

Linking Conservation with CPLRs: Lessons from Management of Gir-Protected Area

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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. The experience from a large number of developing economies suggest 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 the 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 the 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. The PA had faced severe risk of extinction of its core 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 overshoot 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.

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 above¹. 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 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 patterns their use by people within and outside the PA.

Objectives: The specific objectives are to examine:

- (i) Present status of the ecology in 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.

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 the estimates of cost of 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 area²

II. PA and Benefits Flowing from Its Resources

2.1 The Ecology:

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 the western 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. Flow Chart on Gir-Ecology provides a brief description of the PA. Conserving this ecosystem therefore would serve some important functions (Singh, M., 1995)³

It is important to note that the region including the PA has been viewed as a fodder bank especially during the drought years, attracting 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 as an important drought proofing function both formally as well as informally (Sinha, 1967). Regeneration of ecology should therefore, essentially be based on development of the major watersheds comprised of the seven rivers. In that case, the regeneration plan should also cover those areas of these watersheds, which lie out side the PA. Integrating these areas in the periphery would amount to incorporating people and their economies as integral components of the ecology. The peripheral region and their people thus, become important stakeholders though; their stakes may assume a relatively lower priority in the management of the PA (see the flow Chart on Gir-Ecology in Appendix I).

III. Benefits and Costs of PA-Conservation

The close interactions and continued conflicts between the people and the PA suggests a need for a major shift in management strategy for Gir-PA. Before discussing that it would be useful to have a

brief account of the economic and ecological services rendered by the PA. This section a summary account of the valuation exercise conducted earlier (See Shah, 2003).

3.1 Estimating Benefits

3.1.1 Direct Benefits

The total value from various economic services from the PA is estimated to be Rs. 47,705.1 lakh of which about 20 per cent is comprised of the various direct use-values like fodder, fuelwood, irrigation etc. 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 methodological issues are important in this context. First, the estimated fodder value is based on the national average of Rs. 3000 kgs/hectare for the Indian forest (Tewari, 1994). This was essential because the existing studies on Gir do not provide any estimates of the total fodder production from the PA. The second aspects relates to the estimates of Minor Timber Forest Resources (MTFPs). Since there are no systematic estimates of the production of a large number of MTFPs available from the PA, we have once again, resorted to using the national average to estimate the market values. According to the CSO-norms, the actual production is generally 10 times the value realized in the market. We have however, not incorporated these projected values of MTFPs in our estimates. Together, these two methodological issues result into a downward bias in our valuation of benefits resulting from direct use. In fact, in most part of our valuation exercise, we tried to keep a downward bias for estimating the benefits, so that they do not become unrealistic vis-à-vis the estimated cost of investment, necessary for regeneration of the PA.

3.1.2 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 the relative importance of the five major attributes of Gir-PA by obtaining people's perception about the desirability of conservation of the PA. The exercise is based on qualitative information collected from 162 households from four villages in the periphery of Gir-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). 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 clearly believed that the religious spots may also lose their importance if the forest/vegetation get deteriorated. To a large extent, these perceptions confirm the earlier observations by Debnath et. al (2001).

3.2 Cost of PA-Management

The estimated budget for the period is Rs. 5,957 lakh of which Rs. 1,874 lakh (i.e..45%) is contributed by the GEF-supported Eco-development Project (EDP). The average budget for the year is estimated to be Rs. 1191.4 lakhs. If we examine the details of the budgetary allocation, it is observed that the proportion of the budgetary resources allocated for measures that have direct bearing on regeneration of the PA, is about 52.4 per cent of the total budget including the Eco-development Project. Compared to this, a significantly large proportion of the budget is allocated for infrastructure and recurrent expenditure. Moreover, the budgetary allocation for regeneration measures noted above also has some components that may not have 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 with the PA. A similar pattern is also observed in the actual expenditure for Gir-region, which also includes Barda sanctuary. In fact if one looks at the component of soil-water conservation (SWC), it is fairly low i.e. < 4 per cent.

