

KFRI Research Report No.397

ISSN 0970-8103

**LINKING CONSERVATION AND FOREST MANAGEMENT WITH SUSTAINABLE
LIVELIHOODS AND RESOURCE USE CONFLICT IN THE KERALA PART OF
AGASTHYAMALA BIOSPHERE RESERVE**

(Project sponsored by the Ministry of Environment and Forests, Government of India)

(Final Report of the Research Project No. KFRI/520/2006)

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August 2010

ABSTRACT OF THE PROJECT PROPOSAL

Project Number	KFRI/520/2006
Title	Linking conservation and forest management with sustainable livelihoods and resource use conflict in the Kerala part of Agasthyamala Biosphere Reserve (ABR)
Objectives	<p>To examine land use changes and its impact on different production systems and socioeconomic status of the resident population of ABR.</p> <p>To study human interaction, identify and enumerate resource use conflicts, and livelihood issues of the resident population of ABR.</p> <p>To estimate the recreation and cultural tourism value of ABR and its income generating potential.</p> <p>Examine the existing management practices and develop strategies for better management of the natural and human resources in ABR.</p>
Practical utility	Strategies designed for sustainable management of biodiversity based on the study will help implement programmes giving due importance to conservation, socioeconomics, resource use conflicts and the economic potential of the Biosphere Reserve of the region. The final output will be useful for the implementation of community-based people-centered conservation programmes for such a high biodiversity region.
Project period	August 2006 - July 2009*
Funding agency	Ministry of Environment and Forests, Government of India.
Project Team	
Principal Investigator	Dr. V. Anitha
Research Fellow	K.V. Santheep

**The project had a one year extension*

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ACKNOWLEDGEMENTS

The Project was sponsored by the Ministry of Environment and Forests, Biosphere Reserves Grant of Conservation and Survey Division, Government of India. I thank Dr. K.V. Sankaran, Director, KFRI for his kind support and encouragement throughout the project period. I am grateful to Dr. J.K. Sharma and Dr. R. Gnanaharan, former Directors of KFRI for their wholehearted support and encouragement. I am thankful to Dr. S.V. Reddy, Director (S), and Dr. R.K. Rai, Former Additional Director, CS-I Division, for their co-operation in the running of the project. I am indebted to Dr. C.N. Krishnankutty, Dr. K.V. Bhat and Dr. M. Sivaram, Scientists, KFRI for their valuable editorial comments and directions for improving this report. I thank the Officers of the Kerala Forest Department for their help rendered during field work. I also thank all the officials of the concerned Government Departments, the primary stakeholders especially the indigenous communities, the tourists and pilgrims for the cooperation.

ABSTRACT

This study holds significance in the context of special emphasis being laid by the UNESCO to establish linkages between conservation and forest management with sustainable livelihood in Agasthyamala Biosphere Reserve (ABR), having a potential for being recognized as a biodiversity-rich World Heritage Site. The study attempts to bring together insights from emerging forestry and conservation paradigms and investigates their relevance in establishing the aforesaid linkages in the Kerala part of ABR. In the study area, human-related constraints in management mainly relate to the lack of absolute involvement of primary stakeholders and others in participatory management, the social and economic dependencies of the Kanis/local communities that conflict with the objectives of the BR, and the actual commercial threats. Towards this, the study recommends adopting an integrated landscape livelihood approach in BR management. Land use changes in the study area have been highly complex due to human interactions over a period of time. The land reforms introduced in the State over a period of time have brought about institutional changes leading to drastic transformation in the land holding pattern and subsequent shift in land use and cropping pattern in the study area. Encouraging scientific agriculture on one side and putting firm action on those converting forest lands on the other will deter further depletion of such a fragile ecosystem. Recreation/ecotourism is a highly significant economic use of the Biosphere Reserve with immense economic potential for development as an important tourist destination. With Government and development agencies focusing mainly on poverty alleviation, ensuring good standard of living to people and environment stability, ecotourism could be a viable alternative for the sustainable management of forests and societal welfare at large. For ensuring environmental stability, ecotourism ventures must be followed by adequate forest expansion activities. To this the study recommends a site-specific programme towards action plan for environmental and economic security. The strategies for sustainable recreation emphasizes on the pro-poor tourism strategy on sustainable tourism focusing on economic benefits, non economic benefits and policy reforms with special reference to the underprivileged. The results of the study have put forth strategies and action plans for conservation, thus adhering to the Seville Strategy of Biosphere Reserves and the Convention of Biological Diversity.

1. INTRODUCTION

Biodiversity-rich areas have suffered severe depletion because of diversion of forest lands to non-forest uses, ever-increasing demand for fuel wood, fodder and timber; inadequacy of protection measures, among others. Ultimate protection has been provided to biodiversity all over the world through the Protected Area (PA) Networks and the highest protection is given to 'Biosphere Reserves' (BR). As a matter of fact, most of the forest tracts and biodiversity concentration areas have traditional societies in and around them. One general weakness of the management of BRs is that they often fail to consider the role or influence of people, i.e., the resident indigenous population and the local communities, in conserving biodiversity. Not surprisingly, conflicts between BR management, local economic development and subsistence pressure are intensifying.

Global environmental consciousness has established conservation goals as primary with regard to forests. However, the livelihood of the local communities and consequently an understanding of these communities are very essential in formulating suitable management strategies. Growing conflicts between the Forest Department/State and local communities, over utilization of forest resources, are well documented worldwide (Machlis and Tichnell, 1985; Wells and Brandon, 1993; Jusoff and Majid, 1995). Forest resource-based conflicts are a result of unclear natural resources policies and unresolved socioeconomic problems (Anitha and Muraleedharan, 2002; Anitha, *et.al*, 2003, 2004; Anitha and Chundamannil, 2004; Sreelakshmi, 2004; Godbole, *et al.*, 2005). A shift in the land use and resource use, from subsistence to commercial levels, degrades the forest, which is reflected in biodiversity loss and scarcity of resources. The dependence of the local people/stakeholders on the forest resources can be attributed to their low economic status (Anitha and Muraleedharan, 2002; 2007). The poverty environment nexus has been highlighted by several researchers and some studies show that poverty is one of the causatives besides development, policy and institutional failures for environmental degradation. Different systems of management may enhance or reduce forest biodiversity. Keeping these in view, it is essential to link conservation and sustainable management of forest resources to sustainable livelihoods.

Government interventions and conservation efforts often have both favourable and adverse impacts. Unlike the 1952 Policy which was primarily a timber oriented one, the National Forest Policy (1988) focused on the maintenance of environmental stability and on people's participation in forest conservation and management. The implementation of Joint Forest Management (JFM) in Kerala in 1998 has brought about to a fairly large extent, co-operation between Forest Department and tribals/local communities in conservation, protection and management. From this point, the strategies' designed for sustainable management of biodiversity based on the study will help implement programmes giving due importance to conservation, socioeconomics, resource use conflicts and the economic potential of the Biosphere Reserve. The final output will be useful for the implementation of community-based people-centered conservation programmes for Kerala part Agasthyamala Biosphere

1. INTRODUCTION

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Reserve for sustainable development. Furthermore, a document on the linkages will help in developing site-specific action plans for conserving biodiversity at the State and National levels through the National Biodiversity Strategy Action Plan.

The corpus of the study is to examine the relationship between conservation and forest management and sustainable livelihoods and develop strategies for optimum management of both forest and human resources in ABR. The specific objectives are:

1. To examine land use changes and its impact on different production systems and social and economic status of the resident population of ABR.
2. To study human interaction, identify and enumerate resource use conflicts, and livelihood issues of the resident population of ABR.
3. To estimate the recreation and cultural tourism value of ABR and its income generating potential.
4. Examine the existing management practices and develop strategies for better Management of the natural and human resources in ABR.

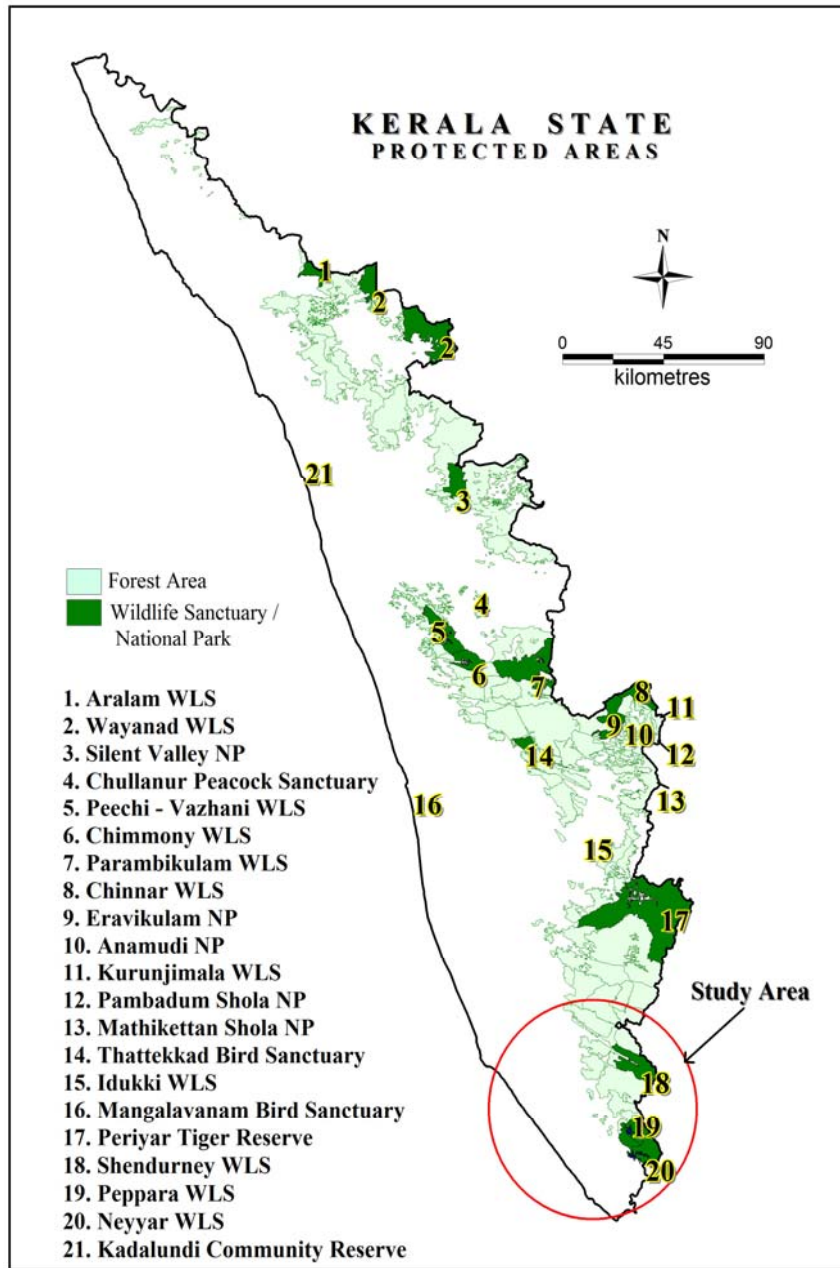
2. AGASTHYAMALA BIOSPHERE RESERVE - THE SACRED LANDSCAPE

The sacred landscape of Agasthyamala is one of the important Biosphere Reserves in the world where the indigenous culture, religion and spirituality are associated with the biological diversity. It is known for the largest tracts of untouched rainforest in Peninsular India. Located in the South Western portion of the Western Ghats between 8°25'N -13°0'N latitude and 77°05'E - 77°35'E longitude, the ABR (Map 2.1) was notified by the Government of India in November 2001 under the UNESCO's Man and Biosphere Programme.

