

Beyond 2000: A management vision for the Kalakad–Mundanthurai Tiger Reserve

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Upgrading of Park Management inputs requires a fuller understanding of both biological as well as sociological issues. This assumes greater importance in high human density regions like Global Biodiversity hotspots. It is now becoming clear that parks in such zones need baseline floral and faunal studies in tandem with a documentation of biotic pressure profile in order to fully assimilate the new participatory approaches to the management. So far, such approaches are overshadowed by concern for livelihood issues of local human populations only. The impact of such livelihood patterns on park ecosystems, particularly in the case of RET species is not taken cognizance of while framing new prescriptions. Finally, monitoring such prescriptions would further refine management inputs through adaptive practices.

THE challenge before Park managers today, is to successfully combine the three major elements of their profession, viz. a clear understanding of the biological systems in their charge; an intelligent handling of human and non-human resources available and finally, and probably the most crucial in the Indian context, successful park–people relationships.

In a high human density environment such as ours, new and innovative attempts at reducing anthropogenic disturbances in park ecosystems are being watched with keen interest by all those interested in wildlife conservation. The concept of joint Protected Area (PA) management, initially introduced through sundry eco-development projects funded by the Government of India, has gained ground and today has resulted in ‘mega’ projects like the India Eco-development Project, among others. The evolution of these participatory management schemes has been systematically documented and analysed for their content and design¹. Joint PA management has concentrated on generating alternative (other than forest-based) livelihood for those sections of rural society who are principally dependent on forest resources for their sustenance². While the gains before the park management in terms of (generally) local goodwill have been tremendous, a need has been expressed to further incorporate local community knowledge and expert systems into the management ethos^{3,4}.

In this essay, an attempt is made to trace worldwide historical trends in park management, and to juxtapose the lessons learnt against the new management inputs under

experimentation through the World Bank financed FREE Project at the Kalakad–Mundanthurai Tiger Reserve (KMTR; popularly called the eco-development programme). Upon analysing these inputs against their perceived objectives, a vision for future park management in India with KMTR as a case study is presented.

Tracing the evolution of park management – Major trends

Park management in the twenty-first century will undergo many changes, both in the third world as well as the developed nations when compared to the trends in the early phase of the Park ‘movement’.

Already three stages in the evolution of this process can be identified.

The first, which is picturesquely defined as exhibiting the ‘Fortress mentality’ was prevalent in most third world nations, both in Asia and Africa, being especially common in those with a colonial heritage. At this stage, the park officials promoted the view that the management of parks was to be isolated from human intervention to the maximum extent possible. Very often, the then current biological principles of conservation biology were quoted in support and there was a firm belief that human intervention, specifically for biomass resource use was detrimental for the long-term maintenance of key sites and sensitive habitats and promoted competition between humans and wildlife for available resources. This attitude could be attributed to the legacy of colonial forestry practices which bureaucracies running the Forest Department had inherited. (Parks were mostly managed by the Forest Department in a majority of South Asian and South-east Asian countries and a separate department of Parks and Wildlife Conservation did not usually exist.)

In India, this proved a natural corollary of managing ‘hunting estates’ by royalty in the recent history and thus also gained the notoriety of being ‘elitist’. Ironically, the early park movement in most independent former imperialist colonies followed the ‘Yellowstone model’ of North America which set aside wilderness areas for the enjoyment of the public⁵.

The second phase was one of contradictions. On the one hand, major conservation success stories rehabilitating rare and endangered species took place worldwide. There was a widespread expansion of the PA network by

increasing the number of National Parks and Sanctuaries. Attempts were made to maintain critical succession stages and other ecological phenomena to ensure long-term survival of endangered species. In India, principally these examples include the oft-quoted case of the hardground barasingha (*Cervus duvauceli*) in the Kanha National Park. This phase includes strategies such as reintroduction, captive breeding and in the extreme case, artificial insemination. Such a phase also coincided with the launch and the growth of mega projects such as Project Tiger.

On the other hand, a serious debate arose on the entire ideology of parks and the fact that the institution of PAs denied local rural population their 'rightful' and traditional access to forest resources. As most such people were already poverty-stricken and marginalized from mainstream economy, their plight was emphasized strongly. A debate arose on the primacy of human rights over the rights of species to survive and such ethical points were questioned and counter-questioned, depending on which position the proponents of the arguments were on. The ensuing debate challenged the very foundations of wildlife management⁶. Complete isolation from human intervention began to be considered as undesirable. It can therefore be concluded that although the success of these projects expanded the available area under the country's PA network, it also brought into sharp focus some of the inherent contradictions present in wildlife conservation as a land use policy.

