RESEARCH PAPER

Assessing Management Effectiveness of Wildlife Protected Areas in India

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RES/E&F-WL/1999

RAAG

Research, Assessment and Analysis Group

Scripted in 1999. An edited version of this report is published in the journal *Parks,* Vol 9, No. 2, June 1999, IUCN, Geneva. The sketch on the cover is by Pratibha Pande.

ASSESSING MANAGEMENT EFFECTIVENESS OF WILDLIFE PROTECTED AREAS IN INDIA

Shekhar Singh[1]

This paper attempts to describe some of the efforts made in India to assess the management effectiveness of protected areas. It describes the methodology used, presents the major national level findings and indicates the action taken on these findings and on the consequent recommendations.

INTRODUCTION

India has a network of 85 national parks and 448 sanctuaries, covering 4.2% of the its land area [MoEF 1998]. This number has progressively increased over the last twenty-five years. In 1975, there were only five national parks and 126 sanctuaries. This increased to 19 parks and 210 sanctuaries by 1983 and to 53 and 247 respectively by 1985.

Areas having significant biodiversity value are declared national parks or sanctuaries under the Wild Life (Protection) Act of 1972 (henceforth referred to as WL Act), as amended in 1991. Before this act, national parks and sanctuaries were being set up but under various state or area specific acts. With the coming of this act, all areas notified under any other act became parks or sanctuaries notified under this act,

Under the WL Act, **national parks** are given a higher level of protection and no human use activity is permitted within them: The act specifies that:

> *"No person shall destroy, exploit or remove any wild life from a National Park or destroy or damage the habitat of any wild animal or deprive any wild animal of its habitat within such National Park except under and in accordance with a permit granted by the Chief Wild Life Warden and no such permit shall be granted unless the State Government, being satisfied that such destruction, exploitation or removal of wild life from the National Park is necessary for the improvement and better management of wild life therein, authorises the issue of such permit."* [Section 35(6) of the Act]

Also, no private land holding or right is allowed within a national park. **Sanctuaries** are accorded a lesser level of protection, and grazing and some community or individual rights can be permitted.

Under the WL Act, national parks are fully protected from all human disturbance and, consequently, correspond to the revised category Ia

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[1] On the faculty of the Indian Institute of Public Administration, New Delhi, India.

(Scientific Reserves) of the IUCN categorisation system for protected areas.

A sanctuary, where grazing and various other rights can be permitted, corresponds to IUCN category IV (Habitat and Wildlife Management Area).

SURVEYING MANAGEMENT EFFECTIVENESS

Over the years, especially with the increase in human populations and the growing thrust on infrastructure development, the pressures on these protected areas have grown tremendously. So much so that, in recent years, it has become increasingly difficult to continue to protect these wildlife areas using the laws and procedures laid down decades earlier. Also, there is a new recognition of the value of biodiversity and the need for its conservation, the need to have at least some representative ecosystems that are free from human manipulation and degradation.

However, if the old management systems are to be changed and updated, there is a need to first understand what their limitations are and how they can be improved. This involves studying not only individual protected areas but also looking at trends and universal problems across states and the whole country.

THE FIRST ALL INDIA SURVEY: 1984-87

In order to meet this need, the Government of India, through its Department of Environment, commissioned the Indian Institute of Public Administration (IIPA), New Delhi, to survey the national parks and sanctuaries in India[2] with the objectives of:

- Documenting, analysing and making public information on the laws, policies, practices and problems relevant to the management of protected areas in India.
- Making recommendations aimed at improving their management.
- Documenting and making public information on the flora, fauna and habitats of these protected areas.

The Methodology

Based on detailed discussions with experts, a methodology was developed which would have a good chance of succeeding, given the various constraints, including those of time, and of human and financial resources. It was decided to develop a detailed questionnaire to be sent out to the

[2] The survey was jointly directed by Mrs Dilnavaz Variava of the Bombay Natural History Society and the author, from the Indian Institute of Public Administration, New Delhi.

directors of each of the protected areas (questionnaire I). This questionnaire had five sections, one each for legal issues, social and human use issues, biological and geographical descriptions, Management issues, and for the perceptions of the PA directors. There were over three hundred questions covering almost all the relevant aspects of PA management. The questionnaire asked not only for basic description and listings, but also required the PA managers to identify problems and prioritise concerns. To trace the history and trends of events and activities, and to describe the initiatives taken by the PA managers in various matters.

A second questionnaire (questionnaire II) was designed for state governments[3]. A briefer questionnaire, it sought to extract information about state level financial provisions for wildlife management, state level wildlife policies and institutions, and plans for the expansion and strengthening of the PA network in the states.

Questionnaire III was designed for non-government organisations, community groups and individual experts. It sought to elicit information on their observations and thoughts about the PAs that they worked in or were familiar with.

Clearly, the two main challenges before the research team, at this stage, were to ensure that the questionnaires were filled in and returned, and to authenticate the information that was received. Fortunately, the state governments co-operated remarkably well and, with the prodding of the Government of India, a very large proportion of the PAs in India sent back completed questionnaires. This was despite the scepticism, expressed by many, that it would be impossible to persuade busy PA managers to complete such a bulky questionnaire.

The state level and NGO questionnaires were also completed and returned though, in the latter, the amount of information forthcoming was disappointing. Clearly, though a large number of NGOs and individuals were interested in wildlife management, they did not have much hard data. However, the NGO inputs were useful in identifying specific issues that needed further investigation and lists of species found in PAs were forthcoming from many amateur wildlifers.

Authentication of the data received was the next challenge. Given the amount of data and the large number of PAs responding, a detailed physical verification was out of the question. It was, therefore, decided to organise field visits to a large sample of the PAs responding. The total

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[3] India has a federal structure of government and has 32 states and union territories. The latter are centrally administered territories while the former enjoy a greater amount of autonomy. The Constitution of India lists certain matters as state subjects, exclusively to be handled by the states, while others are central subjects. Some, like environment, are concurrent, where both have jurisdiction. National parks and sanctuaries are, however, set up and managed by state governments.

number of PAs, at the start of the study, were 293 (51 national parks and 242 sanctuaries). Of these, 261 (89%) completed and sent back questionnaire I. Field visits, by teams of two or more researchers, were completed for 150 PAs (57%).

Within each PA, certain categories of information were verified during the field visit. Primarily the focus was on sensitive information, of the sort that the PA managers might hesitate to openly admit to. Illegal activities within the PA, especially when they were by other government agencies or at the behest of political or administrative bosses, were among such. Another priority for verification was information regarding tensions between local communities and the PA authorities. Here, the perceptions of the PA authorities often differed from those of the affected communities. The field team observed, discussed issues with the PA staff, with local villagers and NGOs, and occasionally with other local officials. Where necessary, official documents were also examined.