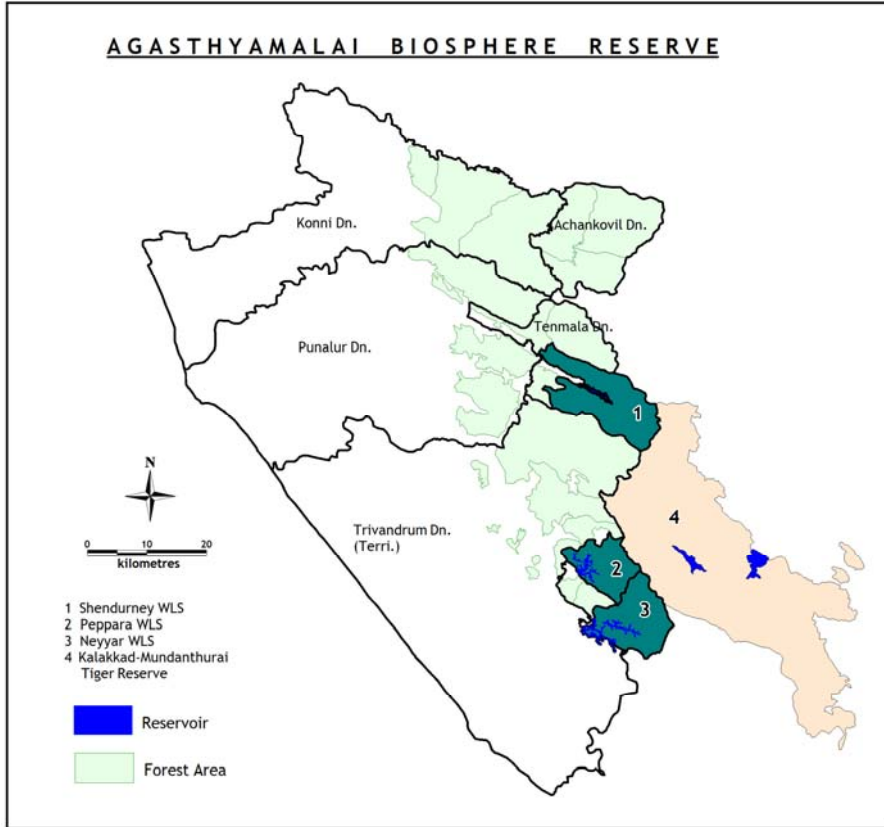
Agasthyamala and its environs, comprising an area of 1,701 km², was designated as the 13th Biosphere Reserve covering three Wildlife Sanctuaries (WLSs) in Kerala and one in Tamil Nadu (Map 2.2). The Kerala part also includes five Territorial Forest Divisions, two Wildlife Divisions, and three Revenue Districts (Table 2.1). The Biosphere Reserve has adequate area to serve the major functions of conservation, development and logistic support with a core zone (225 km²) a buffer zone (754 km²) and a transition zone (722 km²).

Table 2.1. ADMINISTRATIVE UNITS OF KERALA PART OF ABR.

NO OF FOREST DIVISIONS (Thiruvananthapuram, Punalaur, Thenmala, Achenkovil, Konni)	5
NO OF WILDLIFE DIVISIONS (Thiruvananthapuram, Shendurney)	2
NO OF FOREST RANGE	17
NO. OF WILDLIFE SANCTUARIES (Neyyar, Peppara, Shendurney)	3
NO OF PANCHAYATS	277



Map 2.1 Study area



Map 2.2 Agasthyamala Biosphere Reserve

The core zone falls within the Protected Areas of Neyyar, Peppara, and Shendurney WLSs in Kerala and Kallakad Mundanthurai Tiger Reserve (KMTR) in Tamil Nadu. The buffer zone lies within the WLSs and the Tiger Reserve occupies approximately 1500 km² and the transition zone covers approximately 1,000 km². The Kerala portion of the transition zone lies between northern Shendurney sanctuary and the southern Neyyar and Peppara sanctuaries. The Agasthyakoodam known as Herbal Mountain is famous for its medicinal plants and the traditional dwellers are known to possess immense indigenous knowledge related to the herbal-healing culture. Besides plant life the Agasthyamala is a natural habitat for most the high profile endemic animal species. ABR also includes additional areas from the Forest Divisions, which are non-protected areas but are designated Reserve Forests. In both the states of Kerala and Tamil Nadu diverse eco development activities are currently in progress, especially within the fringe areas of the BR where people depend on the forest resources for their livelihoods.

The Kerala part of ABR is blessed with abundant water resources, the main sources being surface water and ground water. The study area including all the three WLSs and the adjoining areas of Tamil Nadu enjoys two well marked rainy seasons, viz., south west and north east monsoons. The study area is endowed with a network of five major rivers, (viz., Neyyar, Karamana, Vamanapuram, Kallada and Achenkovil) originating from the Western Ghats and having a good number of tributaries.

Neyyar and Pamba are the two completed irrigation projects in the study area. The irrigation facilities in ABR cover only 1.4 per cent of its total geographical area. Public canal, private wells, other sources such as traditional irrigation facilities are the major sources of artificial irrigation in ABR. The percentage use of public canal, private canal, public tanks and others is relatively high in the study area. The very low extent of the irrigation facilities highlights the backwardness of the agriculture sector in the study area as agriculture practices are seasonal (98 %) in nature due to total dependence on rains. The average normal rainfall is 2590 mm as against the State average of 3051 mm.

Ecological importance: IUCN has identified Agasthyamala region as one of the three centers of plant diversity in India. Nayar (1996) has identified three endemic centres in Kerala, viz., Agasthyamala, Anamalai high ranges and Silent Valley. ABR has a range of forest types from wet evergreen to dry deciduous and also has some specialized habitats like *Myristica* swamps. *Myristica* swamp patches of Kulathupuzha Forest Range, Anchal Forest Range and Shendurney Wildlife Sanctuary constitute a unique ecosystem restricted to small areas. Joyce Jose (2009) highlights adverse anthropogenic dependencies and severe fragmentation of the ecosystem. Of the animals recorded from the *Myristica* swamp 16.3 per cent are endemic to Western Ghats and 24.2 per cent of the vertebrates are red-listed.



The *Trichopus zeylanicus* ssp. *Travancorica* (Arogyapacha plant) known for its anti-fatigue properties is unique to ABR. Mohanan *et al* (1997) have recoded five new species from ABR forests. Kunjkrishnan (2001) reported 109 species of butterflies, of which 8 species are endemic to Western Ghats. Majority of the rare and endemic butterflies are confined to the evergreen forests and high attitude grasslands. Various studies have been carried out by Kerala Forest Research Institute (KFRI) and Tropical Botanical and Garden Research Institute (TBGRI) on different aspects of plant life and wildlife including ecology, management, distribution and conflict. Various ecological site specific studies have been carried out in ABR on changes in forest composition and structure in tropical evergreen forests around Sengaltheri, part of KMTR, Tamil Nadu (Parthasarathy, 2001); flora of Agasthyamala, parts of Peppara and Neyyar WLS (Mohanan, 2003); rare and endangered species from Peppara WLS (Varghese and Menon, 2000); rapid ecological assessment of forests near the settlements in Peppara and Neyyar indicating degradation due to high

degree human intervention and developmental activities (Godbole, *et al.*, 2005). Among three WLSs, biodiversity is well preserved in Shendurney WLS. The world famous Arogyapacha (*Trychopes zeylanica*) was the discovery of the Kani tribals and a product of community wisdom. Elements of biological diversity have the critical basis in the indigenous communities and the Kanis in Agasthyamala region are no exception (Christopher, 1998; Kunhi and Sankar, 2002).

Traditional dwellers: ABR has a resident population of indigenous communities, i.e., the Kanis and Malapantaram residing in and around the study area (Table 2.3). Kani is a tribal group occupying the ABR area traditionally for more than 100 years. They are a homogenous community without sub tribal groupings. The ethnographic account of Kanis by Iyer (1937) gives their past history; they were formerly settled in Kalakad and Kallidakurchi in Tirunelveli District of Tamil Nadu.



They have established distinct systems of knowledge relating to the uses and management of biological diversity on these lands and environments. The Kanis have been historically engaged in agriculture and dependent on the forest products for their livelihood needs, although the pattern of dependence and sustainability levels has changed. The current main livelihood source for the Kanis is from the monoculture of rubber, mixed agriculture, wage labour, and Non Timber Forest Products (NTFPs) collection. For the Malapantaram, the livelihood is mainly from NTFP collection. The Kanis in KMTR forests of Tamil Nadu are similar in many ways to Kanis from Neyyar and Peppara WLSs.