It is possible that the PA-region is also receiving benefits from the other on-going schemes like Watershed Development from the Ministry of Agriculture or Rural Development. We do not have estimates of these schemes in Gir-region. Nevertheless, the estimated budget for a critical intervention like SWC still appears to be significantly small. Further, it can be argued that a large proportion of expenditure on Integrated Forestry Management could yield better results if the SWC-component was also properly integrated with the former. It is difficult to ascertain the extent to which this has been achieved. The important point at this stage however is that of 'appropriate' allocation of resources especially when funds are limited.

Since Eco-Development Project constitutes a major proportion (i.e. 31.45 per cent) of the total expenditure, it is pertinent to examine the profile of activities, actually planned and/or carried out under this project. If the major part of expenditure under the Eco-development Project is on development/support to the household's immediate requirements like land leveling, deepening of

bore well, purchase of agricultural employment/inputs, or obtaining alternative sources of fuel and building material, as it appears to be true in a large number of cases, regeneration of degraded forest may once again take a back seat in the total expenditure on the PA. This kind of concern is also shared by the management team, which often finds it difficult to obtain permission for regeneration of village pastures. Encroachment of the pastures and illegal grazing in the degraded forest in the peripheral villages is another important issue that constrained utilization of fund for some of the major activities like fodder development/nutrient enrichment programmes in the region.

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 as follows:

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		

III. PA and the People

There are three sets of human settlements within and in the periphery of Gir. These include nesas (clusters of cattle herders i.e. Maldharis), forest settlements, and revenue villages. The first two are located in the sanctuary whereas the villages are on the periphery of the PA. It may be noted that people in nesas 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 will have to keep in mind the two separate categories viz; within and outside the PA. In what follows, we discuss the nature and the extent of dependence

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

3.1 People and other Economic Activities within the PA:

At present, there are about 54 hamlets (Neses) and 14 Forest Settlements in Gir-PA. While these people living inside Gir draw upon the natural resources such as fodder, fuel, land, water, MTFP, 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; also this helps reducing the incidence of forest fire, which generally has a high probability of occurrence in dry-hot weather like that Gir. Another ecological function performed by these people is that of keeping up the chain of herbivorous species, in absence of which, damage to the peripheral agro-economic system might get increased⁴.

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 in the mid-nineties. In the same vein, the management approach is to tighten the protection of the PA from any kind of interference by the people as well as other vested interests from industry, mining and other developmental activities. Together this has led to a typical situation of conflicts between people and the PA or between conservation and livelihood. These conflicts become severe especially during droughts. The situation becomes particularly acute because of the 'inappropriate' use of land as well as water resources in the peripheral region. 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.

Maldharis in the Neses: Resource Use and Damages

Table 1 presents estimates of benefits and costs accruing to Maldharis living in Neses within the PA. Whereas 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 marginal proportion say, 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 area within 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 borne by the Maldharis works out to be Rs. 112.5 lakh. The net benefit is Rs. 1,035.31 lakh. Alternatively, we worked out the net returns from selling of milk and farmyard manure. This was estimated worked out to be Rs. 906.98 lakh per annum. It is thus, quite clear that the Maldharis are at least economically better off within PA. Shifting them out would thus require a fairly attractive compensation package that could take care of the present level of the rightful benefits from the PA. Or else, these Maldharis should be convinced to cooperate with the conservation objectives through participatory processes of awareness generation and compliance of the given norms of 'rights and restrictions'⁵.

3.2 Peripheral Economy and Interface with PA

People in the Periphery:

The periphery of Gir consists of 99 villages in the radius of 5-7 kms. Tables 2 (a and b) provide 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.

To a large extent, this population (human + livestock) seems to have been dependent on the various ecological and 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, known in the local parlance as 'Lili (Green) Nagher', which is the green only fertile patch in the dry/semi-arid region of Saurashtra 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.

Moreover, agricultural pattern on the peripheral villages also seems to be somewhat problematic. 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 not only in depletion of ground water resources but, also creating additional risks for the wildlife due to digging of large number of wells and water holes (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 in 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 large tracts of degraded (345.5 sq.kms.) and highly degraded areas within the PA (122.2 sq.kms). Besides this, there are evidences of degradation within and in the periphery of Gir⁶:

Overall therefore, Gir forest has undergone significant changes over the past two centuries, 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)].

