

Box 5: Farmers with Unirrigated Small Holdings and Landless – with Limited/No Livestock

Components	Alternative Water and Land-Use Approaches	
	Fodder + Fuel	Plantation+ Fodder + Fuel + NTFP
Crop-mix on private land	Same crops	Shift to plantation and/or fodder
Regeneration of village pastures	Fodder + fuel wood	Plantation+ fodder + fuel wood
Livestock	Increased from the present size	Increased from the present size
Increased availability of water	SWC-measures on private and public land	SWC measures + increased allocation of water from irrigation dams as well as other structures within the villages
Protection of CPLRs	Incentives through supply of fodder	Supply of fodder + fencing/ watchman etc.
Employment & income	On SWC, forest vidis + CPLRs (for collection of grass and MTFP)	On SWC, forest vidis, CPLRs, NTFP collection and SWC-work
Sources of fuel	Fuel wood from CPLRs and forest through regulated markets	Fuel wood from regulated markets

Box 6: Maldharis within PA

Components	Alternative Locations for Settlement	
	Outside PA	Within PA
Livestock	Reduced	Same
Grazing practices	Grazing in specially developed plots	Seasonally regulated pattern + cut & carry method
Supply of fodder from PA	On regular basis through cut and carry method + droughts	During droughts
Outside livestock	Stopped completely	Only in limited number during normal years
FYM	Compost for the development of the fodder plot	FYM selling restricted to half
Availability of water	Irrigation for fodder plot + water for livestock	Water for livestock
Compensation	To ensure development of fodder plot + rights to access (not graze) fodder & fuel + cash compensation through term deposits and institutional backing+package of amenities	Incentives for improving quality of livestock without increasing their number

5. Policy Implications and Recommendations

While the present Management Plan has already recognized critical importance of regeneration of pastures within and out side the PA, interdependence between the two and its implications for mobilizing people's commitment towards protection of the PA need to be clearly spelt out. As of now, the management plan (including Eco-Development Project) does not adequately focus on the fact that feasibility as well as effectiveness of regeneration of village pastures in the periphery is essentially dependent on efficacy of soil-water conservation in the upper catchments of watersheds i.e. inside the PA. Similarly the plan does not seem to visualize that sorting out the issues pertaining to people's stakes in might help significantly in mobilising co-operation or participation of people in protection of the PA. This is reflected by the fact that apart from fodder supply during droughts, people in the periphery do not have any direct claims on the PA-resources. This suggests a rather conservationist approach where people especially, in the periphery do not have any legal rights hence, involvement in

PA-management. But as argued earlier, not recognizing people's stakes (if not the legal rights) leads to greater exploitation because of the tendency of overlooking illegal extraction not only by people, but also by the protectors. The next phase thus, needs to go beyond this strictly legal framework pertaining to people's stakes and involvement in PA-management. The basic proposition is that: if people's stakes for subsistence needs are taken care of on a sustainable basis, rather than merely as drought relief measures, it can help reorganizing the livelihood system and also improve compliance of protection measures by the people. The specific policy recommendations have been discussed as follows:

5.1 Recommendations

(i) While regeneration of vegetation should primarily look into the requirements of wild life, it should at least for next 10-15 years, also provide a stable supply of fodder, fuel, and NTFP through a regulated management system adopting `cut and carry' method. Improved vegetation and habitat management should thus, ensure that incidence of attack on crops and wild life is reduced. Essentially, management of pastures within and outside PA should be undertaken as an integrated activity with people's participation and reciprocal commitment for protection. The later should also involve defining carrying capacity of PA in terms of live-stock population. This can be done if, access to fodder is ensured on a sustainable basis. Soil-water conservation measures should take a lead in the process of regeneration of ecology in Gir-PA.