In the third and final phase, there was a reconciliation of the two extreme positions. Parks were now quoted as a medium for sustainable development of rural societies and as such significant contributors to the gross domestic product^{7,8}. There was a discernible amalgamation of the social sciences as well as the science of conservation biology^{9,10}. From this evolved the currently prevalent paradigm of joint or participatory management. This adaptation has been promoted on the basis of the understanding that strict conservation policy has disadvantaged and further marginalized the poorest in rural society. The principles of joint management address the challenge of developing a sound constituency for wildlife conservation through the development of (economic) stakes in the park concerned. This approach promotes utilization of non-consumptive uses of the park, principally in ecotourism. An advanced phase of such projects aims to jointly monitor both ecological as well as economic gains and also advocates co-adaptive management in PAs, whereby both local people as well the park management can take up the necessary interventions or changes in management strategy. This is the stage at which most parks, specially in the high human density third world nations are expected to evolve.

Status of KMTR

This Tiger Reserve which is the 17th in the Project Tiger series, has been principally known for its immense species

richness¹¹. It occupies the southernmost part of the Western Ghats mountain formation and enjoys unique isolation from human intervention due to its challenging topography, inclement weather and proximity to the sea coast. This range of unique attributes coupled with the high rainfall (a product of topographical features) has prompted the evolution of several exclusive niches which have come to be occupied by a range of vertebrate and invertebrate fauna, as well as vascular and non vascular plants, with narrow endemism. The entire Western Ghats enjoys the status of a biodiversity hot spot¹², but the species richness of the flora as well as of the herpetofauna probably reaches an apex in the Agasthyarmalai hills¹³, which constitute the bulk of the area in which the Tiger Reserve lies. The relative exclusion from anthropogenic activities as well as the relatively high proportion of contiguous forest cover have also prompted the inclusion of this region in the type-1 grade of Tiger Conservation Unit¹⁴. The area also features as one of the prominent conservation areas constituting the southernmost population of Asian elephant (*Elephas maximus*)¹⁵.

Biologically, KMTR cannot be considered in isolation, but constitutes along with neighbouring PAs in the adjoining state of Kerala, a compact landscape level unit of approximately 1500 km² comprising the sanctuaries of Neyyar, Peppara and Chendurni across the political border. This complex assemblage of five PAs lies well buffered by the managed forest, comprising administrative forest divisions such as Kanyakumari, Thenmalai as well as Tirunelveli with forestry operations. This compact range of hills have good average elevation and are physically separated from the remainder of the Western Ghats by the Ariankavu Pass or the Shencottah Gap.

The brunt of the anthropogenic pressures due to activities such as fuel wood lopping and livestock grazing is borne by the foothill forests of the eastern perimeter. An estimated 145 revenue villages occur in the immediate vicinity of the park's eastern perimeter in a 5 km broad strip. This 'necklace' of villages comprises a large force of landless and low income group individuals, whose circumstances of poverty have generated a huge dependence on fuel wood as a form of forest resource. This, along with livestock grazing from an estimated 10,000 cattle create the major cause for the degradation of wildlife habitat in the foothill forests, which constitute the buffer zone of the park.

Challenges to the management of KMTR

Very few documents present the range of pressing problems in Indian PAs¹⁶. Park management has tended to concentrate on the 'fortress mentality' for a long time and the principal component of managing any park or sanctuary happens to be implementing the requisite sections of the Wildlife Protection Act 1972. Thus the predominant

effort has been on policing. Though this is recognized as a significant component of park management, a need is felt to compound the effort with habitat management prescriptions arrived at as a result of scientific research. The current scenario, especially in high human density pockets of the country, presents an additional challenge of both quantifying human resource use as well as understanding its impact on the ecosystem concerned. Managing PAs in developing countries of the tropics requires heavy investments in men and materials¹⁷. The challenges to park management in India generally stem from a lack of adequate personnel, especially in technical and semi-technical skills. Thus the general challenges which KMTR shares with most parks in the country may be listed as follows.

- (1) Unavailable or poorly documented species and habitat inventory.
- (2) Unavailable or inadequately documented biomass resource use profile.
- (3) Unavailable or inadequate system of monitoring and adaptive management as a consequence of (1 and 2) above.

In the context of KMTR, the specific challenges are as follows.