The field teams also filled in critical gaps in the information, clarified seeming contradictions and ambiguities in the data, and collected the documents locally available. Before the visit of a field team, the questionnaire sent back, by the PA they were about to visit, was analysed and any obvious questions and gaps were communicated to the PA manager in advance. This allowed the PA manager to collect the required additional information in time for the team to discuss it during their visit.

However, despite this elaborate effort to verify the information collected and received, it was recognised that many bits of information remained unverified or even unverifiable. This fact was stressed in the final report under sections in almost each chapter titled "Limitations of the Data".

The Output

This survey produced the first national database on the management of national parks and sanctuaries in India. Out of this database, various publications emanated. The first, soon after the study started, was the *Directory of National Parks and Sanctuaries in India* [Variava and Singh 1985], which contained basic information about most of the PAs in India. It also contained state maps indicating the location of PAs. In 1991, a detailed analysis of the management status of national parks was produced [Mehta et al 1991]. Simultaneously, Directories of national parks and sanctuaries of each state started being prepared, using the basic database [Singh et al 1990, Pande et al 1991 and Lal et al 1994]. However, the main report of the findings of the study was published in 1989 [Kothari et al 1989]. Some of the major findings are given below.

Major Findings of the First Survey

The first survey collected and analysed data on many aspects of PA management. Some of the important ones are listed below.

Legal steps: Only 21 (40%) of the 52 national parks responding had completed their legal procedures. Significantly, this meant that only 21 of the 52 parks were legally national parks.

Only 16 (8%) of the 209 sanctuaries responding had completed their legal procedures[4].

Human Population: Information was obtained separately for human populations residing inside each park or sanctuary and those living in areas adjacent to it (i.e. within a 10-km. radius). 10 km was specified because studies showed that, by and large, direct pressure on the PA came from people living inside the PA or within 10 km of the boundary.

Population within parks and sanctuaries

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

Since the absolute quantum of population inside is not a good indicator of the potential biotic pressure it can put on to the ecosystem, the data base was used to work out population densities. This was worked out by a simple division of the total population with the total area of each park and sanctuary. Contrast this with the average population density of India, which is about 2.5 per ha.

The data obtained revealed the following ranges of density:

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

Population adjacent to parks and sanctuaries

Of the 23 national parks and 132 sanctuaries responding, 19 (83%) and 115 (87%) respectively, reported populations in their adjacent areas.

An index of population pressures was worked out for each protected area by dividing the total population reported from adjacent areas with the

[4] The number of PAs under each head differs because all the PAs who completed the questionnaire did not respond to every question.

total area of the park or sanctuary. (Note that the index thus worked out was in relation to the area of each park and sanctuary, and not in relation to the area adjacent).

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

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

Rights and Leases: All rights and other human uses are prohibited within national parks. In sanctuaries certain rights can be allowed, however, these should be within the carrying capacity of the area.

In 19 (43%) of the 44 national parks and 128 (68%) of the 187 sanctuaries responding there existed some rights or leases. This meant that these 19 national parks were still not being protected according to the legal requirements. Also, data collected regarding the completion of legal procedures (and quoted earlier) revealed that only 16 sanctuaries responding had completed the prescribed procedures. As at that time it was mandatory to extinguish all rights even in sanctuaries (prior to the 1991 amendment), it would mean that these 128 sanctuaries reporting the existence of rights had not completed their legal procedures and were, as such, not being managed as stipulated.

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

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

Since different kinds of livestock have different ecological impacts, the overall livestock figures were broken up into separate figures for cattle, goats, and sheep, and their densities worked out (number of livestock divided by area in ha. of park/sanctuary). The tables below

present densities of cattle, goats, and sheep grazing in parks and sanctuaries, arranged in descending order.

The range of densities obtained was as follows:

Cattle

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

Note that the national density was roughly 0.81 cattle per ha., if one took the 1982 figure of 260 million heads of cattle.

Goats

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

Density of goats for India as a whole was roughly 0.30 per ha., given the 1982 figure of 95 million goats in India.

Sheep

Density (No. of sheep per ha.)	No. of N/S		
	N	S	T
5.0 to 10.00	0	1	1
1.0 to 4.99	1	7	7
0.5 to 0.99	0	4	4
0.1 to 0.49	3	24	27
0.01 to 0.09	6	25	31

The density of sheep in India was roughly 0.15 per ha., if one took the 1982 figure of 48 million sheep in the country.

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

Extraction of Timber and Non-Timber Forest Products: The law prohibits the extraction of timber and other forest produce from national parks. From sanctuaries, timber and other biomass can only be extracted if its extraction is "for the better management of wildlife". After the 1991 amendment, extraction can also be allowed from a sanctuary if it is a right that has been allowed by the Chief Wildlife Warden.

Timber

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

Non-Timber Forest Produce

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

Use and Occupation by other Government Departments and Agencies: The Wild Life (Protection) Act of 1972 specifies that the control of national parks and sanctuaries must vest with the Chief Wildlife Warden of each state (section 33 for sanctuaries, and section 35 (6-8) for national parks).

What this implies is that any activity by a government agency or department, in a national park or sanctuary, has to be cleared by the Chief Wildlife Warden.

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

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

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

Encroachment: Three (7%) of the 44 national parks and 32 (20%) of the 160 sanctuaries responding reported encroachment.

Though encroachment is also "illegal occupation", a distinction is made here between illegal location by government or other outside agencies (occupation) and by local people (encroachment).

Offences: Of the 45 national parks and 172 sanctuaries responding, 31 (69%) and 96 (56%) respectively reported incidence of one or more types of offences. Incidentally, the absence of recorded offences in a PA does not necessarily mean that the PA is either well managed or that the

pressures in it are low. It might very well mean that violations of the law are not being recorded or acted upon.

Clashes: Conflicts over the use and control of natural resources become law and order problems and often result in clashes and physical confrontations between the local people and the PA authorities. 16 (37%) of the 43 national parks and 31 (17%) of the 179 sanctuaries responding reported the incidence of such confrontations or clashes.

Management

Management Plan: Of the 52 national parks and 208 sanctuaries responding, 26 (50%) of the parks and 65 (31%) of the sanctuaries reported the existence of management plans. In all the other areas management was carried out, on an ad hoc basis with an annual perspective, rather than a five or ten yearly one.

Zoning: 18 (38%) of the 48 national parks and 41 (19%) of the 221 sanctuaries responding, reported the existence of zones.

Relocation of Human Population: Of the 16 national parks and 88 sanctuaries which had human population inside them and which had responded to this question, 5 (31%) of the parks and 4 (5%) of the sanctuaries had proposed to relocate a part or whole of their population prior to 1984.