(ii) While the management plan has recognised the need for developing irrigated fodder plots in the periphery, its actual implementation is found to be difficult. The experience of Eco-Development Project is also not so encouraging with respect to regeneration of pastures in the peripheral villages. It may therefore be important to explore alternative institutional mechanisms to help developing pastures in the periphery and also organising fodder supply system by pooling resources from pastures both-within and in the periphery of the PA. A professional agency preferably, a non-profit making organisation, may be involved in managing these tasks.

(iii) A reliable fodder supply system may also help stabilising livelihood base of Maldharis relocated out side the PA. A comprehensive plan for their effective rehabilitation on various land-based activities should be worked out. This is essential not only for checking further deterioration of their livelihood base, but also for mitigating the problem of `illegal' re-entry of human as well as livestock population into the PA.

Given the large area covered by the PA, and also considering expansion of the home range for accommodating an increased population of about 500 lions, it is essential that the next stage of PA-management is much more interactive and inclusive rather than exclusive of the people living in the periphery of the expanded boundary. Management of pastures within and outside the PA, holds the key to operationalisation of an approach such as this.

Table 1: Value of Economic Services from Gir PA

(at 1994-95 prices)

Economic benefits	Value (Rs.lakh)	%
Direct Use		
Fodder	4,114.23	42.55
Fuel wood	1,406.25	14.54
NTFP	1,319.02	13.64
FYM (from Neses)	392.44	4.06
Tourism	19.64	0.20
Irrigation	2,411.40	24.94
Medicinal plants	6.16	00.06
Sub-total (a)	9,669.14 (20.27)	100
Indirect Use		
Timber Teak	7,250.00	19.14
Non-teak	4,499.00	
Fuel wood from timber logging	2,751.00	
	30,633.00 (64.2)	80.86
Sub-total (b)	37,883.00 (79.41)	100
Drought proofing Grass collection (Tonne) Supporting about 2040 livestock for 4 months)	153.00 (0.32)	
Total (a+ b)	47,705.14 (100)	

Note: Based on the estimates presented in Appendix Tables 1 to 6 in Shah (2003). These values are significantly under estimated due to non-valuation of the ecological diversity.

Table 2: Budget Estimates for PA – Management in Gir (at 1994-95 Prices)

Budget Head	Estimated Expenditure for 1995-2000 (Rs. Lakh)	Average Per Year (Rs. Lakh)	Percentage
A.			
Demarcation	20.80	4.16	0.51
Habitat Improvement	131.00	26.20**	3.20
Development of Peripheral Coastal Forest	716.90	143.38**	17.55
Protection	161.00	32.20*	3.94
Research, Education and Training	82.80	16.56	2.02
Vehicle and Equipments	151.40	30.28	3.71
Quarters and Buildings	135.10	27.02	3.31
Tourism	170.00	34.00*	4.16
Socio-Economic (including Resettlements)	309.00	61.80*	7.57
Recurrent Expenditure	2205.00	441.00	54.00
Total	4083.00 (68.54)	816.60	100.00
B. Eco-Development Project			
Village Eco-Development	1239.00	247.8*	66.11
Improvement of Protected Area	396.00	79.2**	21.13
Education and Awareness	49.00	9.8	2.61
Research	190.00	38.0	10.14
Total	1874.00 (31.45)	374.8	100.00
Grand Total	5957.00 (100.00)	1191.4	0.0

* Indicates allocation for activities that might indirectly contribute to regeneration.
** Indicates allocation for measures directly relevant for regeneration.

Source: Singh and Kamboj (1995).