- (1) Prioritization of R.E.T. plant species of the region and their habitats for specific ecological monitoring.
- (2) Documenting and analysing the biomass use pressures from neighbouring villages on the buffer zone ecosystem.
- (3) Predicting enhanced biomass resource use in coming years and developing preemptive strategies to counter the apprehended degradation of buffer zone ecosystem.
- (4) Enhancing prey and predator population in the context of the specific objectives of Project Tiger.
- (5) Management of tourism pressures, especially in short-term timeframe in ecologically fragile habitats.

An analysis of the available management plan¹⁸ reveals a paucity of specific data or baseline information to design adequate management prescriptions. However, certain very perceptive observations are made in this plan, which would help to prioritize management concerns. These include the thrust on ecotourism, the emphasis on research and monitoring, as well as the need for habitat manipulation. Such an emphasis reveals the ability to analyse the inherent ecological attributes of the park's ecosystem and to sustain the non-consumptive values. Thus the imperative need is for researched information as a backup to management inputs.

Objectives of management of Project Tiger

The Project Tiger has been especially designed with a focus on the conservation of a large predator. However, the species occupies the apex niche in the ecological pyramid and thus its protection by implication also includes the protection of the entire ecosystem. The management

of Tiger Reserves in India therefore includes the management of entire ecosystems under an 'umbrella' approach. In this context special emphasis has to be given to the rare and endangered species which occupy special habitats within the Tiger Reserve ecosystem. There is also an added emphasis on the amelioration of human impacts in the buffer zone and its complete exclusion in the core areas. The objectives of managing KMTR may thus be summarized as follows.

- (1) Maintenance of a viable population of the tiger (*Panthera tigris*) in the long term.
- (2) Maintenance of stable populations of other rare, endangered and threatened species – both flora as well as fauna.
- (3) Safekeeping of the ecosystem services in order to ensure the long-term welfare of the human race (principally the neighbouring rural population).

Learnings from the current eco-development programme

The existing eco-development programme encompasses a total of 113 Village Forest Committees (VFCs) in the eco-development zone bordering the eastern perimeter of the park. Through the micro planning process, VFCs have been able to identify and will sanction alternative income-generating activities to an estimated 24,928 individuals in a span of three financial years. These alternative livelihoods have helped them to give up a living dependent on fuel wood gathering. This achievement is all the more remarkable in that it was achieved through a process of participatory planning, wherein the choice of individual beneficiary was a prerogative of the rural population itself. However, a very preliminary analysis reveals that the coverage of marginalized and forest resource-dependent individuals may not have been adequately achieved within the eco-development project timeframe. Thus this could require as long as a decade before assuredly neutralizing the effects of anthropogenic pressures (see Figure 1 and Table 1). From the point of view of ecosystem management, the ecological ramifications of resource use on

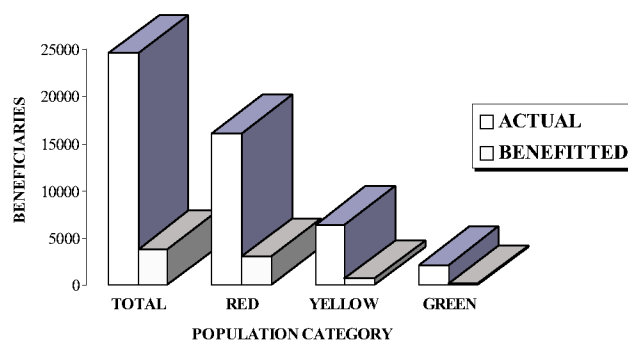


Figure 1. Alternative income generating activities beneficiaries.

buffer zone ecosystem is limited to that of enhancing or reducing competition for food resources of the herbivore population, both terrestrial and arboreal. No precision exists for modelling the adverse effect of, for example, fuel wood lopping on spatial, feeding and breeding niches meant to be occupied by the wild herbivores.

The eco-development programme has a strong socio-economic agenda and perhaps less obvious ecological content. Its ultimate impact on the KMTR ecosystem would lie in reducing competition to prey species for large carnivores such as the tiger, leopard (*Panthera pardus*) and dhole (*Cuon alpinus*). When such species have a recovery of their population, the real effect of the eco-development programme as a park management strategy will be experienced.

For the interim period, eco-development must complement habitat manipulation wherever perceived necessary.

Desirability of management of habitat to enhance prey–predator population in the context of Tiger Conservation

The Wildlife Institute of India (WII) has undertaken a comprehensive research programme formulated to address expressed management needs¹⁹. The research tasks undertaken include the following.

- (1) A baseline inventory of fauna as well as flora.
- (2) Generation of a biotic pressure profile of the park.
- (3) An economic valuation of the consumptive as well as non-consumptive resources of the park.