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. If we compare the growth rates of population in the nearby vs. distant villages, we find them more or less same i.e. 2.25 vs. 2.10 respectively. However, if we look at the estimates of two sets of villages viz; nearby and distant, we observe that the growth in population is higher among nearby villages, as compared to the distant villages, in the case of four out of six talukas for which we have comparable estimates. These are Dhari, Mendarada, Talala, and Visavadar. 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 < 3 kms. Prima facie low level of population growth in these talukas could be attributed to two important changes that have taken place since the mid-seventies. First, due to protection measures the people’s access to forest resources has declined (though, not stopped) over time. And second decline in the quality and quantity of Common Property Land Resources (CPLRs) have led to out-migration besides the ‘pull’ effect from the urban centers. While these are propositions are difficult to ascertain through the

existing data, we have tried to find plausible explanations by examining some of the important changes during 1971-1991 in the periphery of Gir (See Table 3).

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. In that case the lower growth in of population in the peripheral region 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 periphery 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 the Forest Department over the inclusion of CPLRs within the boundary. Notwithstanding these limitations we have tried to capture some of the basic information pertaining to CPLRs in these 29 villages (see Table 4). It is observed that the size of CPLRs has declined substantially in 18 out of the 29 villages. To a large extent this has happened due to notification of the village pastures as forest area within PA. Moreover, there is a significant problem of encroachment of CPLRs by the individual households. 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 resources within 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. In what follows we present a summary of the major observations based on the secondary as well as primary data.

IV. Alternative approaches for PA-Management

4.1 The Present Status

The foregoing analysis of the various economic and ecological services from PA and people's interface with the resources therein has highlighted some important issues that need special attention while exploring right kind of approaches for its future management. *Prima facie* 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 issues while designing management plan for the PA.

The forest department of the Government of Gujarat has already worked out second phase of the management plan, envisaging a special focus on regeneration pastures, and also a significant expansion of the home range in order to sustain a population of 500 lions (Singh and Pathak, 2000). This of course 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. And, third, using a part of regenerated resources from the PA as incentives to reduce the pressure by checking the haphazard and 'illegal' use of the 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 the three sets of stakeholders viz; farmers with irrigation, landless households and farmers without irrigation, and Maldharis. This, of course, is an indicative planning for regeneration, conservation and sharing of resources.

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 in the previous section should ideally, be used for exploring alternative strategy in the light of these issues.

The central theme of the PA-management is to evolve an alternative land-use (and vegetation) plan, which in turn, calls for a suitable mechanism of accessing (or sharing) these resources with the people whose livelihood needs are closely linked with the health of the PA. At present, the existing legal structure does not recognise the stakes of the people especially, in the periphery. But this is not in tandem with the historical developments and the ground realities. Non-recognition of the people's rights therefore 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 this. 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 questioned. Exploring alternatives for more effective management in future should therefore, try to look into the changing pattern of the resource base within and outside the PA, people's livelihood requirements, and the prevalence of these informal alliances for extraction of the PA-resources. This section tries to look into these issues with a view to identify alternative approaches for PA-management in the next stage. This has been done in the light of a sample survey of households.

4.2 People's Livelihood Base: The Present Scenario

4.2.1 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 in sample villages. 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 among farmers without irrigation and 27 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 on 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 appears to be closely associated with dependence on forest.
 - iii. Similarly a large proportion of the traditional herders also have to depend on agriculture. This might imply that livestock alone is no more an adequate source of employment and /or income even among the herder communities. To an extent this confirms smaller size of livestock owned by these households as noted earlier. Declining access to CPLRs as well as foddors from the PA might also be responsible for this phenomenon.

Together these observations substantiates the earlier findings that the households on the two ends of the spectrum in terms of access to land and irrigation tend to depend more on the 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 MTFP, illegal extraction of timber, fodder, etc.