Table 3: Benefits and Costs to Maldharis in Gir

Economic Benefits and Costs	Rs. Lakh (1994-95)	Other Gains and Losses
A. Benefits		**Gains**
1. Fodder	784.48	1. Clean air and water
2. Fuel wood	5.93	2. Less risk of droughts
3. Timber	4.30	3. Free housing
4. FYM	156.98	4. Grazing outside livestock
5. MTFP	NA	5. Natural ambiance
6. Grazing of outside animals	196.12	**Losses**
7. Water, Housing, Other Amenities	NA	1. Absence of schools 2. Absence of electricity 3. Lack of health facilities 4. Limited scope for occupational diversification 5. Limited links to market 6. Problems of mobility 7. Conflicts with FD-staff
Total economic benefits	1147.81	
B. Loss of livestock (750/Year)	112.50	
C. Total net benefits (A-B)	1035.31	
D. Cash Income		
1. Milk	750.00	
2. FYM	156.98	
Total	906.98	

Notes: Based on the information obtained from Maldharis about average consumption of fodder per livestock and fuel wood per households. The norms used for fodder consumption by cow and buffalo are 20 and 25 kgs. per day per animal respectively. Fuel consumption per household was estimated @ 6kg. per day. For timber the norm used is 10 cubic meters per household for 20 years. The FYM production per livestock is 8 tones per year and the net price received is Rs.0.2 though, the market price is Rs. 0.5. The prices used for fodder, fuel wood and FYM are Rs. 1, 1.25 and 0.75 per kg. respectively.

Source: Calculated on the basis of the information collected from various studies. For details see Chapter 3 in Shah (2003).

Table 4: Population and Employment among Villages in Periphery of Gir

All (99) Villages on Periphery	Total HHs	Total Popula-tion	Total Main Workers	Cult. as % to Main Worker	Agril. Laborers as % to Main Workers	Livestock etc as % to Main Workers	Non-Workers as % to Main Workers
1971	18386	106620	28200	68.38	35.27	2.80	248.41
1991	26397	152032	41513	51.27	32.17	2.68	166.53
Difference	8011	45412	13313	-17.11	-3.1	-0.10	-81.89
% change	43.57	42.59	47.20	-	-	-	-

Source: Census of India, 1971 and 1991.

Table 5: Changes in Land Use among Peripheral Villages

Distance from PA	Year	Total Area (ha)	Forest Area as % of Total Area	Irrigated Area (ha)	Cultivable Wasteland (ha)	Not Available for Cultiva-tion 95% to Total	NCA
<3	1971	79494	15.59	4339	14340	10.44	43380
<3	1991	78685	33.67	8088	7994	7.33	47002
Difference	-	-809	18.08	3749	-6346	-3.11	3622
>3	1971	32715	3.93	2171	7012	9.53	23001
>3	1991	34386	19.32	6237	2823	3.34	15183
Difference	-	1671	15.39	4066	-4189	-6.19	-7818
Both	1971	112209	19.52	6510	21352	19.97	66381
Both	1991	113071	52.99	14325	10817	10.57	62185
Difference	-	862	33.47	7815	-10535	-9.40	-4196