Much research efforts undertaken in the past have tended to concentrate on a small plateau approximately 60 to 70 km², located in the north-central portion of the Tiger Reserve, by virtue of accessibility of terrain as well as adequacy of food availability. This plateau called the Mundanthurai plateau attracts a large number of wild herbivores and is consequently expected to harbour a significant population of large predators. There appears to be scope for enhancing such predator population by managing food resources to herbivores through a reduction of anthropogenic pressures. This exercise however is expected to be accompanied by management prescription that will enhance the currently available food resources for large carnivores.

Specific management prescriptions that will need attention are as follows.

Table 1. Percentage beneficiaries among population categories ranging from heavily dependent on forest resources (Red) to less dependent (Green)

	Total	Red	Yellow	Green
Actual	24635	16101	6400	2134
Benefitted	3799	3069	639	91
Percentage	15.42	19.06	9.98	4.26

(1) Enhancement of food availability for grazing herbivores by means of opening up more grasslands than currently available.

(2) Enhanced protection from anthropogenic disturbances.

The Mundanthurai plateau has had large patches of grassland which were cleared for the Kumri cultivation in the past. This fact is being investigated by the analysis of satellite imagery through the WII research programme. A study to investigate the effect of fire and grazing on the succession patterns in the understory vegetation in the plateau has revealed several hitherto less understood facts (Sankaran, M., pers. commun.).

It is therefore recommended that certain areas be put under field trials for burning prescriptions. In this case, it is preliminarily observed that the chital (*Axis axis*) are more abundant in the newly cleared viewing line areas in the case of the roads in the plateau. This substantiates the claim that the deer are prone to occupy the edge habitat and has been an important principle of wildlife management in the American continent. The same effect can possibly be enhanced by regular burning prescriptions which will substantially improve the fresh growth that will be the preferred food for the ungulates in the area. The paucity of biological information on the subject of evolution of these grasslands, however, prompts one to be extremely cautious in approaching novel management prescriptions.

It is hoped that the targeted growth in density of the wild herbivores in the plateau can be doubled in the next five years with the results of the management field trials suggested elsewhere in the article. This will enhance the available prey base for tigers in the plateau. It is hoped that similar areas can be designated on the Thalayanai plains. The present author opines that the remaining areas of the park currently cannot be subjected to such treatments in the short term. This is because of the currently heavy fuel wood removal as well as livestock grazing. Substantial progress has been made in the reduction of the grazing pressures in certain village pockets abutting the Mundanthurai plateau. The villagers near Vickramsinghapuram town have formed a federation and jointly put up a 5 km electric fence and this is expected to reduce the livestock grazing pressure at least in the limited zone of influence of the fence. It is to be seen whether such ameliorative measures can be replicated elsewhere along the forest boundary. In any case, the brunt of the biotic pressure would continue to be from cattle grazing and fuel wood lopping and will thus continue to attract management attention in the years to come.

A realistic estimation of annual wood fuel demand from forest resources is a difficult exercise (see Box 1). Its accurate estimation is however the sine qua non of effective buffer zone management in the park. Wood fuel lopping not only interferes with crucial niches of arboreal species, it discourages free ranging movement for feeding

and/or breeding, both of terrestrial prey and predators that perceive man as a threat. Its reduction can only be achieved, however, by generating suitable alternatives, especially to the poor and landless who are marginalized from the normal rural economy.

Such marginalized personnel are required to sustain their activities after obtaining small loans from the VFCs. Practical problems in the day-to-day functioning are many. They often exclude such needy groups from loan disbursal due to their poor loan recovery. They thus need differential loan interest rates or perhaps additional financial and technical support for prolonged periods to ensure dissociation from forest resource dependency. It is necessary to innovate new management methods to creatively enhance this critical sector.

The second major emphasis is livestock grazing, which promotes direct competition with wild herbivores like chital and sambar (*Cervus unicolor*) for food resource. Elsewhere in the country, in many parks such intervention has influenced predator feeding habits. It is thus felt highly desirable to reduce this feature as, in addition, livestock also bring in the possibility of zoonotic disease.

Preliminary results on scrutiny of eco-development statistics are encouraging. In certain villages, 50% reduction of scrub cattle is expected³. This needs to be encouraged throughout the eco-development belt through introduction of stall feeding, as well as introduction of improved breeds. A simultaneous strengthening of law implementation by territorial staff is already showing a

visible decline in the incidence of such biotic pressures. Future eco-development would concentrate on a two-pronged strategy of alternative fuel generation as well as cattle substitution. The other challenge is to consolidate the present-day gains by creating federations such as diary-co-operatives or village craft co-operatives with scientific market surveys and sale out reach establishment.