The herder communities on the other hand seem to have faced a crisis because of their receding resource-base under the relatively more stringent measures for protection of the PA. This in turn seems to have reduced the size of their livestock, which worked out to be 6.3 per household as against 23.5 in the case of the Maldharis living inside the PA. In fact, this observation, once again, raises doubts about the estimate of about 95,000 livestock in the periphery of the PA. Projecting an apparently overestimated population of livestock leads to a misplaced emphasis on the actual pressure on the PA and at the same time gives a misleading impression about the higher (than the actual) productivity of forest from the PA.⁷ In fact, the reality appears to be a mix of all these phenomena: (a) improved protection vis-à-vis the seventies; (b) continued pressure on the PA but at a lower rate than before because of the combined effect of the improved protection measures as well as reduced livestock population in the periphery; and (c) increased degradation of the village pastures, which might be partly due to the protection measures but also due to the loss of relatively better pastures to the PA. We will return to this issue at a later stage.

In terms of income, agriculture and livestock, besides services, are found to be more rewarding. The average income per household works out to be highest in the case of service i.e. Rs. 64,090 per annum. This is followed by agriculture (Rs. 44,273) and trading (Rs. 15,250). The average income from livestock is Rs. 12,728, which is almost same as that from other casual labour. This kind of income, in absence of multiple sources of income may hardly suffice for ensuring subsistence livelihood.

While these are somewhat crude estimates, what is important is that they reinstate the importance of agriculture and agriculture related labour for livelihood base of the people in periphery. This, as we noted earlier, has a direct bearing on availability of irrigation. In fact, declining access to fodder seems to have created increasing burden on agriculture and in turn, on water resources in the region. What is the status of the use of ground water? How sustainable it is? And, what measures could be taken to mitigate the depleting ground water resources? These are some of the critical questions for the PA-management as depletion of ground water resources may exert negative impact on the level and pattern of vegetation and also water table within the PA. These issues have been discussed subsequently.

4.2.2 Status of Ground water and Shift in Cropping Pattern

The decline in ground water table has been fairly widespread as reported in Table 5. 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 the 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%) as shown in Table 3.5 in the previous section. While we do not have details of the cropping pattern in all the 99 villages in periphery, the observation about the 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 the 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 the nearby villages.

We have tried to explore this option by obtaining the 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 the water-use efficiency. Table 6 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 7 presents information about the 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.

We have tried to obtain people's perceptions about their preferences for regenerating the CPLRs and also for reducing pressure on the PA. This has been discussed in the subsequent analysis.

4.3.1 Regeneration of Village Pastures

We had detailed discussions with the sample households as well as with the village communities regarding the appropriate approaches for regenerating the village pastures. It was noted that whereas a majority of people in the villages in Gir-West preferred development of fodder alone, those in Gir-East felt that fodder + plantation might be a good strategy. This apparently suggests importance of livestock in the former vis-à-vis the latter. This reinstates the earlier observation

regarding a mutually reinforcing impact of irrigation and on 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 Gir-East. Table 4.8 presents main reasons for the stated preference for fodder while regeneration of the CPLRs. It is heartening to note 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.

4.3.2 Regeneration of Forest Vidis

We tried to understand people's perceptions about improving the status especially by reducing the pressure on the PA. 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 the usual responses with respect to PA-management, what is important is to note that a large proportion of the people (i.e. 60 per cent) perceived economic + ecological services from the PA as non-sustainable given the present scenario of management practices and people's pressure on the PA. Evidently, large farmers with irrigation and households from herders' community do not share this perception. This kind of divergence in perceptions tends to confirm the pattern of differential stakes across households presented earlier. Despite this, it is encouraging to note that there is almost a consensus on desirability of conservation measures for sustenance of the ecology. It may however, be noted that, people by and large, do not think the present management system to be functioning satisfactorily.

We have tried to ascertain what kind of support people would expect in case the present restrictions are tightened further in 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 have been grouped into five broad categories in terms of their relative importance (See table 8). These 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.

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 the realization that the use is non-sustainable.

It is in this backdrop, we have tried to explore alternative management scenarios for the three important sets of communities: (i) households with land + irrigation and livestock; (ii) households with small land holdings without irrigation or landless having no/very small size of livestock; and (iii) Maldharis within the PA. Before we attempt this, it would be useful to recapitulate some of the major observations regarding the present status of the various resources and the problems faced in their management.