Actual relocation till 1984 had been done in 4 (25%), of the national parks and 3 (3%) of the sanctuaries having human population and responding. This represents 80% of the parks and 75% of the sanctuaries where relocation was proposed. This does not however mean that relocation has been complete, i.e. that all the villages proposed for relocation have been shifted.

Compensation Payable for Injury or Death of Livestock: 10 (22%) of the 45 national parks and 57 (31%) of the 182 sanctuaries responding have reported that compensation is payable for injury or death of livestock, by wild animals, within the PA. Corresponding figures for adjacent areas are: 20 (44%) of the 45 national parks and 59 (32%) of the 182 sanctuaries responding. Only 9 (20%) of the national parks and 46 (25%) of the sanctuaries pay compensation for injury or death both inside and outside. The rates of compensation vary from Rs. 5000 to Rs. 100 per cow killed or injured and somewhat less for buffaloes, goats and sheep.

Compensation for Damage to Crops: 2 (5%) of the 43 national parks and 19 (10%) of the 188 sanctuaries responding reported that compensation is payable for crop damage inside the PA, by wild animals. For the adjacent area, the figures were 5 (12%) of 43 national parks and 26 (14%) of the 188 sanctuaries responding. Compensation was payable both inside and in adjacent areas in only 1 (2%) of 43 national parks and 18 (10%) of 188 sanctuaries responding.

Research and Monitoring: 16 (42%) of the 38 national parks responding and 38 (23%) of the 166 sanctuaries responding reported that research work had been undertaken or was underway.

Monitoring was reported from 9 (20%) of the 46 national parks and only 21 (11%) of the 193 sanctuaries responding.

Management Practices Pertaining to Forest Fires, Floods, Droughts and Water Pollution: *Forest Fires:* 12 (32%) of the 37 national parks responding and 38 (23%) of the 165 sanctuaries responding reported the existence of fire lines, while 8 (21%) and 22 (13%) respectively reported the existence of other fire fighting measures. 53% of the parks and 39% of the sanctuaries responding reported the incidence of forest fires, which gives some idea of the shortage of proper anti-fire facilities. However, these figures are not strictly comparable, since some parks and sanctuaries which reported the existence of fire lines had had no incidence of fire.

Floods: Of the two national parks and 14 sanctuaries reporting floods from among the areas responding, one (50%) and five (36%) respectively reported taking any flood control measures. These measures included creation of embankments, strengthening of *bunds* (embankments), provision of better drainage, and others.

Droughts: Of the four national parks and 28 sanctuaries reporting the incidence of drought from among those responding, all 4 national parks and 16 (57%) sanctuaries had taken some remedial measures. These measures included creation of artificial water points, digging of wells, and others.

Water Pollution: Of the five national parks and 20 sanctuaries reporting incidence of water pollution from among those responding, three (60%) and eight (40%) respectively had taken some remedial measures. Measures ranged from lodging of protest with the relevant authorities to chemical treatment.

Personnel: The data show that 45 (90%) of the 50 parks and 171 (87%) of the 196 sanctuaries responding have staff positioned in or for them. The data further show that of the 45 parks reporting existence of staff, 30 (67%) had at least one staff member trained in wildlife. Corresponding figures for sanctuaries were 61 (36%) out of 171.

Association of NGOs: The involvement of people and people's organisations in wildlife management has been recognised as crucial to the protection of wildlife areas. The National Wildlife Action Plan, drawn up by the Government of India, repeatedly stresses this point: "The involvement of Non-Government Organisations is of great importance to the total conservation effort of the country and there is an urgent need to define the role of such organisations and identify particular ways in which they can be of assistance".There has also been a task force, set up by the Indian

Board for Wildlife , to report on ways and means of eliciting public support for wildlife conservation.

Unfortunately, there does not seem to be much evidence of association of NGOs with parks and sanctuaries. Of the 47 national parks and 198 sanctuaries responding, only eight (17%) and 23 (12%) respectively reported association of NGOs.

Equipment: Nationwide, of the 40 national parks and 159 sanctuaries responding, 27 parks (68%) and 79 sanctuaries (50%) reported the existence of one or more kinds of equipment.

Management Constraints

The findings of the survey brought out many important constraints to the effective management of PAs. They also established that, though the expansion of the protected areas network, both in numbers and in the area covered, had been rapid, growth in management effectiveness had not kept pace. Some of the major constraints to effective management that the survey brought out are described below.

Cumbersome Legal Processes: Setting up of protected areas under the WL Act has proved to be a cumbersome process. Before the 1991 amendment, the procedure was that for national parks, the government had to declare its intention to constitute an area into a national park. After this, local people were asked to prefer any rights and other claims that they might have in the notified area. These rights were then to be settled. Only after the rights and claims were settled or the affected area excluded from the intended national park, could it be finally notified.

To set up a sanctuary, the government had only to notify an area as a sanctuary and the area legally became so from the date of notification. The rights and claims of the people were settled after the area was fully notified.

Experience showed that in a large proportion of the national parks, the final notifications were not done even decades after the initial intention had been notified. This was partly due to the requirement that the settlement of rights would be done by the collector or the collector's nominee. In India, the collector is not only a very busy person who rarely finds time to take up this responsibility but also it is not his/her department that is responsible for managing a park. Therefore, low priority and problems of inter-departmental co-ordination resulted in many of the so-called national parks actually having no legal status as national parks.

For sanctuaries also, a similar problem existed for similar reasons. Of course, in the case of a sanctuary, there was no requirement for a final notification and the area became a legal sanctuary from the date of the first notification. However, the non-completion of the processes designed to identify and settle rights and claims meant that these rights and claims

continued to be exercised in the sanctuary, making its proper management an almost impossible task.

Even for areas, which were originally reserved forests, the WL Act prescribed that all the procedures to determine and settle rights and other claims were to be carried out before it could be made into a national park. This was despite the fact that a procedure, similar to the one prescribed in the WL Act, would already have been carried out to determine and settle rights and claims, when the area was declared a reserved forest. As no new rights could be acquired in a reserved forest, the repetition of this lengthy process was a waste of time and money.

Inadequate Management Inputs and Capacities: Almost on all fronts, PAs in India were found to be lacking in management capacities. Few had management plans, even fewer had operationalised these plans; budgets were mostly inadequate, personnel few and mostly untrained, with little research and almost no equipment. In many PAs, the control of the entire area had not been handed over, as required, to the wildlife department and, in others, forestry operations unsuitable to wildlife protected areas were still prevalent. Most disturbingly, a large number of government departments continued to use the PAs in ways that were illegal and destructive. The ability of the PA manager or the wildlife department, despite the best of intentions, to prevent this was limited. In fact, the survey found that the government itself was the largest violator of the WL Act!