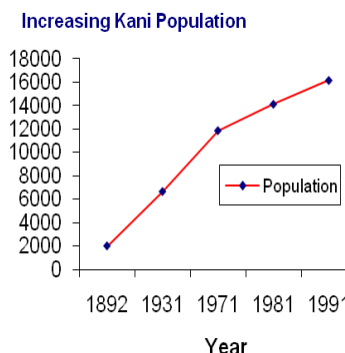
The growing tribal population over the years is a cause of concern (Figure 2.1). In 1892, Bourdillan estimated the Kani population to be about 2000 with the largest

Table 2.3 TRIBAL SETTLEMENTS IN ABR

FOREST DIVISION /WLSs/Tiger Reserve	NO.	TRIBAL COMMUNITY
Thiruvananthapuram	20	Kani
Achencoil	3	Kani & Malapantaram
Thenmala		
Punalur	13	Kani & Malapantaram
Konni	4	Malapantaram
Neyyar WLS	18	Kani
Peppara WLS	14	Kani
Shendurney WLS	0	Kani
ABP *	13	Kani
KMTR (Tamil Nadu)	8	Kani
Source: Compiled from respective Administrative Unit data and field work		

concentration in the Kothayar and Neyyar basins. In 1931, their number was estimated to be 6,659 excluding the small population in Papanasam hills. By 1971, their numbers had increased to 11,879 (Census of India, 1971). By 1981, in the Thiruvananthapuram district alone they numbered 14,145 and in 1991 the number reached 16,181 within the District (Census of India, 1981, 1991).

Figure 2.1



Kani tribals are in the limelight due to the famous case of use of *Trichopus zylanicus* in their traditional system for energy restoration and the more recent benefit sharing mechanism that has been developed by TBGRI.

The strong eco-culture of the traditional communities has been contributing much to the conservation, sustainable management and utilization of natural resources in the study area. However, the historical process over the years has done much damage both to the fragile ecosystems and socio-cultural linkages. Even the land use scale conversion of forest land to the pattern of the resident population is changing fast adversely affecting the landscape health. The dependence on agriculture primarily has led to large agriculture land. Besides, there is growing cultural/pilgrim tourism in Agasthyamala (Kunhi and Sankar, 2002), which is adding fuel to the degradation process by attracting thousands of pilgrims, tourists and nature admirers annually. People in the fringe areas are competing with Kanis for forest resources and are contributing to degradation of forest ecosystems. Drying up of some of the perennial streams is an indicator of degradation of forests. Forest fires are major threats to the remaining biodiversity of rich forest ecosystems of ABR (Godbole, *et al*, 2005). The introduction of crocodiles in Neyyar has created man-wildlife conflicts also (Jayson, 1998). Besides, the ability of the Reserve to provide benefits are being undermined by various commercial threats/unauthorized activities occurring.

For the purpose of this study only the Kerala part of ABR is considered. The study specifically covers the land use alterations impacting both livelihood and ecosystem integrity; the economic potential of the BR; socioeconomic dependencies/pressures and resource use conflicts; and management aspects. A detailed study of each of these was undertaken to integrate them in the conservation and management perspective in the Kerala part of ABR.

3. LAND USE DYNAMICS - SHIFTING PARADIGMS

Historical evolution of land use reveals that the study area has undergone drastic alterations over a period of time affecting the sacred landscape and the resident indigenous population (Table 3.1). There has been a vivid change in the economic perspective of development and deforestation. This has been ascertained through discussions with the selected communities, Forest Department officials and other stakeholders. The two significant land use changes in the study area are (i) from forest land to agriculture land and (ii) from agriculture purposes to non-agriculture purposes. Ramesh et al. (1997) reported a five-fold increase in deforestation between 1920 to 1960 and 1960 to 1990 for the Agasthyamala region in southern



Western Ghats. An understanding of the ecological system and the forest types clearly indicates that adverse anthropogenic pressures coupled with management lapses and natural factors have led to the conversion of the dominant natural vegetation of this area which is evergreen forests into semi-evergreen and moist deciduous forests interspersed with secondary grasslands (Godbole, *et al*, 2005). The immense pressure on forest continues unabated.

The reasons for forest degradation in the study area are numerous of which population increase due to migration is most important. The settlers who came in during the dam construction both at Neyyar and Peppara have been mainly responsible for the pressure on land. Encroachment, conversion of forest land for agricultural purposes and plantation activities were among other factors. Now, with the Rubber Board intervention, the primary stakeholders seem to be immensely benefited. More recently the growing impetus given to promote recreation has wide ranging implications in their life.



The traditional land use: Kani landholdings were classified under two categories, i.e., those held by individual proprietorship and those held under the chieftain's proprietorship which was allotted for cultivation to the members. One of the traditional occupations of the Kanikkar was shifting cultivation of paddy and ragi. The slash and burn cultivation of the Kanis followed a three-year fallow period after two croppings of dryland paddy sown in March-April and harvested during August-

September. The large number of cultivars included foxtail millet (*Setaria italia*), common millet (*Panicum miliare*), green gram (*Phaseolus mungo*), sorghum (*Andropogon sorghum*), maize (*Zea mays*), sweet potato (*Ipomea batatus*), squash (*Cucurbita moschata*), turmeric (*Curcuma longa*), several varieties of plantains, ginger etc. for subsistence and market.

Table 3.1. CHRONOLOGY OF EVENTS: Forest Exploitation and Deforestation in the Kerala part of ABR

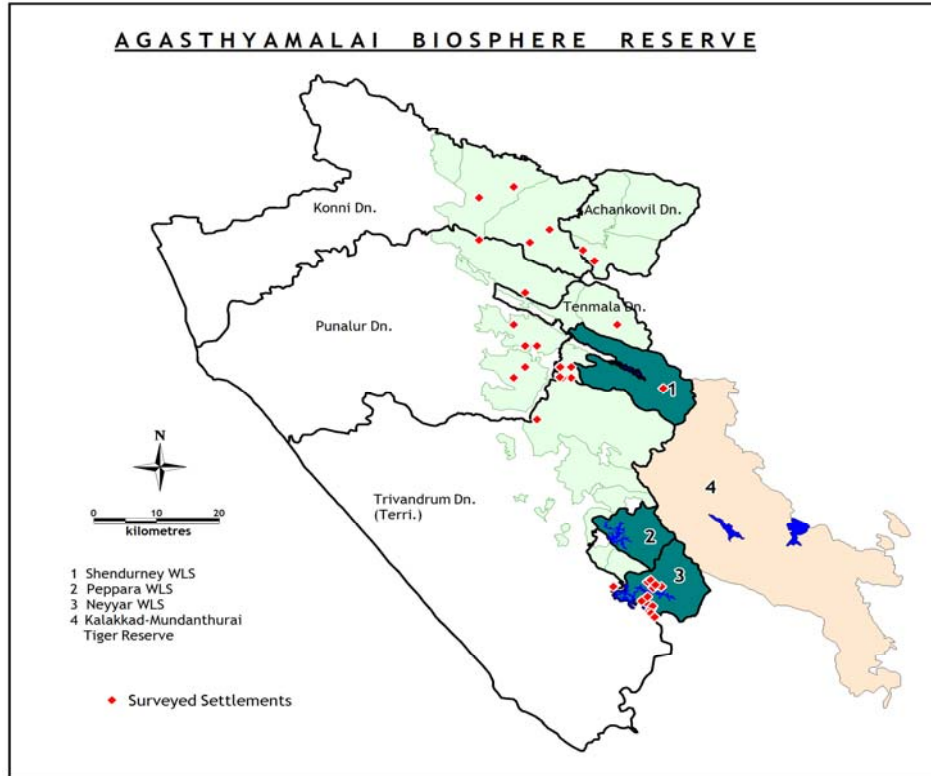
YEAR	EVENT	CONSEQUENCE
After 1880s	<ul style="list-style-type: none"> Reservation of hill forests 	<ul style="list-style-type: none"> Almost all of Agasthyamala range foothill, forest close to plains became 'Government Reserved Forests' No control over shifting cultivation of Kani No systematic timber extraction
From 1900s	<ul style="list-style-type: none"> Steady extension of paddy cultivation Construction of Trivandrum. Shenkotta road and subsequent roads Forest plantations in lower elevation forests Land released from Reserved Forest under various Government Schemes - Colonization Programme, Grow More Food campaign Human interference and forest working by Forest Department 	<ul style="list-style-type: none"> Process of isolation of indigenous communities Kani alienated to inner pockets of the forests Encroachments by plainsmen Severe forest fragmentations Considerable encroachments of best accessible forest tracts Forest degradation Adverse impact in the traditional land use
1960s	<ul style="list-style-type: none"> Construction of Kallada dam (1961) Pamba Irrigation Project Construction of irrigation dam at Neyyar & Kottayar (1964) 	<ul style="list-style-type: none"> Except Kallada on an average 500 ha of forests submerged Kallada submerged approximately 4,800 ha. Loss of rich forested valleys Forest ecosystem heavily disturbed Opened up inaccessible forest pockets Displacement of traditional dwellers.
1980s	<ul style="list-style-type: none"> Construction of Peppara dam. Formation of Neyyar WLS Formation of Peppara WLS 	<ul style="list-style-type: none"> Large influx of population, development of small townships near dam sites Unauthorized encroachments Increased degradation of forests Social conflicts led to destruction of the typical Kani society Acculturation of the Kani tribal community
2000s	<ul style="list-style-type: none"> Participatory Forest Management 	<ul style="list-style-type: none"> Formation of VSS/EDCs Kani EDC- pilgrimage

Most of the traditional practices have been discontinued although, some of the traditional occupations, are still continued despite strict laws prohibiting the

practice. Settled cultivation of plantation crops like coconut, rubber and cardamom, and tuber crops have been adopted in a small way and now form their primary occupation. The Kanis are also employed as forest laborers. Today the Kani lands and the surrounding forest land are under Government ownership and control.

To identify land use changes over a period of time and the associated socioeconomic and livelihood aspects in the study area both primary and secondary data was used. Secondary data was used to identify the overall land use pattern in the study area while primary data was used for socioeconomic assessment (dealt within the following section), especially to identify the land use pattern in the peripheral area of the forest. A detailed reconnaissance survey covering all the panchayaths in the study area was conducted and basic details on population, wards, forest cover was gathered. Secondary data pertaining to the present cropping pattern was collected from the respective Krishibhavan and Grama Panchayaths in the study area.