The foregoing passages should not convey the erroneous impression that all management needs to be now centered around the eco-development as well as the buffer zones and that the core areas with mainly wet evergreen forests can be neglected or left to nature. Though the extent of human disturbance is relatively low in the designated core areas, with the possible exception of the BBTC tea estate, they are by no means free from resource use, which interferes with habitat. The practice of habitat management is a vital component of park management and as such it is complemented with protection and law enforcement. KMTR has many special or key habitats that are the result of microclimatic conditions and as such provide the spatial niches to many unique RET species. This is especially true of the wet evergreen forest types. In a separate study conducted by the WII in the Western Ghats ecosystem, various human interventions, especially NTFP removal have been investigated for the spatial niches occupied by various vertebrate species. Preliminary results indicate that the seasonality of extraction as well as the scale at which the products are removed have a bearing on the utilization of these specific niches by the faunal species

Box 1. Wood fuel demand management

Estimates of wood fuel demand remain woefully inaccurate²⁰. While assessments are available on a national or regional scale, local demand assessment continues to be a challenge. It is important to note that while wood is an important source for meeting domestic energy needs in rural society, it is surprising that a substantial proportion of wood fuel supply may not be met from forest species. In fact, the deficit between wood fuel demand and supply (from forests) is actually largely met from farmyard wastes, bagasse and sometimes trees from homesteads. The utilization of forest wood fuel by individuals in this zone is a choice exercised largely by deciding factors such as accessibility and the range of available alternatives such as LPG, kerosene, cattle dung, etc. The strategy of raising fuel wood plantations may not succeed in diverting the regular fuel wood user from the forests. In any case, plantations have a long gestation period and cannot resolve the issue of demand and supply in the interim gestation period.

Even if we assume that 50% of the domestic fuel wood is met from forest species, and even if the population (and thus the demand) is assumed to double in the next ten years, there remains the scope of demand management without resorting to plantations. This kind of strategy would aim at creating incentives for encouraging the transition from wood fuel to alternatives like kerosene or LPG. The transition is described as a 'fuel wood ladder' and is matched by rising income levels combined with an effective public distribution system of fuels like kerosene or even LPG.

This strategy combined with a programme of incentives to utilize fuel-efficient stoves and chullahs will be a permanent solution to gradually wean away the fuel wood users from forest species.

concerned. Disturbances to the feeding ecology as well as breeding behaviour generally create the conditions that ultimately affect the demography of the species and push them towards the extinction vortex. Thus, it is with this viewpoint that a very critical evaluation needs to be made as to the impact of the various human-related activities in the park. A list of such activities ranges from biomass removal (through grazing as well as fuel wood lopping) to adventure tourism or even religious festivals with high visitor density over short time periods, e.g. the August festival at Mundanthurai. These are concerns that the management has been addressing, but as such the effect of the same needs to be ecologically monitored for their long term impacts. It may be possible that there are no serious deleterious impacts, but a system of adaptive management will definitely be an advantage to test the efficacy of the various management prescriptions that have been undertaken.

The following field trials are suggested in the light of firming up management prescriptions towards improving habitat.

(i) Experimental burns in the mid elevation *Cymbopogon flexuosus* as well as *Aristida setacea*-dominant grasslands (typical of the plateau region). This should be done with a view to observe herbivore usage patterns in the post-burn periods.

(ii) Uprooting softwood plantations with a view to create the edges that are expected to enhance *Axis axis*-population. This assumes that the removal of the softwoods would result in savannah-like mosaics that will be preferred by the edge species like the spotted deer.

(iii) Monitoring of the animal and plant populations in order to obtain a trend of the population and thereby establish whether a healthy demographic condition exists. The following are particularly recommended – animals, lion-tailed macaque (*Macaca silenus*), Nilgiri tahr (*Hemitragus hylocrius*) and Malabar giant squirrel (*Ratufa indica*); plants, *Paphiopedilum drurii*, *Hopea utilis*, *Bentinckia condapanna* and *Nageia wallichiana*.

Efforts to reduce anthropogenic pressures as well as to manage the available habitat, will go a long way to enhance the prey base for the tiger. The available current emphasis on protection and anti poaching is laudable and will only be strengthened in the long run. While the system of monitoring is as yet a new one for most Indian parks, it is hoped that the thrust on adaptive management

emphasized in this essay will set a model for parks in this country to emulate.

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