Poor Support and Involvement of the Local Communities: Support and involvement of the local communities was almost totally absent in most of the PAs. In fact, in many of them there was evidence of hostility between the PA authorities and the local communities. This was characterised by clashes, often involving violence, between them. The hostility of the local communities was usually because of what they saw as an illegitimate curtailment of their access to the PA's resources. The PA managers, on the other hand, saw themselves as being bound by the law to curtail the access of local communities and without the mandate to provide any alternatives to the affected communities, or even compensate them for their loss.

There was also tension because of the depredations caused by wild animals, often from the PAs, to the crops and livestock of local communities. In some cases, there were also records of attacks on human beings. The inability of the PA authorities to prevent this and, when it happened, to give quick and adequate relief and compensation, was another source of tension. The fact that, in PAs, most 'forest working' stopped, thereby depriving the local people of employment as wage labourers, further exacerbated the tension.

Lack of a regional perspective: The ability of PA managers to regulate land use and other activities in areas adjacent to the PA was lacking. This

meant that the PA could not be effectively protected from pressures, especially pollution, emanating from outside the PA boundary. This constraint was especially critical where mines or polluting industries were allowed to operate outside but adjacent to the PA.

Lack of research and monitoring: Scientific inputs into PA management were almost non-existent. Very few of the PAs had active research programmes and even fewer had programmes relevant to their management needs. Most PAs did not even have an authentic listing of the main faunal and floral species found within their boundaries. Biological, institutional and socio-economic monitoring was almost entirely absent. Apart from annual or biannual census of some of the larger animals, very little other information was being collected or analysed on a regular basis.

Follow Up

Many of the recommendations made in the study report were accepted and adopted by the Government of India. For example, the legal procedures were simplified and areas, which were already reserved forests or territorial waters of India, did not have to go through a detailed process of determining and settling rights [1991 amendment of the WL Act]. Currently the act is being again revised to make the process of finally notifying PAs less cumbersome in other ways. The financial allocations to the wildlife sector were also significantly enhanced in the coming years. Training of wildlife personnel was stepped up and special efforts were made to develop management plans for all the PAs.

Based on the findings of this study, the World Wide Fund for Nature-India (WWF India) filed a case in the Supreme Court of India, requesting the court to direct the Union Government and the respective state governments to complete the legal procedures required to set up national parks and to rid sanctuaries of unwanted pressures. The Supreme Court, in an interim order, so directed the concerned governments and gave them a time schedule to complete this process.

But perhaps the most significant development of all was the introduction of schemes on ecodevelopment, aimed at minimising the deprivations faced by local communities due to the setting up of the PA, and at progressively getting the support and involvement of the local communities in the management of PAs.

Planning for Ecodevelopment: 1992-1995

The results of the first survey, published in 1989, and other studies and assessments, made it clear that one of the most difficult challenges facing PA managers was the reconciliation of the local community's demands for biomass and incomes from the PA with the requirements of biodiversity

conservation. The law, on the one hand, prohibited access to almost all the resources within a PA. On the other hand, these communities had few other survival options. Besides, many of the local people living in and around PAs had been using these resources for years, sometimes for generations, and usually from well before the PA was constituted. The sudden restrictions on their access not only resulted in severe hardships but also made them hostile to the PA managers.

In order to tackle this problem, the Government of India decided to launch a programme for introducing ecodevelopment around PAs. Ecodevelopment[5], as an approach, seeks to assess the adverse impacts that local people have on the PA and the PA has on the lives of the people. It then attempts to minimise these impacts by helping develop alternative sources of biomass and incomes, which are ecologically and socially acceptable. It does this through supporting the local communities to develop a village level plan exploring and establishing either alternative sources of fuel, fodder and other biomass, or alternatives to such biomass. It also seeks to develop income generation opportunities that can divert the dependence of the local population from the PA. The involvement of the local communities in the management of the PAs is also encouraged and support is given for strengthening PA management, training and research.

The IIPA was commissioned by the Ministry of Environment and Forests (MoEF), Government of India, to do a series of studies to identify the best ecodevelopment strategies for selected PAs. Between 1992 and 1995, detailed studies were carried out in eleven PAs, namely Kalakad Mundunthurai Tiger Reserve in the state of Tamil Nadu, Great Himalayan National Park in Himachal Pradesh, Rajaji National Park in Uttar Pradesh, Simlipal Tiger Reserve in Orissa, Gir National Park in Gujarat, Pench Tiger Reserve in Madhya Pradesh, Periyar Tiger reserve in Kearala, Buxa Tiger Reserve in west Bengal, Ranthambhore Tiger Reserve in Rajasthan, Palamau Tiger Reserve in Bihar and Nagarahole Tiger Reserve in Karnataka.

Based on these studies, ecodevelopment projects were sanctioned and initiated in nine out of these eleven PAs. The first two listed were included, in 1995, in the World Bank supported Forestry Research, Education and Extension Project (FREEP). The last seven listed were included in the India Ecodevelopment Project (1997), supported by the Global Environment Facility (GEF).

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[5] For a detailed description see, for instance, Singh, Shekhar, *Biodiversity Conservation Through Ecodevelopment: Planning and Implementation Lessons from India*, UNESCO, Paris, 1997

Prioritising Among PAs

The experience of developing detailed plans for these eleven areas showed that the time and resources required for developing a workable plan were such that it would be impossible to concurrently plan for all the PAs in India. The need for prioritising among PAs was, therefore, great.

In 1996, a project was initiated to prioritise, for India, sites, species and strategies for biodiversity conservation. This project, called the Biodiversity Conservation Prioritisation Project (BCPP), was sponsored by the Biodiversity Support Programme (BSP)[6] and implemented collaboratively by a group of NGOs and individuals, with the administrative support of WWF India[7].

Among the various types of sites selected for prioritisation were national parks and sanctuaries. The prioritisation of national parks and sanctuaries was done collaboratively by IIPA and WWF India [Mehta 1998].

The Methodology

In order to prioritise from among the PAs, it was decided to use the IIPA and other available databases, and grade each PA in terms of its biological value, the level of pressures or threats it faces and its management and legal status. The values were ascribed as described below.

1. **Biological Value**: based on the diversity of forest types and subtypes occurring in the Paand rarity, the faunal species occurring in the PA, their endemicity, rarity, and threat status, the PA size, geographical link with other PAs, and on the percentage of the biogeographic province under protection.
2. **Pressures or threats** on the PA due to consumptive human use and other reasons.
3. **Management and legal status** of the PA.