The sample constituted the primary stakeholders, i.e., the direct users of the forest who extracted forest produce on a regular basis and were found to be dependent on the forests for their livelihood. Here, the direct users constituted the local community and the traditional dwellers (the tribal communities). The local community constituted people who were settlers, migrants and cultivators of a heterogeneous class, who resided in the fringes of the ABR and the tribal communities living in and around the study area. A three stage random sampling method is adopted for selecting the sample. This was adopted to include representative sample households of the direct users who were dependent on the forests but were spatially dispersed covering a large area. In the first stage we select the panchayat, which has forest cover in their territorial area. It is observed that 20 panchayats in the study area has forest regions and it includes 149 wards and 84129 households. All wards in a selected panchayat do not have forest cover, thus in the second stage we select the wards which have forest cover and in the third stage sample households were selected by following the random sampling method. 1 per cent of the total households in the selected wards were taken as sample by following the random sampling method and the sample size of the study is 841 households. Giving due weightage to the land use pattern of the traditional dwellers 10 per cent of the proposed sample comprised tribal households (Map 3.1). Thus, it is planned to take 84 tribal households and 757 other households.



Map 3 1 Surveyed settlements

A direct household survey was conducted for primary data collection of the relevant socioeconomic data in which the questionnaire method was followed. The tools and technique used were mainly for estimating the standard of living of the people and their forest dependence. Simple percentage analysis and correlation was done to assess the general socioeconomic features of the sample.

Current land use: Geographically the study area covered 629612 hectares and forest land covered 28.1 per cent of the total geographical area as against the state and national averages of 28.9 and 19.5 per cents respectively (Table 3.2). Total cropped area occupied 59.6 per cent as against the 58 per cent of the total geographical area and 9.9 per cent of the area was allotted to non-agriculture purposes. Barren and uncultivable land, permanent pastures, cultivable re waste and fallow land together occupied 2.4 per cent of the area.

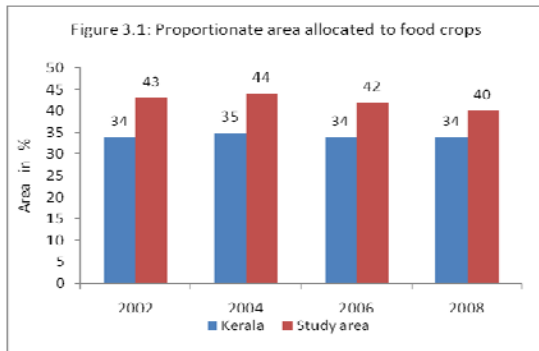
Sl No	Classification of land	Kerala		Study Area	
		Area (ha)	Per cent	Area (ha)	Per cent
1	Total geographical area	3885497	100	629612	100.000
2	Forest	1081509	27.83	176937	28.103
3	Land put to non-agricultural use	308439	7.94	62337	9.901
4	Barren and uncultivable land	51530	1.33	1164	0.185
5	Permanent pastors and grazing land	1569	0.04	23	0.004
6	Land under miscellaneous tree crops not included in net area sown	36713	0.94	260	0.041
7	Cultivable waste	89769	2.31	1830	0.291
8	Fallow other than current fallow	28695	0.74	1887	0.300
9	Current fallow	49171	1.27	9862	1.566
10	Total cropped area	3042701	78.81	375312	59.610

The study area exhibited a similar land use pattern as is in the State. Compared to the State, the study area had only 1 per cent more of the forest cover but in the case of the agriculture the state percentage of land allocation for agriculture was 2 per cent higher than that of the study area. In the case of the non-agriculture purposes the state aggregate allocation was lesser by 2 per cent compared to allocation per cent of ABR. The major portion of the geographical area was allotted to cultivation, which highlights the importance of agriculture sector in the study area.

In the study area, of the five Territorial Divisions and two Wildlife Divisions of Kerala Forest and Wildlife Department of Government of Kerala Thiruvananthapuram Division occupied the largest share of the forest cover in ABR with 20.9 per cent of the total forest cover followed by Konni, Punalur, Achenkovil, Thenmala, Shendurney WL, Thiruvananthapuram WL and Agasthyavanam Biological Park (Table 3.3).

Sl. No	Division	Area	Area (in %)
1	Konni	33166	18.74
2	Achenkovil	26900	15.20
3	Punalur	28022	15.84
4	Thenmala	20617	11.65
5	Thiruvananthapuram	36988	20.90
6	Shendurney WL	15332	8.67
7	Thiruvananthapuram WL	12800	7.23
8	Agasthyavanam BP	3112	1.76
	Total	176937	100.00

Cropping pattern: The cropping pattern refers to the proportionate area under different crops during an agriculture season. It further helps to identify the relative abundance of a crop or a group of crops in the region. Figure 3.1 highlights that 42 per cent of the total study area was allotted to food crops during the study period, while 34 per cent of the total geographical area of the state was used for food crops. The average areas of land allotted to food crops production in the study area



was 158569 hectares. These crops were grown single (mono cropping) or mixed (mixed cropping), or in a definite sequence (rotational cropping). The prevalent cropping system was the cumulative result of the past and present decisions by individuals, communities or Government and their agencies. These decisions were usually based on experience, tradition, expected profit, personal preference and

resources, social and political pressure, among others. Paddy and tapioca were the major food crops produced in the ABR. Here, more land was allotted to non-food crops than that of the food crops. The cultivated non-food crops include the spices like pepper, ginger, turmeric, cardamom and cash crops like coconut, cocoa, tea and rubber. On an average 216743 hectares of land is used for non-food cultivation, which covers 34 per cent of the total geographical area of the study area. The difference in the allocation of land between the food and non-food crops indicates the commercialization of the agriculture sector in the study area.



The area under food crops has fallen over the years due to a variety of reasons such as rising cost of production and the disproportionately small increase in price. This is largely due to the structural transformation the State's economy has been going through from the mid-seventies whereby large areas under traditional crops are being brought under the more remunerative crops such as coconut and rubber. The substantial increase in prices of fertilizers and wage, the non availability of labour

in peak seasons in certain locations and the failure of the irrigation system to serve the areas to the extent desired are the major reasons for the shift in the cultivation practices from the food crops to non food crops. For example, in Amburi Grama Panchayath in the study area, major portion of the land was used for non-agriculture purposes such as construction of buildings, developing commercial areas, and hospitals among others.

Economic valuation of agriculture loss: The major threat to agriculture (as inferred by the primary stakeholders) was wildlife causing crop damage and loss. In order to tackle this problem, farmers in the peripheral area of the forest preferred cash crops like rubber to food crops like paddy. In the tribal settlements also there was a significant shift in the cropping pattern towards cash crops cultivation.

Table 3.5. Intensity of wildlife attack

Sl. No	Intensity	Number of households		
		Tribes	Non Tribe	Total
1	Very high (7 raids/ week)	35 (42)	73 (10)	108 (13)
2	High (> 5 raids/week)	19 (23)	324 (43)	343 (41)
3	Medium (> 2 raids/week)	13 (15)	205 (27)	218 (26)
4	Low (up to 7 raids/month)	10 (12)	91 (12)	101 (12)
5	Nil	1 (1)	55 (7)	56 (7)
6	Not Responded	6 (7)	9 (1)	15 (2)
	Total	84 (100)	757 (100)	841 (100)

The Rubber Board have been imparting training to tribals on the method of rubber cultivation by providing saplings, fertilizers, pesticides and training. Due to the high intensity of wildlife attack in the tribal settlement, food crops cultivation as been facing severe threat. The intensity of the wildlife attack was classified into four based on the number of raids these

animals conduct in the agriculture field (Table 3.5). With regard to the intensity of wildlife attack 42 per cent of tribal and 10 per cent of non tribal households faced very high wildlife problem since the wildlife conducted daily raids in their agricultural fields. It was also observed that 23, 15 and 10 per cents of tribal households respectively faced high, medium and low intensity of wildlife problem. In the case of the non tribals 43, 27, and 12 per cents respectively faced high, medium and low Intensity of wildlife problem.

Enquiry into the minimum amount the tribals are willing to accept (WTA) as annual compensation to the agricultural loss due to the wildlife attack highlighted willingness to accept between Rs. 500/- and Rs. 50,000/- with an average annual value of Rs. 27660 /-(Table 3.6). Furthermore, 86 per cent of the sample households are willing to accept more than Rs. 10,000 as an annual compensation.

Agriculture cultivation has become almost impossible in most of the tribal settlements in the Biosphere Reserve due to very high wildlife attack. Though Kanis were used to such damage, the extent of land cultivated earlier was more. Due to the settled way of life in recent times they cultivate very limited land near their settlement. Of late, cattle lifting and attack on people was also becoming frequent and it was great challenge to keep both people and animals in such fragile ecosystems. Compensation for losses due to animals was available but the procedures and paper work required for the same continued to be still tedious and time consuming for the tribals in the study area.

Table 3.6. Willingness to Accept of the sample households

Sl. No	Willingness to Accept	Number of household
1	1- 500	9 (1.1)
2	501 - 1000	15 (1.8)
3	1001 - 5000	26 (3.1)
4	5001 - 10000	67 (8.0)
5	10001 - 20000	79 (9.4)
6	20001 - 30000	232 (27.6)
7	30001 - 40000	285 (33.9)
8	40001 - 50000	125 (14.9)

Factors determining the land use pattern- economic rationality

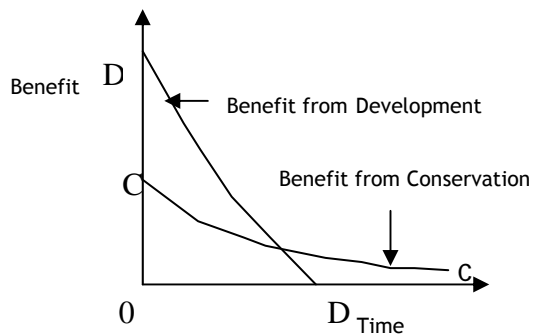
There were various socioeconomic and environmental factors determining the land use pattern in the peripheral areas of the forest region in the study area. People preferred cash crops to food crops as the latter was more susceptible to wildlife attack. The sample survey covering 2690 acres of land highlighted that land is primarily devoted to cash crops (31 %) and food crops (23 %). This was also so as there has been a general shift towards cash crops cultivation in Kerala during the 1970s due the commercialization of the agriculture sectoring.