4.4 Status and Issues Pertaining to PA-Resources: A Recapitulation

PA-Resources (present stock)	Status	Ises
Wild life (No.) Lion 300 to 320 Ungulates 36,555	<ul style="list-style-type: none"> Increased number 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Low density and slow regeneration after the cyclones in the mid-eighties 	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Substantial diversity 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Large tracts of degraded and highly degraded areas Balancing of vegetation for habitation of wildlife and livestock. 	<ul style="list-style-type: none"> 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
Fuelwood: Total availability (T/Year) 1,87,500	<ul style="list-style-type: none"> Substantial supply and heavy dependence by the people even through market channels 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Large quantity of supply 	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> Major source of irrigation and income from agriculture as well as livestock outside the PA 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Declining livestock population though systematic estimates are not available 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Shifting of population to the nearby villages partly due to declining NCA and CPLRs in distant villages 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Fairly good understanding of the problems and significant achievement in the first phase 	<ul style="list-style-type: none"> Problems of second generation, policy formulation Absence of proper data base on

	of conservation	resources, stakeholders and dependents <ul style="list-style-type: none"> • Faulty alliance between people and protectors • Water scarcity as critical constraint for regeneration efforts • Budgetary constraints
Funders: National + global	<ul style="list-style-type: none"> • Support through eco-development project 	<ul style="list-style-type: none"> • Inadequate consultation with stakeholders and managers
Researchers & global communities interested in biodiversity: Various disciplines	<ul style="list-style-type: none"> • High level of awareness and large number of quality research 	<ul style="list-style-type: none"> • Need for synthesis • Projection for fund raising and tourism • Absence of a policy dialogue

4.5 Exploring Alternative Management Scenarios

The above description of the resources, status and issues for the PA-management highlighted critical importance of improving vegetation in a manner that can serve the needs of the eco-system as well as a part of the peripheral economy on a sustainable basis. Management of water resources is central to this objective. 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 a co-existence of wildlife and people (+ their livestock) is increasingly being accepted in the on-going debate on protected areas especially in the context of developing countries with sizeable population (Parker, 1983). This has given way to a wide range of alternative arrangements for management of the PA through collaborations between the statutory conservation bodies and private landowners (Biglake, 2000).⁸

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 however, has 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 could 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 into neglect of some of the basic functions of conservation, habitat management and long-term sustainability.

Learning from Eco-Development Project

Ideally Eco-Development Project (EDP) could have explored these aspects for, the underlying rationale of the project is to strengthen the linkages between management of resources in the core and the periphery. The central theme of the project is to regenerate and develop the peripheral villages so as to be able to protect the core (i.e. the PA). This has to be done by involving people in implementation of project in the peripheral villages.

While the project implementation had suffered from certain initial trouble, the project has made positive contributions [9] in terms of:

- i. Orientation and sensitization of the FD-staff towards participatory approaches
- ii. Building-up of confidence between the people and the FD-staff.
- iii. Increasing recognition of the need for transparency and accountability in PA-management.
- iv. Evolution of innovative ideas for sharing of cost, responsibilities and weakening of the traditional power structure within the village communities.
- v. Positive demonstration effect of the successful interventions into CPLR-development on a few cases.

Notwithstanding these achievements, the project continues to suffer from limitations of both-being over prescriptive on the one hand, and silent on certain critical aspects on the other. The major limitations have been listed as follows.

- i. The project does not envisage any direct and/or systematic links with the vegetation and habitat management within the PA. The only strong link between the periphery and the

- PA is the assumption that reduced pressure on PA due to development in the periphery will itself ensure better protection and regeneration within the PA. The project however, is silent on the need and mechanism for sharing of resources with the people.
- ii. Although, there is special emphasis on development of community based activities, it does not get in terms with the ground realities like encroachment of CPLRs. As a corollary it does not visualize any kind of negotiations in terms of sharing of PA-resources, with better institutional support and regulation, as incentives for releasing encroachment and/or ensuring protection of CPLRs. Also, SWC is a lower priority in EDP. This is despite the fact that the budgetary allocation for SWC is already too small.
 - iii. People's participation is viewed in a somewhat limited manner i.e. by sharing a part of the project cost. But participatory processes also need to be based on equity-principle. This should imply differential rates of contribution and mechanism of cross subsidization across households with different economic base.
 - iv. It fails to recognise that shifting from almost a cost-free source of fuel i.e. from fuelwood to bio-gas or cooking gas is non-feasible for a large number of poor households not having land/ livestock. These households need to be supported on a sustained basis.
 - v. Insistence of payment of cash-contribution in advance, prior to setting-up of a robust village institution, may give way to inappropriate practices that might hamper participatory processes in the subsequent stages of project implementation.