The system of valuation is described in annex 1.

1. In terms of the biological value of a PA, each area was either:-
   a. a very high value PA, or
   b. a high value PA.
2. In terms of pressures or threats on the PA, each area was either:-
   a. a high pressure PA, or
   b. a low pressure PA.

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[6] The BSP is located in Washington DC, USA, and is a consortium of World Wildlife Fund, World Resources Institute and Nature Conservancy. It is supported by USAID.

[7] The project was co-ordinated by a steering group, chaired by the author. Raman Mehta of WWF India carried out the study on protected areas.

3. In terms of the legal and management status of a PA, each area was either:-
   a. a low legal and management status PA, or
   b. a high legal and management status PA.

By ascribing the values described above, PAs were classified within each biogeographic province. The PAs which had very high biological value were obviously the first priority. However, among them those that had high levels of pressures were listed higher than those with lower levels of pressures. Further, if a very high value and high pressure PA also had a low legal and management status, it got the highest priority, as conservation focus was most needed there. Conversely, the lowest priority was given to those PAs that had high biological value (as opposed to very high) and low level of pressures coupled with a high legal and management status.

Outputs

By applying this methodology, a list of priorities was built up from among 253 PAs in India[8]. The aggregate total findings were as below:

Valuation of PAs

Biological Value	Human Pressures	Management and Legal Status
Very High **162**	High **135**	High **166**
High **116**	Low **118**	Low **87**
Total **278**	Total **253**	Total **253**

Final Priority Ranking

Priority/Category	Numbers
1. Very High Biodiversity + High Pressure + Low Legal and Management Status	**17**
2. Very High Biodiversity + High Pressure + High Legal and Management Status	**54**
3. Very High Biodiversity + Low Pressure + Low Legal and Management Status	**19**
4. Very High Biodiversity + Low Pressure + High Legal and Management Status	**52**
5. High Biodiversity + High Pressure + Low Legal and Management Status	**25**
6. High Biodiversity + High Pressure + High Legal and	**39**

[8] The 105 PAs of Andaman and Nicobar Islands were not included in this exercise as it was felt that a separate prioritisation exercise should be done for them. Of the remaining 428, adequate data were only available for 253. Data on biological aspects were, however, available for 278 PAs.

Management Status	
7. High Biodiversity + Low Pressure + Low Legal and Management Status	26
8. High Biodiversity + Low Pressure + High Legal and Management Status	21
Total	253

Follow Up

The priority list of PAs, developed under the BCPP, is being increasingly used to channel additional funding to the high priority areas. For example, the preliminary list of forty PAs to be taken up in the GEF funded second India Ecodevelopment Project, currently under planning, is based on this prioritisation exercise.

The Second All India Survey: 1998-2001

Over ten years having passed since the last survey (1984-87), it was thought desirable to conduct a fresh survey and to assess the changes that have occurred in the interim. Accordingly, the MoEF sponsored the IIPA, with financial assistance from the World Bank, to conduct a fresh survey. The objectives of this second survey are to:

1. Survey the status of wildlife protected areas (PAs) in India, including the legal and administrative status, socio-economic pressures, management planning and implementation, staffing, research, monitoring, and tourism.
2. Use a methodology, for the basic survey, that is such that it allows comparison of data with the earlier survey done by the IIPA in 1984-87.
3. Based on this survey:
   - 3.1 update their publication *Management of National Parks and Sanctuaries in India: A* Status Report [IIPA 1989], and highlight trends, using the 1989 report as the baseline.
   - 3.2 Describe and prioritise PAs in terms of the ecodevelopment requirements for each protected area, so as to assist in developing a list of PAs to be selected for the proposed GEF India Ecodevelopment Project - II.
   - 3.3 Describe and prioritise PAs in terms of management needs for each PA.
   - 3.4 Assess national laws, policies, schemes and programmes relevant to PA management and ecodevelopment, and recommend changes, if required.

3.5 Develop a database on different aspects of PAs including photographic data for use both in training and in subsequent monitoring.

3.6 Identify legal and other external interventions that might be required for the proper conservation of specific PAs.

In order to fulfil the prescribed objectives, it is proposed to survey all the national parks and sanctuaries in India in terms of their:

- **Legal Status**: how many of the steps prescribed, for setting up a national park or sanctuary, under the Wild Life (Protection) Act of 1972, as amended in 1991, have been carried out? With whom does the control over the PA vest?
- **Management Status**: Are there up-to-date and approved management plans? Are there appropriate budget provisions? What levels and numbers of staff are in position, and how many are trained in wildlife management? What are the organisational structures and systems? What is the management practices, especially relating to control of poaching, regulation of visitors, and prevention and vacation of encroachments? What is the availability of equipment, literature and reference materials? What interpretation, education and extension facilities and activities are in evidence? What level of participation is there of the local people in the protection and management of the PA? What ecodevelopment initiatives have taken place?
- **Biological Profile**: What habitat and ecosystem types, including forest and biogeographic types, occur in the PA, what is their location and extent, and what is their status? What species of fauna and flora occur in the PA, what is their distribution and status? What geographical connection, if any, does the PA have, through corridors and such like, with other PAs? What are the special biological values of the PA? How adequate is our PA network in terms of protection of priority species?
- **Geographical Profile**: What is the location of the PA and how best can it be reached? What is the nature of the terrain and what are the significant physical features, including the high and low points? What is the climate like? What are the locations of other human made and natural features?
- **Socio-economic Profile**: How many people live within or adjacent (10 kms radius) to the PA? What is their socio-economic status and their dependence on the natural resources, especially those of the PA? What is the nature and legitimacy of their use of, and dependence on, the PA, past and present? What is the tourism value of the PA and how many and what sorts of tourists visit it, and when? What are the religious and cultural values of the PA? What impact does the PA have on the local people, especially adverse impacts including depredation by wild animals and restrictions on the use of resources? What alternate resource

bases can be, or have been, developed for the local people, especially through an ecodevelopment approach?

- **Management Issues**: What are the major threats to the habitat and species, including those through pressures from the local people? What is the incidence and nature of illegal activities in the PA? What is the incidence and impact of activities within the PA by other government departments? What is the cause, intensity and frequency of law and order problems, including tensions with the local people?

The Methodology

As the findings of this survey have to be contrasted with the findings of the earlier survey, in order to assess the changes that have occurred in the interim, the basic methodology being followed is the same as that which was followed in the earlier survey. This methodology is described below.