Land use conversion was the primary factor explaining biodiversity loss in and around the forest areas in the study area. Economic rationality suggests that the decision to conserve or develop land will be determined by the relative profitability or rate of return of the two options. Within the conservation option is included sustainable use of forest, agroforestry, ecotourism, among others. The relevant rate of return is those that accrue to the land owner. At this point no account is taken of any return to the society as a whole. The rate of return from sustainable use of biodiversity should be greater than the rate of return from development. Symbolically $B (SuB) - C (SuB) > B (Dev) - C (Dev)$, where $B (SuB)$, $C (SuB)$ represent benefit and cost of sustainable biodiversity conservation and $B (Dev)$, $C (Dev)$ are benefit and cost of economic development. The net benefit from sustainable use of biodiversity should exceed the net benefit from development, if conservation is to be preferred to development. The benefit and cost are defined in terms of return to the individual. If the value of SuB is low and that for development is high, then other thing being equal, land conversion will take place. Very simply from the standpoint of the individual it is more profitable to develop than to conserve. Now if the benefits accrue in a non-marketed form, then the individual land owner has no incentive to take account of them. They may accrue to other people. The benefits

from development are real and tangible while benefits from the conservation of biodiversity are intangible.

Land conversion has the higher short term profit but zero long term profit. Sustainable land use has long term profit but lower immediate return. Figure 3.4 will explain the rationality behind the land conversion activities in the peripheral areas of forest. DD and CC curves represent benefits from development and benefit from conservation respectively. As benefits from development are higher than the benefits from conservation, an individual has the natural incentive to convert existing biodiversity to development purposes. The benefits from development became zero at OD period of time while the long term benefit of conservation is higher than that of development.

Figure 3.4. Rationality of land conversion



4. THE HUMAN DIMENSIONS

A stakeholder identification /analysis was carried out for understanding the social and institutional context of the project. A multiple stakeholder group (Box 4.1) comprising traditional tribal communities, tourists and pilgrims, tourism managers and the non tribals was identified in the Kerala part of ABR based on the secondary data, discussions with experts/ office bearers of the concerned Departments and the short term UNESCO initiative (Godbole et al., 2005). While all other individuals or institutions with a stake, interest or intermediary role in the activity such as the Forest Department, the local social workers, the State Government, various Governmental Departments, the Non Governmental Organisations and academic community are taken as secondary / tertiary stakeholders.

Box 4.1. MULTIPLE STAKEHOLDER GROUPS

- a. Kanis : Three groups i.e., Kani settlements in the remote interiors of the study area, Kani settlements near the fringe areas and Kanis from urbanized areas (possibly migrated or pushed from ABR area in the recent past)
- b. Plantations owners / Agro forestry practitioners within the transition or multiple use zone of the PAs: It includes rubber plantation owners within Neyyar catchment area, tea plantation owners at Ponmudi etc.
- c. Tourists and pilgrims: All types of tourists including nature tourists, adventure tourists, picnickers and pilgrims visiting to Agasthyakoodam peak. Local tourists, Indian tourists from other states and foreigners.
- d. Tourism managers: Tour operators from the city, tourism managers of State Forest Dept (Officers within information centers, local guides, boat owners etc), tourism managers of District Tourism Development Council, Ecotourism managers and Irrigation Department officers.
- e. Non tribals: people on the fringes and boundaries of protected areas and those possibly competing for the resources with Kanis.

The livelihood/socioeconomic assessment have been carried out following the methodology described in section 3 of the report. The size of landholding, socioeconomic factors and general cropping pattern held significance while analyzing the resource use pattern and the subsistence dependence on forest. A classification of the sample households was done to assess whether there was any significant difference between the sizes of holding among the various groups. Accordingly (Table 4.1), farmers possessing an area less than one acre were reckoned as marginal; farmers with farm size between 1.01 acre and two acres were classified as small farmers and those with an area between 2.01 and 10 acres were

considered as medium farmers and those with more than 10 acres of land were considered as large farmers.

Classification	Sample Nos.	Size of Landholdings in Acre			Total landholding in Acre
		Minimum	Maximum	Average	
Marginal (< 1)	365 (43)	0.04	1	0.45	164 (6)
Small (1.01 to 2)	229 (27)	1.10	2	1.35	309 (11)
Medium (2.01 to 10)	155 (18)	2.25	10	5.40	837 (31)
Large (> 10)	92 (11)	10.5	22	15	1380 (51)

Primary data estimates

All of the families depended on agriculture for their subsistence but did not follow scientific methods of production. Their major cultivars used were rubber, plantain, tapioca, coconut and kashurimanjal. In the recent past, the Rubber Board provided rubber plants and training on scientific cultivation, although only a few people practiced scientific rubber cultivation even though it enhanced their economic security.

The sample constituted 43 per cent marginal farmers, followed by small (27), medium (19) and large farmers (11). The mean size of the holdings was estimated to be 0.45, 1.35, 5.4 and 15 acres for the marginal, small, medium and large farmers respectively and the overall mean size of holding of the sample was found to be 5.5 acres. The size of holding in the study area was highly skewed towards a few households who owned a substantial area of land, which projects an unequal distribution of land holdings across households in the study area. This coupled with poor agricultural and wage (labour) income was one of the major determinants of forest dependence.

Size of land holding and level of income

The primary sector depicts predominance in the income sources of the sample households by contributing to 70 per cent of the average annual income. Livestock provided 10 per cent of the average annual income while the other sources such as business, self employment, and others contributed 10 per cent, followed by wage

labour, fuel wood and forest work. It was observed that the percentage share of each source of income varied with each group *viz.*, marginal, small, medium and large. However, the major share of income of all the groups was from agriculture. Agriculture constituted 22.1 per cent of income among the marginal holders while it was 51.1, 67.3 and 81.7 per cent for small, medium and large holders respectively. On an average, annual agricultural income per household was Rs. 8,282, Rs. 27,669, Rs.42,323 and Rs. 2,05,834 for the marginal, small, medium and large groups respectively (Table 4.2).

Source	Marginal	Small	Medium	Large	All households
Agriculture	8282 (22.1)*	27669 (51.1)	42323 (67.3)	205834 (81.7)	284108 (70)
Fuel wood	7212 (19.3)	6211 (11.5)	2658 (4.2)	0	16081 (4)
Livestock	4281 (11.4)	5561 (10.3)	7641 (12.2)	23625 (9.4)	41109 (10)
Forest work	2848 (7.6)	813 (1.5)	415 (0.7)	0	4076 (1)
Wage Labour	8469 (22.6)	7892 (14.6)	3708 (5.9)	0	20068 (5)
Other source	6332 (16.9)	6054 (11.2)	6095 (9.7)	22541 (8.9)	41023 (10)
Total	37425 (100)	54200 (100)	62840 (100)	252000 (100)	406465 (100)

Primary data estimates

*Figures in parenthesis show percentage to total

The difference in income from agriculture across the classes was thus attributed to the size of holding. Livestock provided 11.4 per cent of income to the marginal holders while it was 10.3, 12.2 and 9.4 per cent to small, medium and large holders respectively.

On an average, annual livestock income per household was Rs. 4,281, Rs. 5,561, Rs. 7,641 and Rs. 23,625 for the marginal, small, medium and large groups respectively. The large landholders did not depend on fuel wood, forest work and wage labour as an income source. The average annual income per household was Rs. 37425, 54200, 62840 and 252000 for the marginal, small, medium and large groups respectively.

Forest Dependency Index (FDI)

The human-forest interaction was analyzed by assessing the socioeconomic dependencies in the study area. The dependence of the resident population varied significantly between the different social groups. Forest Dependency Index is based on the simple principle of resource use (Anitha and Muraleedharan, 2002, 2007). It is a numerical estimator of the dependency of a family or a community over the forest. It helps us to identify and compare the dependency of different families or different communities. Here, the dependency of the resident population on the forest was identified primarily for five purposes, i.e., income, food, housing, grazing and for fuel wood. The FDI is thus the index of income, food, housing, grazing, and fuel dependency. The FDI of a family is derived by using the following equation.

$$\text{FDI (Family)} = \left(\frac{\frac{y}{Y} + \frac{f}{F} + \frac{h}{H} + \frac{x}{x+y+z} + \frac{a}{a+b+c}}{5} \right) 100$$

Where, y = Income from forest produce and forest related work; Y = Total family income; f = Value of food items collected from the forest; F = Total family expenditure on food; h = 1 if roof or wall or door of the house is made by the forest products; $h=2$ if roof and wall or roof and door or wall and door are made with the forest products; $h=3$ if roof and wall and door are made with the forest products; H = 3 Number of parts of a house that can be built using forest products; $x=1$ for grazing in the forest; $x=0$ for not grazing in the forest; $y=1$ for grazing in the homeland; $y=0$ for not grazing in the homeland; $z=1$ for using stall food; $z=0$ for not using stall food; $a=1$ for fuel from forest; $a=0$ for fuel not from the forest; $b=1$ for fuel from home land; $b=0$ for fuel from not home land; $c=1$ for fuel from other sources like electricity, gas, etc.; $c=0$ for fuel not from other sources, and n = sample size.

A site specific index thus arrived at will help decide government priority for long-term conservation and sustainable development in order to reduce the adverse socioeconomic dependencies and pressure in the study area.

Socioeconomic studies revealed the degree of dependency on the forests of both tribals and non-tribals residing within and in the fringes of the study area. These people collect thatching grass, NTFPs, fuel wood, bamboo poles, reeds, and occasionally large timber for subsistence. The forest dependence of the sample households is broadly classified into two, economic and cultural dependence. The economic dependence is for the satisfaction of the economic needs, which can be termed as subsistence dependence. The cultural dependence is for the satisfaction of the cultural needs such as customs and rituals, which cannot be estimated directly as it is more subjective in nature.

The Forest Dependence Index (FDI) estimates the economic dependence of the sample households. The economic dependence on the forests is mainly for income, food, house construction materials, fodder and fuel. Here, the FDI is an average value of income, food, housing, fodder and fuel dependencies (Table 4.3). The income dependency of the household is estimated as a proportion of income from forest to total household income. The forests provide various avenues of employment to the people in the peripheral areas of forest, such as, forestry operations (fire watching, etc.) ecotourism, NTFP collection, among others. The food dependencies estimated as a per cent of total quantity of food collected from the forest to total annual food intake of the family is near to zero. People in the peripheral areas especially tribals used forest resources for constructing houses, mainly the walls, doors, and the roof of their home. In order to estimate the housing dependencies, the per cent of the number of parts of home constructed by using the forest products to the total number of parts of the house was estimated. Three options for grazing cattle are homeland, forest area and stall feed. Forest in the study area was an important source of fuel, besides homeland, and other sources such as kerosene, cooking gas, electricity, among others. It was also assumed that people gave equal preference to all these alternatives. As is evident among the tribals the maximum dependence on forests was for housing material followed by income and fuel wood. As far as the non-tribals are concerned, their dependence on the forest is mainly for fuel wood followed by for grazing.