Source: Primary Survey

Table 6: Status of CPLRs in Selected Villages

Village	Status of *Gauchar*				Current (in Ha)		Other Grazing	
	Earlier (in ha)	Encro-ached (in ha)	Donated (in ha)	Notified Forest (in ha)	Avail-able	Con-dition	*Vidis* (in ha)	Private (in ha)
Kamdadi	34.89	5.87	0.00	23.16	5.87	A	0.00	0.00
Hirava	111.15	0.00	0.00	111.15	0.00		111.15	185.24
Paniya	0.00	0.00	0.00	0.00	0.00		0.00	15.44
Gigasan	30.87	0.00	0.00	0.00	30.87	A	0.00	0.00
Shivad	15.44	0.00	0.00	0.00	15.44	A	0.00	0.00
Jhankia	10.03	0.00	0.00	0.00	10.03	C	0.00	0.00
Fareda	77.18	30.87	0.00	0.00	46.31	C	78.11	15.44
Dron	385.92	46.31	169.81	0.00	169.81	A	0.00	0.00
Nitli	293.30	15.44	0.00	0.00	277.86	A	0.00	0.00
Juna Ugla	30.87	6.17	15.44	0.00	9.26	A	0.00	0.00
Itvaya	92.62	46.31	0.00	0.00	46.31	A	0.00	0.00
Khilvad	77.18	46.31	0.00	0.00	30.87	A	0.00	15.44
Bhalchel	231.55	0.00	0.00	231.55	0.00		0.00	0.00
Kenedipur	571.16	308.74	77.18	108.06	23.16	A	38.59	0.00
Ambala	61.75	30.87	0.00	0.00	30.87	B	0.00	52.02
Amrapur	120.41	0.00	0.00	108.06	12.35	A	0.00	0.00
Jalandhar	648.35	324.17	0.00	0.00	15.44	A	287.13	0.00
Khodiyar	154.37	0.00	7.72	0.00	146.65	A	0.00	77.18
Ratang	385.92	30.87	108.06	0.00	246.99	A	0.00	0.00
Limadra	231.55	0.00	0.00	0.00	231.55	A	0.00	0.00
Monpari	77.18	0.00	0.00	30.87	46.31	A	0.00	0.00
Laduli	185.24	0.00	100.34	0.00	84.90	A	154.37	0.00
Jepur	277.86	30.87	38.59	154.37	54.03	A	23.16	12.35
Jambur	308.74	46.31	77.18	154.37	30.87	A	0.00	0.00
Rasulpara	15.44	0.00	0.00	0.00	15.44	A	0.00	0.00
Bhojde	540.29	0.00	0.00	540.29	540.29	C	0.00	0.00
Borvav	277.86	46.31	77.18	0.00	77.18	A	77.18	0.00
Surajgadh	12.35	0.00	0.00	0.00	12.35	A	0.00	0.00
Chitrod	123.49	0.00	0.00	123.49	0.00		0.00	0.00

A: Indicates land supports livestock of the village for 2 or 3 season for grazing and frequent harvesting of grass is possible

B: Indicates land supports livestock of the village for monsoon season and harvesting of grass is not possible every year.

C: Indicates land partially supports village livestock during monsoon.

Source: Primary data

Table 7: Distribution of Households Reporting Changes in Water Table (% of Households)

Water Table in Ft.	Before Ten Years				At Present			
	<50	51-100	100-151	>151	51-100	101-300	301-500	>501
Kendipur	97	3	-	-	73*	-	-	-
Madhupur	86	11	3	-	69	31	-	-
Govindpur	63	30	5	2	48	30	12	-
Dadli	85	10	3	2	65	32	-	3
All	82	14	3	1	70	23	5	2

* 24% households reported <50 feet

Source: Primary Survey.

Table 8: Farmers' Responses for Adoption of Measures to Improve Efficient Use of Water

Measures	Kendipur	Madhupur	Govindpur	Dadly	All
Changing Crop mix	35	22	24	27	108
Less Use of water	37	35	34	22	128
Use of Drip Irrigation	21	19	27	17	84
Control of High Power Electric Motor	17	19	28	20	84
Water Storage and Management	40	39	38	38	155
Well recharging	16	15	12	29	72

Source: Primary survey

Table 9: Use of CPRs among Sample Households

Use of CPRs	Kendipur	Madhupur	Govindpur	Dadly	All
Gaucher	37	9	21	34	101
Forest vidi	19	16	7	32	74
Check dams/pond	6	12	10	13	41
Other colio	-	-	-	-	-
All	43	39	40	40	162

Source: primary Survey.

Table 10: People's Expectations from Management of Gir-PA

Expectations	Revenue Villages %	FSs %	Neses %
Adequate employment + self-employment schemes	40	6	14
Access to fodder and fuel	22	38	22
Pasture development on degraded vidis	3	26	36
Measures of agricultural development	4	-	-
Allocation of land to landless	8	-	-
Settling down the issue of land lost of the PA	7	-	-
Distribution of gobar gas	12	-	-
Other amenities	4	30	28
All responses	100	100	100

Source: Primary Survey.

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