- A questionnaire seeking information on all these aspects will be sent to the directors or officers-in-charge of each national park and sanctuary. They would be requested to complete the questionnaire and return it to IIPA.
- Another questionnaire would be sent to NGOs and individuals knowledgeable about PAs.
- Meanwhile, a search of secondary literature on each PA, dealing with any of the listed aspects, will be undertaken, and the documents compiled.
- Simultaneously, a database would be created of the known distribution of prioritised plant and animal species and of biomes, across India and, based on that, a listing of what species and biomes could ordinarily be expected to occur in which PA.
- Also, a survey of census records and other related data would be made and details of the human population and socio-economic parameters relevant to PAs and their adjacent areas would be compiled from these sources.
- Similarly, the boundaries of each PA would be marked out on a Survey of India topographical sheet of appropriate scale and on forest cover maps of the Forest Survey of India. Using these, maps would be developed depicting the boundaries of, and the forest cover in, each PA. These maps would be the base maps on which all additional information received from the PAs or from the field visitors will be depicted.
- National and state budgets and plans will also be analysed to identify the allocations and schemes relevant to each PA and to its adjacent area.
- The completed questionnaires would be analysed and gaps or questions, if any, would be taken up with the PA authorities,
- Based on a quick survey of the questionnaires received and of data already with us, those PAs would be identified that warrant a field visit. These would include PAs for which personal observation and/or a

discussion with the local level officials and communities, is considered essential.

- Teams of three or more researchers, who would collectively represent all the different areas of expertise required, would do the field visits. These teams would not only visit the PA and meet with the forest officials but also, where required, meet revenue and other officials connected with the PA and its adjoining areas. The field visitors would also meet with local NGOs and other knowledgeable and concerned individuals, including a sample of the local villagers.
- The information so gathered would be compiled and a profile made of each PA. There would also be a compilation of state level data. These profiles would then be sent back to the PA/state and, wherever necessary, discussions would be held at the state level.
- The final data set would then be analysed and a draft report produced, which would be discussed in one or more workshops, before being finalised.

Expected Outputs

The survey is expected to produce:

- A profile of each PA, along with a description of its adjacent areas.
- A map of each PA and of its adjacent areas.
- A map of each state and of the country, depicting the location of the PAs and the ecosystems they cover.
- An analysis of the changes that have taken place, since the last survey, in the biological, geographical, socio-economic and managerial status of each PA, and of the PA network in each state and nationally.
- An analysis of the major management issues in each PA, and for the PA network in each state and in the country.
- A gap analysis of the coverage that PAs are providing to different species of fauna and flora, especially threatened and endangered species, and to various ecosystems.
- A priority listing of PAs in terms of their conservation value and their management needs.
- A photographic profile of the PA network, to assist in training, education and monitoring.
- An assessment of the existing and possible management strategies at all levels of the PA network.
- Recommendations at the policy and implementation levels.

Current Status of the Survey

The survey started a year back and a detailed questionnaire was developed and sent to all the PA directors. The questionnaire was designed so as to provide information that allowed comparison with the earlier database and

yet had new and changed questions, based on the experience of the last survey. Field research teams have been identified in different parts of the country and have been put through a basic orientation programme. Field visits to the prioritised PAs are currently underway.

Concurrently, a survey of secondary literature is being conducted and documentation on the PAs and the PA network is also being compiled. A new feature of this survey is the development of a species gap analysis. An assessment is being made to determine how many of the faunal and floral species, prioritised as a part of the BCPP, are found in PAs, in how many, and what is their status. This would hopefully produce a gap analysis which would supplement and update the earlier analysis done by Rodgers and Panwar (1987).

Conclusions

Over the last fifteen years there have been various attempts at surveying and assessing the management of wildlife protected areas in India. Due to a paucity of precedents, the methodology for carrying out such surveys had to be developed through trial and error, keeping in mind the Indian conditions, especially the general paucity of scientific data. Fortunately, the findings and recommendations of the various surveys and studies were taken cognisance of by the government and various changes were made in the laws, policies and programmes relating to wildlife conservation.

However, the major constraint in fully assessing the management effectiveness of individual PAs continues to be the paucity of scientific data. The cost of data collection across over five hundred PAs is prohibitive and it is thought, with some justification, that this money is better spent in supporting PA management. There is, nevertheless, a need to strike a balance between investments on planning and those on implementation.

The major constraints to increased management effectiveness continue to be the paucity of financial and human resources, and a historical inability to involve the local communities in the management of PAs. Fortunately, there is evidence of a change for the better. Investment on wildlife management is increasing, both through national budgets and through externally supported projects. Whereas earlier, bilateral and multilateral donor agencies often supported forestry projects with no wildlife or biodiversity conservation component, this has now changed. Most such projects now have funds specifically committed for wildlife conservation.

Training opportunities in wildlife management have also increased substantially and an increasing number of senior forest officers have voluntarily opted for wildlife postings. However, the ability to attract good and interested field staff, is still a problem.

Most happily, the attitudes of the government, and particularly of PA managers, towards the involvement of local communities in PA management have changed for the better. Apart from changing attitudes, programmes like ecodevelopment have given PA managers the wherewithal and the official legitimacy to start working with the local people. And it is in this direction that hope for the future lies.

ANNEX - 1
FRAMEWORK FOR VALUATION OF PAs

1. **Biodiversity Values:**

a) Occurrence of forest types:

i) Occurrence of a forest sub type = 2 marks for each forest sub type [source: IIPA database]

ii) Occurrence of more than one forest type = 5 marks

iii) Occurrence of a rare forest type/sub type = 5 marks [source: Rodgers and Panwar]

b) Occurrence of an under represented biome apart from a forest type e.g. deserts, wetlands etc. = 5 marks [source: Rodgers and Panwar & Forest Survey of India]

c) Occurrence in a PA of a species of flora or fauna listed in schedule - I of the Wildlife (Protection) Act, 1972, and which does not occur in any other PA = 10 marks [source:IIPA & WII Database & Rodgers and Panwar]

d) Occurrence of a species of flora or fauna listed in schedule - I of the Wildlife (Protection) Act, 1972, which is found in more than 1 PA but in less than or equal to 5 PAs = 8 marks [source: IIPA & WII Database & Rodgers and Panwar]

e) Occurrence of a species of flora or fauna listed in schedule - I of the Wildlife (Protection) Act, 1972, which is found in more than 5 PAs and less than or equal to 10 PAs = 5 marks [source: IIPA & WII Database & Rodgers and Panwar]

f) Occurrence of a species of flora or fauna listed in schedule - I of the Wildlife (Protection) Act, 1972, which is found in more than 10 PAs and less than or equal to 15 PAs = 3 marks [source: IIPA & WII Database & Rodgers and Panwar]

g) Occurrence of a species of flora or fauna listed in schedule - I of the Wildlife (Protection) Act, 1972, which do not fall in categories c), d), e) and f) above = 1 mark per species [source: IIPA & WII Database]