Sl. No	Dependency	Non - Tribal	Tribal
		Average index	Average index
1	Income	0	0.28
2	Food	0	0.02
3	Housing	0.01	0.39
4	Grazing	0.34	0.01
5	Fuel	0.42	0.6
Total Dependence		0.154	0.26

Primary data estimates

There was an erosion of traditional medicinal knowledge among the younger generation. People in the area preferred allopathic medicinal system in the town. A few people pointed out that by consuming fertilized food items bought from the shops in the town, there was a change in the character of diseases which could not be cured by using the traditional medicines from the forest. The medicinal dependency was comparatively low among the younger generation which is a result or consequence of loss of the Indigenous Traditional Knowledge base and acculturation process. The government priority (Table 4.4) when assessed indicated first priority for fuel wood. It indicates that keeping conservation and sustainable management in mind, alternate solutions must be worked out priority-wise in order to reduce the adverse socioeconomic dependency on the forests.

Dependency	Index	Govt. Priority
Income	0.24	3rd
Food	0	-
Housing	0.37	2 nd
Grazing	0.11	4 th
Fuel	0.51	1st

Education and subsistence dependence

The number of forest entry per month shows the actual forest dependence of the people. The average frequencies of forest entry and subsistence dependence of forest were positively related. In order to identify the relationship between education and forest entry, the sample households is classified into four groups based on the educational levels and average monthly frequency of forest entry of each group was estimated separately. With an increase in the level of education, new avenues for livelihood emerged resulting in reduced subsistence dependence over the forest. In the sample households 6 per cent of the non tribals and 37 per cent of the tribals had no formal education and their frequencies of forest entry per month were 13 and 23 respectively (Table 4.5). It was also observed that 17 per

Table 4.5. Educational level and frequency of forest entry per month (average)

Sl. No	Educational level	Non Tribal		Tribal	
		Frequency of entry per month	Sample (%)	Frequency of entry per month	Sample (%)
1	No formal education	13	6	23	37
2	Primary	8	17	17	42
3	High school	4	32	8	17
4	Above high school	0	45	2	4

Primary data estimates

literacy level above high school did not enter forest on a monthly basis. It was observed that 17 and 4 per cent of tribal respondent's availed high school and above high school education respectively and their corresponding frequency of monthly forest entry were 8 and 2. This is indicative of the inverse relationship that as level of education increased frequency of forest entry for satisfying the subsistence dependence decreased.

In the education scenario, the students in the settlements were being exposed to modern school education but the education system was not giving any importance to their cultural and traditional values. Education has great potential to reduce forest dependency which is very evident in these areas. Educated people have greater capacity to capture the benefit of various government aided programmes. Although the government gave giving equal preference to all tribals, the benefit was not equally distributed in these areas. Thus, there was large scale inequality in the distribution of income and wealth in the study area.

cent of non tribals and 42 per cent of tribals had availed primary education and their respective frequencies of forest entry were 8 and 17 per month.

Among the non tribals 32 and 45 per cent had high school and above high school education respectively. The frequency of forest entry of the former was 4 per month, while those with

Income and subsistence dependence

Monthly income of the household is an important factor determining the forest dependence of the sample households in the peripheral area of the forest. People depend on forest for their day to day subsistence because they are poor with respect of productive resources. As income increases new avenues of production will be opened and they move away from the forest. Table 4.6 highlights the relationship between income and subsistence dependence represented by the average forest entry per month. In the sample households 33 per cent came under the monthly income category of 1000 to 5000 and their monthly forest entry ranges between 10 and 24. The level of monthly income and forest entry are inversely related, which is very evident in case of the tribal households in the study area. The monthly income of the 25 per cent of sample household was below 1000 and their monthly forest entry ranged between 20 and 26. In the higher income category of 5000 - 10000, the average forest entry of the sample household decreased to 5 - 10 range and as income touched 10000 and above category the frequency of monthly forest entry decreased to 0. In brief, the socioeconomic assessment revealed that most of the tribals living within the study area are caught in a diminishing flow of development.

Sl. No	Monthly income	Non Tribe		Tribe	
		Sample household	Forest entry	Sample household	Forest entry
1	Below 1000	0 (0)	0	21 (25)	20 - 26
2	1000- 5000	249 (33)	10 - 24	32 (38)	15 - 20
3	5000-10000	330 (44)	0	14 (17)	5 - 10
4	10000 above	161 (21)	0	6 (7)	0
	Not responding	17 (2)	0	11 (13)	-

Primary data estimates

RESOURCE USE CONFLICTS

The Kanis have been using the natural resources for years. Due to displacement as a consequence of various irrigation projects in the Kani areas the land resources available to them reduced drastically and they were forced to change their livelihood activities. As a consequence of the Biosphere Reserve regulations and restrictions over a period of time the Kanis are more settled today. However, there is constant increase in the number of outsiders using the resources. Depletion of forests, outsiders encroachment and penetration of plantation crops deep inside the

forests and changed livelihoods of kanis have contributed to various conflicting situations that are ultimately resulting in the further deterioration of the landscape. Availability of land and cheap labour were favourable conditions for plantations. Through such activities and political dominance, control over the resources increased giving rise to conflicting situations. The underprivileged soon took to unauthorized activities like liquor brewing, poaching, among other activities. Often they are held responsible by the Department and State authorities while the actual players are different. In many occasions during the study period it was observed that the Kanis in many pockets were an organized lot voicing their grievances vociferously.

Developmental interventions in the Kerala part of ABR have created human related constraints in the management. Due to tourism development and other development programmes of State Forest Department and other state agencies many conflicting situations have developed. For instance, in the Neyyar WLS there has been a serious man - wildlife conflict due to introduction of crocodiles in the Neyyar reservoir without proper consideration of the dependence of the resident population on the reservoir for various purposes. There is high conflict between the Forest Department and the resident population, reasons being:

- The Departmental protection activities with regard to wildlife in most cases are detrimental to the people's interests.
- High rate of deforestation observed in and around habited areas.

Key resource use conflicts identified in ABR are three, viz., (i) for land (change in boundaries, wanting social security); (ii) for produce / resource, for self-consumption or for sale (authorized - e.g. cheenikka, or unauthorised - eg. rose wood, deer meat); and (iii) for political dominance, exhibiting extremist behaviour / attitude. There are a wide range of conflicts and disputes adversely influencing the management (Box 4.2). Besides, the dependency factors are also various commercial interests being pursued within BR that are also causative of a conflict situation.

The study area faces severe anthropogenic threat from the dependence on the local and easily available resources. The local communities not only depend on the sanctuaries for their sustenance needs, but also relate to them in various cultural ways. When access to natural resources is restricted and ownership rights are not clear, this natural capital becomes an open access resource. Thus, denial of their primary source of livelihood, the discontentment and dissatisfaction has resulted in constraints being posed in management, leading to conflicts. Ultimately, this also threatens conservation goals with an already understaffed Department staff working in hostile conditions with very little public support. There are also unauthorized processes of wood theft, poaching, urban growth and encroachment for various commercial purposes, which along with others are the actual commercial threats in the study area (Box 4.3).

Box 4.2 . RESOURCE USE CONFLICTS IDENTIFIED AS HUMAN RELATED CONSTRAINTS IN MANAGEMENT IN KERALA PART OF AGASTHYAMALA BIOSPHERE RESERVE

GENERAL

- Land ownership conflicts - creating land disputes with no expedient legal method to clarify ownership;
- Tensions from rapid socio-economic changes due to shift from subsistence to market economy;
- Tensions between tribals and settlers over the use of ABR resources;
- Existence of actual commercial threats;
- Political and religious tensions creating family and community divisions;
- Growing pressures to find alternate income or subsistence where resources are depleted;
- Fear, tension and mistrust over custom beliefs; and
- Tensions caused by breakdown of traditional leadership structures and systems, ie., respect for and power of leaders, without new systems to replace leadership.
- Latent family and relationship dispute;
- Disputes caused by political influence;

COMMUNITY VS FORESTRY

- Lack of knowledge in forestry creating imbalance of power and mistrust
- Dominance of commercial interests over fodder and fuel wood needs of women;
- Lack of involvement of local interested parties in management and defining strategic livelihood objectives within PAs;
- Social tensions consequent on the mention of PFM and creation of VSS;
- Tensions between communities unaware of forestry practices that create environmental degradation and downstream stakeholders; and
- Contradictory natural resources management objectives of the Wildlife managers and the basic livelihood issues.

Primary data estimates (PRA)

There are a number of factors that have contributed to the natural resources based conflicts in the study area. Some of the causes are the attempts to evict of the encroachers / forest dwellers, land allocation, changing socioeconomic needs, lack of community awareness, breakdown of traditional institutions that governed resource conservation and use, political interference and the growing population and dwindling resources. Most of the causes of conflicts are as a result of constraints within and between local communities and the State over the resource ownership and access Vs protection (Box 4.4). Some take advantage of such a situation and end up causing more conflicts. Some such resultant conflicts are so serious that they have turned political.

Box 4.3. ACTUAL COMMERCIAL THREATS TO THE STUDY AREA

- Open access area (no fixed boundary)
- Existence of enclave settlements
- Adverse socioeconomic dependency/ pressures
- Indigenous Farming / cultivation
- Land use alterations from subsistence to commercial farming
- Commercial Fishing
- Uncontrolled extraction of medicinal plants & other NTFPs from within and adjoining areas
- Commercial extraction of fuel wood
- Large number of entry paths
- Sand mining/Rock mining
- Encroachment
- Poaching, smuggling, ganja cultivation
- Unauthorized wood felling
- Unauthorized brewing of country liquor
- Growing ecotourism and cultural tourism

Primary data estimates (PRA)

Box 4.4 . CAUSATIVE FACTORS OF HUMAN RELATED CONSTRAINTS IN CONSERVATION

- Tenure issues
- Lack of community awareness
- Population pressures Vs dwindling resources
- Unclear institutional arrangements
- Policy and legal framework
- Forest land allocation
- Political interference
- Market forces

Primary data estimates (PRA)

Manifestations and attempts to manage the conflicts

The human-related constraints in the study area are the manifestations of their resentment to the restriction clamped upon them which they see as restrictions on their basic livelihood issues, which have consequently resulted in a strained relationship between the two (Box 4.5) .