It is hoped that some of these lessons could be incorporated into the management plan under preparation. The need however, is to take forward the idea of a 'regional planning' through a series of dialogue with various stakeholders viz; FD-staff, funders, researchers and environmental groups, policy makers and above all, the people. This will not only help evolving a shared understanding on the issues and alternatives for PA-management among the various stakeholders, it will also (hopefully) break open new paths in the on-going discourse on the perspectives of PA-management.

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

4.5.1 Farmers with Irrigation (and Livestock)

As noted earlier, there has been a significant increase in irrigated area since 1971 (Table 3). In 1991, the irrigated area constituted about 24 per cent of the NCA, which is likely to have increased over time. The present use of irrigation has two major problems. First, in 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 the crop-choice as well as methods. 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:

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-stock Employment on SWC	Same/reduced income from crops Subsidies modern on irrigation methods comp. More or less same income with reduced number of livestock 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-management 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.

4.5.2 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 + fuelwood	Plantation+ fodder + fuelwood
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	Fuelwood from CPLRs and forest through regulated markets	Fuelwood from regulated markets

4.5.3 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

V. Policy Implications and Recommendations:

While the present Management Plan has already recognized the critical importance of regeneration of pastures within and out side the PA, the 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 of the issue of people's stakes in the PA-resources might help a lot 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 stakes in the PA-resources. This suggests a rather strictly conservationist approach where people especially, in the periphery do not have any legal rights. 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 by the people, and at times, also by the protectors. The next phase thus, needs to go beyond this strictly legal framework pertaining to people's stakes and involvement in the 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.

Recommendations

- (i) While regeneration of vegetation should primarily look into the requirements of the wild life, it should at least for next 10-15 years, also provide a stable supply of fodder, fuel, and MTFP 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 the 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 the ecology.
- (ii) While the management plan has recognised need for developing irrigated fodder plots in the periphery, its actual implementation is found to be difficult. The experience of the Eco-Development Project is also not so encouraging with respect to regeneration of CPLRs in the peripheral village. 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 the 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 the Maldharis relocated outside 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 of the PA and also in the light of the perspective plan for a still larger home range for its core wild life species, i.e. lion, it is essential that the next stage of the PA-management is much more interactive and inclusive rather than exclusive of people in the periphery. Management of CPLRs within and outside the PA holds the key to operationalisation of an approach like this.

Table 1: Benefits and Costs to Maldharis in Gir

Economic Benefits and Costs	Rs. Lakh	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 tonnes 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.

Table 2: Changes in Population and Employment

All (99) villages on periphery	Total HHs	Total population	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 3: 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 cultivation 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 4: Status of CPLRs in Selected Villages

Village	Status of <i>Gauchar</i>				Current (in Ha)		Other Grazing	
	Earlier (in ha)	Encroached (in ha)	Donated (in ha)	Notified forest (in ha)	Available	Condition	<i>Vidis</i> (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 Uгла	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
Surajgad	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

Source: Primary data

- 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.

Table 5: 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

Table 6: 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 7: 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 8: 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.