h) Value for the size of the PA = Area of the PA(sq. km.)/100 upto a maximum of 10 marks

i) PA adjoining other PAs or linked through corridors to other PAs = Area of the PA/PAs(sq. km.)/100 upto a maximum of 10 marks [Source: Rodgers and Panwar, IIPA Database]

j) PA situated within a biogeographic province where total area covered by PAs is less than or equal to 1% = 10 marks [Rodgers and Panwar, List of PAs (MoEF)]

k) PA situated within a biogeographic province where total area covered by PAs is greater than 1% and less than or equal to 2% = 7 marks [Rodgers and Panwar, List of PAs (MoEF)]

l) PA situated within a biogeographic province where total area covered by PAs is greater than 2% and less than or equal to 4% = 4 marks [Rodgers and Panwar, List of PAs (MoEF)]

m) PA situated within a biogeographic province where total number of PAs is less than or equal to 5 = 10 marks [Rodgers and Panwar, List of PAs (MoEF)]

n) PA situated within a biogeographic province where total number of PAs is greater than 5 and less than or equal to 10 = 7 marks [Rodgers and Panwar, List of PAs (MoEF)]

o) PA situated within a biogeographic province where total number of PAs is greater than 10 and less than or equal to 15 = 4 marks [Rodgers and Panwar, List of PAs (MoEF)]

2. Legal Status:
   A. Intended Sanctuary (if notified after the 1991 amendment of the Wildlife (Protection) Act, 1972) = 0.5 marks [source: Questionnaire 1A]
   B. Intended Sanctuary having a legal status of a Reserve Forest = 1 mark [source: Questionnaire 1A]
   C. Intended Sanctuary having no rights within = 1.5 marks [source: Questionnaire 1A]
   D. Intended National Park = 2 marks [source: Questionnaire 1A]
   E. Intended National Park having a legal status of a Reserve Forest = 2.5 marks [source: Questionnaire 1A]
   F. Intended National Park having no rights within = 3 marks [source: Questionnaire 1A]
   G. Sanctuary notified before the 1991 amendment of the Wildlife (Protection) Act, 1972, but not fully set up = 3.5 marks [source: Questionnaire 1A]
   H. Sanctuary not fully set up but having a legal status of a Reserve Forest = 4 marks [source: Questionnaire 1A]
   I. Sanctuary not fully set up but having no rights within = 4.5 marks [source: Questionnaire 1A]
   J. Sanctuary fully set up = 5 marks [source: Questionnaire 1A]
   K. Sanctuary fully set up and an Intended National Park = 5.5 marks [source: Questionnaire 1A]
   L. Sanctuary fully set up and an Intended National Park as well as having a legal status of a Reserve Forest = 6 marks [source: Questionnaire 1A]
   M. Sanctuary fully set up and an Intended National Park having no rights within = 6.5 marks [source: Questionnaire 1A]
   N. Fully notified National Park = 7 marks [source: Questionnaire 1A]

3. Management Parameters:
   O. PAs which have a management plan = 1 mark [source: IIPA database, Questionnaire 1A & WII database]
   P. PAs which have a separate budget = 1 mark [source: IIPA database, Questionnaire 1A & WII database]
   Q. PAs which have zoning = 1 mark [source: IIPA database, Questionnaire 1A & WII database]

4. Biotic Pressures [Source: IIPA database and Questionnaire 1A]: Please note that an absence of any of the pressures will result in the PA getting no marks for those pressures which do not exist. In the case of a PA having no pressures at all, its negative value will be equal to zero.

a) Dam for an irrigation or hydel power project:
   i) Area of the reservoir less than or equal to 5% of the PA = 1 mark
   ii) Area of the reservoir more than 5% or equal to 10% of the PA = 2 marks
   iii) Area of the reservoir more than 10% of the PA = 3 marks

b) Tourism:
   i) Area occupied by the tourism project less than or equal to 5% of the PA = 1 mark

ii) Area occupied by the tourism project more than 5% and equal to 10% of the PA = 2 marks

iii) Area occupied by the tourism project more than 10% of the PA = 3 marks

iv) Density of tourists visiting the PA annually below or equal to the 33 percentile class density of tourists visiting all other PAs annually = 1 mark

v) Density tourists visiting the PA annually more than 33 or equal to 66 percentile class density of tourists visiting all other PAs annually = 2 marks

vi) Density of tourists visiting the PA annually more than 66 percentile class density of tourists visiting all other PAs annually = 3 marks

c) Mining/Quarrying

i) Area occupied by the mining/quarrying project less than or equal to 5% of the PA = 1 mark

ii) Area occupied by the mining/quarrying project more than 5% and equal to 10% of the PA = 2 marks

iii) Area occupied by the mining/quarrying project more than 10% of the PA = 3 marks

d) Plantations:

i) Area of the PA used for plantations less than or equal to 5% of the PA = 1 mark

ii) Area of the PA used for plantations more than 5% and equal to 10% of the PA = 2 marks

iii) Area of the PA used for plantations more than 10% of the PA = 3 marks

e) Electrical cables/transmission lines:

i) Electrical cables transmission lines within the PA = 2 marks

f) PWD Roads/Highways:

i) PWD Roads/Highways within the PA = 2 marks

g) Habitation:

i) Area of habitation less than or equal to 5% of the PA = 1 mark

ii) Area of habitation more than 5% or equal to 10% of the PA = 2 marks

iii) Area of habitation greater than 10% of the PA = 3 marks

iv) Density of population less than or equal to 33% of the density of population of the district(s) in which the PA is located = 1 mark

v) Density of population more than 33% and less than or equal to 66% of the density of population of the district(s) in which the PA is located = 2 marks

vi) Density of population more than 66% of the density of population of the district(s) in which the PA is located = 3 marks

h) Cultivation:

i) Area of cultivation less than or equal to 5% of the PA = 1 mark

ii) Area of cultivation more than 5% or equal to 10% of the PA = 2 marks

iii) Area of cultivation greater than 10% of the PA = 3 marks

i) Pilgrimage:

i) Area of pilgrimage spot(s) less than or equal to 5% of the PA = 1 mark

ii) Area of pilgrimage spot(s) more than 5% or equal to 10% of the PA = 2 marks

iii) Area of pilgrimage spot(s) greater than 10% of the PA = 3 marks

iv) Density of pilgrims visiting the PA annually less than or equal to the 33 percentile class of pilgrims visiting all other PAs annually = 1 mark

v) Density of pilgrims visiting the PA annually more than 33 percentile or equal to 66 percentile class of pilgrims visiting all other PAs annually = 2 marks