Serious attempts are made by the Forest Department to manage these conflicts by way of formation of approximately 55 Vana Samrakshana Samithies (VSSs) covering Thiruvananthapuram, Thenmala, Konni and Punalur Divisions and 27 Eco Development Committees (EDCs) covering Neyyar and Peppara WLSs within the study area. Cases are also booked and charged in the court.

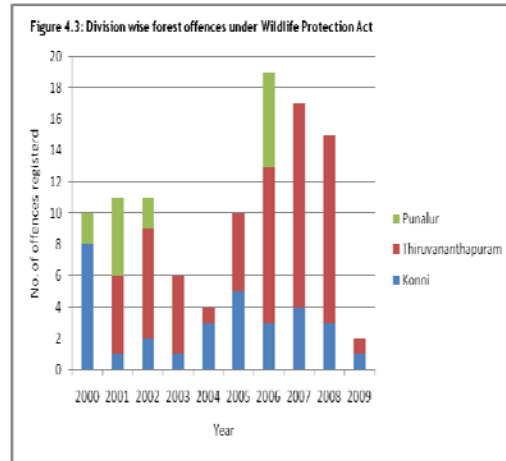
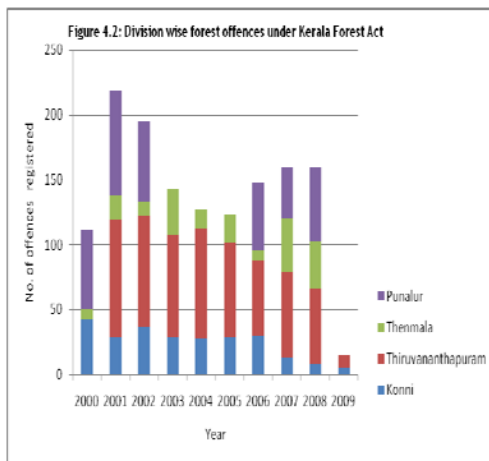
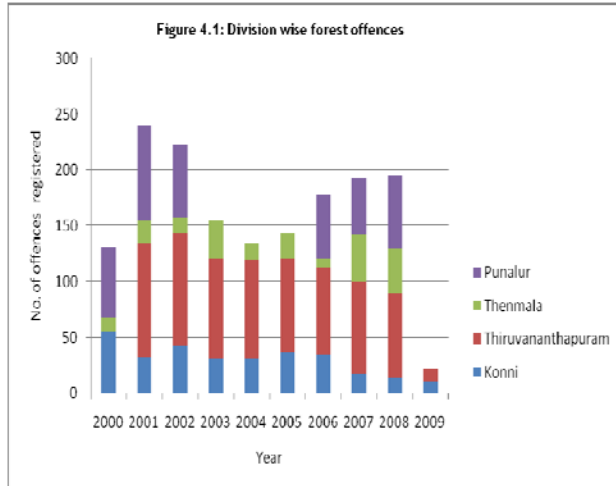
Box 4.5: HUMAN RELATED CONSTRAINTS IN MANAGEMENT - MANIFESTATIONS

- non co-operation (refusing to help put out forest fires, refusing to keep out cattle)
- deliberate destruction (unauthorized timber cutting, starting forest fires)
- violence against officials (against Wildlife Warden and associated staff)
- bypassing the law by gaining political patronage
- indulging in unauthorized activities like, liquor brewing and ganja cultivation
- passive resistance (tree felling, among others)

Primary data estimates (PRA)

Offences are booked under different categories in the study area, viz. (i) Wildlife offences (WL) (such as, poaching etc.), booked under the Wildlife Protection Act 1972; and (ii) Forest Offences (FR) (such as, wood felling, etc.) booked under the Kerala Forest Act 1961 and other Acts, like KPT Act , 61A etc. Maximum numbers of cases have been registered in Thiruvananthapuram Division followed by Punalur, Konni and Thenmala (Figure 4.1).

Maximum cases are registered under the Kerala Forest Act in Thiruvananthapuram Division (Figure 4.2) as also under the WLP Act (Figure 4.3) during the period 2000-2008. In general there has been a decline in the number of cases registered over the years. This is due to the effective management of the Department through their Participatory management initiatives.



5. THE ECONOMICS OF RECREATION AND CULTURAL TOURISM

Economic value of recreation and pilgrimage: The recreation and cultural tourism value of the Kerala part of ABR and its income generating potential were estimated using the standard methods adopted in the valuation of direct non-market use value of a natural resource.

Contingent Valuation Method (CVM): Contingent Valuation Method (CVM) is a direct income based approach, it asks people what they are willing to pay (WTP) for a benefit, or what they are willing to accept (WTA) by way of compensation to tolerate a cost or both. There are four common methods for applying CVM, viz., Contingent referendum method, Payment card method, Open ended question method and Bidding game method. Here in this case, the bidding game method of CVM was adopted for estimating the Total Recreation Value. The method consisted of two steps: first, the respondents were asked whether they were willing to pay for a given non-market commodity benefit after providing proper information about the commodity. If the answer was no, the process ended there with the particular respondent. If the answer was yes, the second step was to determine the maximum amount the respondent was willing to pay. The maximum willingness to pay was determined by the bidding process. The recreation demand curve, representing the relationship between amount that the people were willing to pay for having the benefit and number of tourists is represented as $Y = f(V)$ Where Y, f and V represents the willingness to pay, functional relationship and number of tourists respectively.

The respective functional relationship is estimated by using the OLS method ($Y = \beta_1 + \beta_2 V$) where β_1 and β_2 represents the intercept and slope coefficients respectively. The total recreation value (TRV), equivalent to aggregate willingness to pay of the sample is estimated by using the integration method in which AV represent total number of sample visitors.

Contingent Activity Method (CAM) : Here, a hypothetical activity, i.e., willingness to travel additional distance (WTT) is used to indirectly measure the recreation surplus. WTT will be expressed in monetary terms by taking the product of additional distance a tourist/pilgrim is willing to travel and his travel cost per kilometer. Functionally $V = f(D)$, where V, f and D represent f number of visitors, functional relationship and the additional distance the tourists are willing to travel respectively. The linear observation of the functional relationship is in the form, $V = \beta_1 - \beta_2 D$ where β_1 and β_2 are intercepting and slope coefficient respectively. The recreation surplus, which is equivalent to gain in net utility and represented by the willingness to travel additional distance by the tourists is estimated by the integration method, in which RS, V, P and k represent recreation surplus, number of visitors willing to travel additional distance, average travel cost per kilometers and total number of visitors willing to travel additional distance respectively.

In order to determine the Total Recreation Value of the recreation and cultural tourism development activities in Neyyar, Thenmala and Agasthyakoodam detailed visitors' survey was conducted. The official visitor register of these sites highlighted

that 2,28,958 visitors visited the Neyyar recreation center during the period of 2002 - 2004 and 6,94,789 visitors visited Thenmala during the period of 2000 - 2007. During the period 1994 to 2005 25,227 visitors got permission to visit Agasthyakoodam based on restricted entry by the Kerala Forest Department. Thus, the estimated average annual visitor flow to Neyyar, Thenmala and Agasthyakoodam were 76,319, 86,848 and 4,204 respectively and 1 per cent of the average annual visitor flow of these recreation centers were taken as the sample (Table 5.1). Thus, 1673 visitors constituted the total sample size of this study. The questionnaire method was adopted for the collection of primary data covering questions related to economic and social variables of the visitors and those pertaining to Contingent Valuation method and Contingent Activity method.

Visitors	Neyyar	Thenmala	Agasthyakoodam
Total	228958 (2002 - 04)*	694789 (2000 -07)*	25227 (1994 -2005)*
Average	76319	86848	4204
Sample	763	868	42
* Corresponding year. visitors		Sample size 1673	

The recreation potential: Recreation in the Kerala part of ABR was nature based and the seasonality pattern varied from site to site. The study area provided a range of opportunities for recreational pursuits that added to those available on other public lands, such as picnicking, camping, trekking, bird watching, nature walk, among others. The water bodies formed within the forest area due to construction of dams and natural waterfalls provided ample scope for recreational facilities. The study area had three reservoirs among various other attractions and each one was a good location for day's picnic with family. The key attractions here were the three Wildlife Sanctuaries (WLSs), Thenmala Ecotourism initiative, Ponnudi, Meenmutty waterfalls, among others. Neyyar, Thenmala and Peppara were the most sought after ecotourism destination of southern Kerala. The tourist influx in the WLSs was restricted to the recreational area around the dam.

Neyyar WLS: Spread over 128 km² of forest area in the Western Ghats, Neyyar WLS forms the drainage basin for the Neyyar River and attracts tourists during various seasons (Box 5.1). It is in the southern tip of Kerala and has tremendous floral, faunal, ecological and geographical significance. The sanctuary is contiguous with the Kalakkad- Mundanthurai Tiger Reserve in Tamil Nadu. Agasthyavanam Biological Park and Peppara WLS surround it towards the north, private land on the south and west, and Tamil Nadu forests (Kalakkad -Mundanthurai Tiger Reserve area) on the

east. Neyyar dam was constructed across the river Neyyar in 1964 for irrigation purpose and the reservoir spread over 8.5 Km² area.