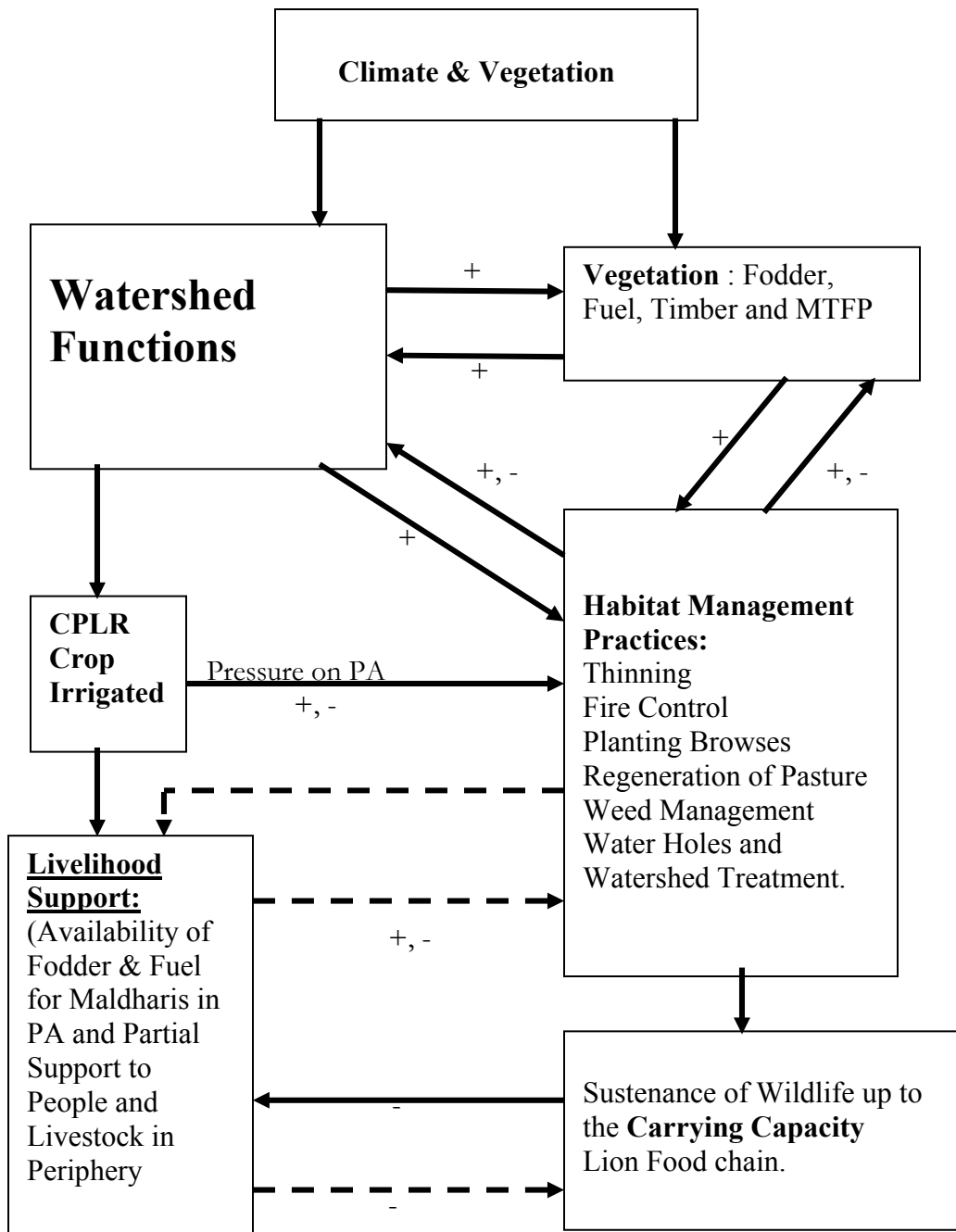
End Notes

1. For further details on the alternative approaches to PA-management, see Shah, 2003.
2. 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.
3. **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.
4. 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 is 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 biodiversity 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 into increased damages to the property and people in the peripheral region.
5. 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.
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.
7. In fact, there is an inherent contradiction in these two phenomena i.e. large population of livestock creating a high pressure on the PA, and a higher productivity of fodder. As per the management plan (1996) the improved protection of the PA has shifted the pressure to the pastures in the peripheral villages. As a result, these pastures got further degraded. While this is fairly valid explanation for the degraded status of the village pastures, it however does not go consistently with the assessment of the 'pressure from the people'.
8. The emerging perspective on PA-management thus, is based on a wide-ranging experiences suggesting that: (a) the interaction between domestic species and wildlife is complex-symmetric, asymmetric, positive and/or negative. And (b) designing of parks have to take cognizance of the functional relationships between parks and the area (Gichochi, 2000). This kind of emerging perspective is particularly relevant in the case of Gir-PA where a large number of human and livestock population have co-existed with wildlife; both these have increased over time.

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Appendix I: Gir-Ecology



+: Positive Impact
 -: Negative Impact

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