vi) Density of pilgrims visiting the PA annually more than 66 percentile class of pilgrims visiting all other PAs annually = 3 marks

j) Fishing:

i) Area impacted by fishing less than or equal to 5% of the PA = 1 mark

ii) Area impacted by fishing more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by fishing greater than 10% of the PA = 3 marks

iv) Quantum of extraction per sq. km. of fish less than or equal to the 33 percentile class of the per sq. km. extraction of fish from PAs = 1 mark

v) Quantum of extraction per sq. km. of fish more than 33 or equal to 66 percentile class of the per sq. km. extraction of fish from PAs = 2 marks

vi) Quantum of extraction per sq. km. of fish more than 66 percentile class of the per sq. km. extraction of fish from PAs = 3 marks

k) Timber Extraction:

i) Area impacted by timber extraction less than or equal to 5% of the PA = 1 mark

ii) Area impacted by timber extraction more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by timber extraction greater than 10% of the PA = 3 marks

iv) Quantum of extraction per sq. km. of timber less than or equal to 33 percentile class of the per sq. km. extraction of timber from PAs = 1 mark

v) Quantum of extraction per sq. km. of timber more than 33 percentile or equal to 66 percentile class of the per sq. km. extraction of timber from PAs = 2 marks

vi) Quantum of extraction per sq. km. of timber more than 66 percentile class of the per sq. km. extraction of timber from PAs = 3 marks

l) Fuelwood Extraction:

i) Area impacted by fuelwood extraction less than or equal to 5% of the PA = 1 mark

ii) Area impacted by fuelwood extraction more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by fuelwood extraction greater than 10% of the PA = 3 marks

iv) Quantum of extraction per sq. km. of fuelwood less than or equal to 33 percentile class of the per sq. km. extraction of fuelwood from PAs = 1 mark

v) Quantum of extraction per sq. km. of fuelwood more than 33 percentile or equal to 66 percentile class of the per sq. km. extraction of fuelwood from PAs = 2 marks

vi) Quantum of extraction per sq. km. of fuelwood more than 66 percentile class of the per sq. km. extraction of fuelwood from PAs = 3 marks

m) NWFP Extraction:

i) Area impacted by NWFP extraction less than or equal to 5% of the PA = 1 mark

ii) Area impacted by NWFP extraction more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by NWFP extraction greater than 10% of the PA = 3 marks

iv) Quantum of extraction per sq. km. of NWFP less than or equal to 33 percentile class of the per sq. km. extraction of NWFP from PAs = 1 mark

v) Quantum of extraction per sq. km. of NWFP more than 33 percentile or equal to 66 percentile class of the per sq. km. extraction of NWFP from PAs = 2 marks

vi) Quantum of extraction per sq. km. of NWFP more than 66 percentile class of the per sq. km. extraction of NWFP from PAs = 3 marks

n) Fodder Extraction:

i) Area impacted by fodder extraction less than or equal to 5% of the PA = 1 mark

ii) Area impacted by fodder extraction more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by fodder extraction greater than 10% of the PA = 3 marks

iv) Quantum of extraction per sq. km. of fodder less than or equal to 33 percentile class of the per sq. km. extraction of fodder from PAs = 1 mark

v) Quantum of extraction per sq. km. of fodder more than 33 percentile or equal to 66 percentile class of the per sq. km. extraction of fodder from PAs = 2 marks

vi) Quantum of extraction of fodder more than 66 percentile class of the per sq. km. extraction of fodder from PAs = 3 marks

o) Grazing:

i) Area impacted by grazing less than or equal to 5% of the PA = 1 mark

ii) Area impacted by grazing more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by grazing greater than 10% of the PA = 3 marks

iv) Density of cattle units grazing in the PA less than the density of cattle units in the district in which the PA is located = 1 mark

v) Density of cattle units grazing in the PA equal to the density of cattle units in the district in which the PA is located = 2 marks

vi) Density of cattle units grazing in the PA less more than the density of cattle units in the district in which the PA is located = 3 marks

p) Forest Fires:

i) Area impacted by forest fires less than or equal to 5% of the PA = 1 mark

ii) Area impacted by forest fires more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by forest fires greater than 10% of the PA = 3 marks

q) Weed infestation:

i) Area impacted by weed infestation less than or equal to 5% of the PA = 1 mark

ii) Area impacted by weed infestation more than 5% or equal to 10% of the PA = 2 marks

iii) Area impacted by weed infestation greater than 10% of the PA = 3 marks

r) **Poaching:**

i) Existence of Poaching of animals = 2 marks

ii) Existence of illegal cutting of trees = 2 marks

iii) Poaching or illegal cutting of trees being done by organised gangs of poachers = 3 marks

Questionnaire 1 or 1A = questionnaire circulated as a part of the IIPA study.

References

Kothari et al 1989. Kothari, A., P.Pande, Shekhar Singh, and Dilnavaz Variava. *Management of National Parks and Sanctuaries in India, A Status Report*, Environmental Studies Division, Indian Institute of Public Administration, New Delhi.

Lal et al 1994. Ranjit Lal, , Ashish Kothari, Pratibha Pande, and Shekhar Singh *Directory of National Parks and Sanctuaries in Karnataka: Management Status and Profiles*, Indian Institute of Public Administration, New Delhi

Mehta et al 1991. Mehta, Raman, Shekhar Singh, and Ashish Kothari. *India's National Parks, A Management Profile*. Environment Studies Division, Indian Institute of Public Administration, New Delhi.

Mehta 1998. Mehta, Raman, *Prioritisation of National Parks and Sanctuaries in the Indian Mainland*, A collaborative study of the Indian institute of public administration and the world wide fund for nature - India for the biodiversity conservation prioritisation project, Mimeo.

MoEF 1998. Ministry of Environment and Forests, Government of India, *Implementation of Article 6 of the Convention on Biological Diversity on India.*

Pande et al 1991., Pratibha Pande, Ashish Kothari, and Shekhar Singh, *Directory of National Parks and Sanctuaries in Andaman and Nicobar Islands: Management Status and Profiles*, Indian Institute of Public Administration, New Delhi

Rodgers and Panwar 1988. Rodgers, W.A. and H.S.Panwar. *Planning a Wildlife Protected Area Network in India*, March 1988, Wildlife Institute of India, Dehradun, India.

Singh et al 1990. Shekhar Singh, Ashish Kothari and Pratibha Pande, *Directory of National Parks and Sanctuaries in Himachal Pradesh: Management Status and Profiles*, Indian Institute of Public Administration, New Delhi

Variava and Singh 1985. Dinavaz Variava and Shekhar Singh, *Directory of National Parks and Sanctuaries in India*, Indian Institute of Public Administration, New Delhi