**Box 5.1. MAJOR
ATTRACTIONS IN NEYYAR
WLS**

1. Agasthya Park
2. Meenmutty Waterfall
3. Dam view
4. Deer park
5. Nature trails
6. Crocodile Protection centre
7. Elephant rehabilitation centre
8. Elephant ride
9. Lion safari park
10. Boating-immense scope for wildlife viewing)
11. Trekking / camping in the wilderness
12. Medicinal garden
13. Agastyarkoodam hill
14. Sivananda Yoga Vedanta Dhanwantri Ashram (Yoga & ayurvedic treatment)
15. Athirumala region (high ecological significance)
16. Varayattumudi

Peppara WLS : Peppara WLS attract nature admirers and various tourists (Box 5.2). The Government of Kerala constituted the sanctuary after the construction of a dam across the river Karamanayar at Peppara by Kerala Water Authority for catering to the drinking water purposes of Thiruvananthapuram and suburban areas in 1983. The sanctuary spread over 53 km² of forest area includes Peppara reservoir which has a spread area of over 5.82 km². The sanctuary is contiguous with Kalakkadu - Mundanthurai Tiger reserve of Tamil Nadu and Neyyar Wildlife Sanctuary of Kerala.

**Box 5.2 . MAJOR
ATTRACTIONS
IN PEPPARA WLS**

- ◆ Vazhvamthole waterfalls
- ◆ Bona waterfalls
- ◆ Agasthyamalai
- ◆ Karamanayar River
- ◆ Watch tower
- ◆ Peppara Dam
- ◆ Protected Medicinal plants
- ◆ Natural trail
- ◆ Pandipath day-night camp
- ◆ Bonacaud
- ◆ Ponmudi Hill Station
- ◆ Anappara
- ◆ Kallar
- ◆ Meenmutty Waterfalls

Shendurney WLS: The major attractions (Box 5.3) here in the natural backdrop bring many nature admirers and visitors to Shendurney. Shendurney Wildlife Sanctuary owes its name to the endemic species, *Gluta Travancorica*, locally known as 'Chenkurinji'. Lying on either side of the Shendurney River, the reservoir of the Parappara Dam, constructed across Kallada River in 1986, occupies the heart of this Wildlife Sanctuary which is the only one in Kollam District. The vegetation in the Sanctuary is mainly wet evergreen forests and about eight divergent types of forests have been identified here including the fragile and vulnerable *Myristica* swamps.

Box 5.3. MAJOR ATTRACTIONS IN SHENDURNEY WLS

- Expedition to the large cave with paintings similar to the Mesolithic paintings of Central India and containing relics of the Stone Age culture is of great tourist attraction
- Boating,
- Ottakkal Reservoir
- Trekking
- The Dharbhakulam trail, Kallar trail and Kuttilappara-Choodal bird watching trail
- Deer rehabilitation centre
- Erumadam
- Shenduruny River
- Thenmala Dam
- Palaruvi Waterfalls near Aryankavu and Courtallam
- Kulathupuzha, Aryankavu and Achankovil are important pilgrim centres.

The Thenmala Ecotourism Initiative: Thenmala is India's first planned ecotourism initiative and one among the top five ecotourism destinations in the world. Thenmala Ecotourism shares its resources with the famous Shenduruney WLS. Managed by Thenmala Ecotourism Promotional Society, which is an undertaking of the Government of Kerala, Thenmala Ecotourism is unique destination from a visitor's point of view (Box 5.4). With its forests, rubber estates and tea plantations, Thenmala provides the perfect background for leisure and adventure activities. The principles of zoning in ecotourism have been adopted here to create various zones (Culture/Adventure/Leisure), featuring specific familiarization activities for nature enthusiasts. The Thenmala Ecotourism Facilitation Centre has enough activities to entertain both adults and children. Asia's first butterfly safari park has got a variety of plants to attract butterflies. It has a short distance from Courtallam Falls in Tamil Nadu. The center of attraction of this place is Thenmala Dam. The project area also has tree top huts and children's eco-park, riverside treks, and floodlight assisted vehicle rides through the forest, enabling wildlife sighting.

Box 5.4 . MAJOR ATTRACTIONS IN THENMALA ECOTOURISM INITIATIVE

- Second largest irrigation project in Kerala
- Longest reservoir in the state
- Location - close to Shendurney Wildlife Sanctuary
- India's first eco tourism project
- Boastful earth dam
- Kollam-Shencotta rail journey (Shencotta metre gauge) passes through a landscape that is a feast for the eyes.
- The monumental flyover with 13 granite pillars between Thenmala and Aryankavu is simply breathtaking and by all standards a monument.
- A walk on tree tops- A 120-m long elevated walkway touching the treetops in the middle of forest!
- Shendurony wildlife Sanctuary

Other Attractions

- Trekking- One to three-day guided trekking tours and bird watching trails in the Shendurony Wildlife Sanctuary.
- Bird Watching Trail: Two-day programme in the Shendurony Wildlife Sanctuary
- Environment Education Centre: This Centre facilitates various activities inside the forest area, using the potential features of the site to educate the visitors.
- One-day Ecotourism at Palaruvi: The eco-trip to the 300 ft waterfall is managed by the local community

Agasthyavanam Biological Park (ABP) : Extending over an area of 23 Km², ABP is a center of *ex-situ* and *in-situ* conservation efforts. The park is named after the Agasthyakoodam, the second highest peak in the State. A major center for conservation and nature education, ABP offers recreational facilities such as trekking in the wilderness, bird watching, among others.

The economic impact of recreation development : The primary motivator to promote recreational activities in the study area has been the expected economic improvement by way of foreign exchange earnings, contributions to Government revenue, employment generation, infrastructural investments and improvements in the quality of living standards and income generation, especially of the underprivileged sections of the society. The visitor flow to the Wildlife Sanctuaries and National Parks in the State depict an increasing trend during the period 1998-2006 and the annual visitors' flow was 6,63,255 (Jayaraman and Anitha, 2008).

The visitor flow and revenue generating potential of Neyyar WLS depicts an increasing trend (Figure 5.1). The seasonality of visitation and the Government revenue generated in Peppara WLS depict fluctuating trend (Figure 5.2). Facilities when compared to Neyyar are less. The seasonal fluctuations in visitation and revenue generation in Shendurney depict an almost similar pattern although the same are not comparable among the three WLSs.

Figure 5.1 . Revenue generation in Neyyar WLS

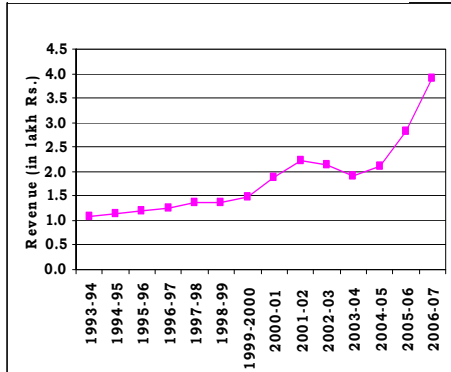
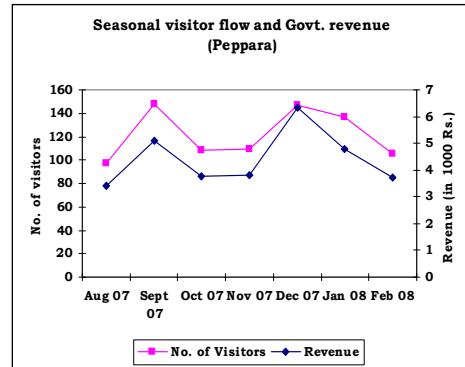
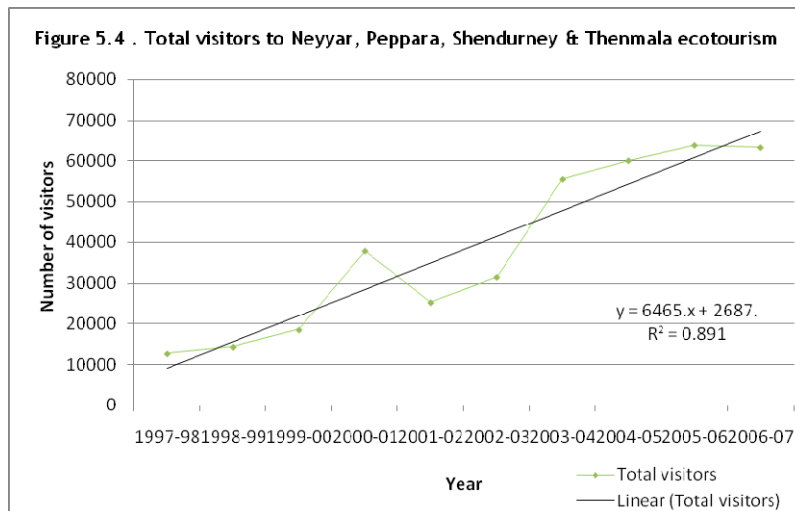
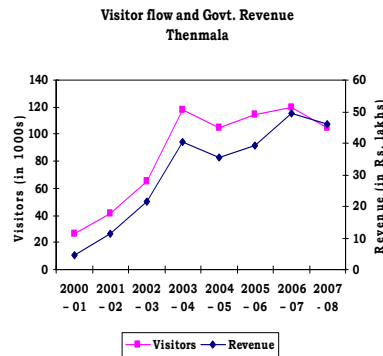


Figure 5.2 . seasonal visitor flow & revenue generation in Peppara



The estimated linear trend line (Figure 5.3) highlights that the average annual growth rate of visitors flow and revenue generation. In Thenmala Ecotourism initiative the average growth rate figures were 12853 visitors and Rs. 631338 respectively. Analysis of the key parameters of tourism indicate that tourist flow to the recreational sites in the study area increased at an average of 5,608 per year (Figure 5.4).

Figure.5.3. Visitor flow and Government revenue (Thenmala ecotourism initiative)



The economic impact of tourism in terms of earnings in the State indicated an increasing trend over the years. In 2008 the total revenue generated was Rs.13130 crores depicting an increase of 14.84 per cent over the previous years and the tourism contribution to the States Gross Domestic Product was 7.70 per cent (Economic Review, 2009).

The recreation fees collected at each recreation site differed depending on the varied attractions and facilities and hence a comparison is not considered here. The total revenue from recreational activities in the study area indicates an increase at an average of Rs. 8384/- per year during the study period.

In Neyyar WLS the average spending of a tourist during the period 1997-2008 was only Rs 13. The commercial development in the ecotourism areas of Neyyar was relatively poor and it was estimated that the tourism sector generated an aggregate demand equal to Rs 950 per day in the area. This aggregate demand was derived based on the interaction with the shopkeepers, vendors and by analyzing the spending habits of the tourists.

The average revenue generated in the Shendurney WLS was Rs 980,571 and it was mainly from the boating and the average fee of an individual tourist including the foreigners was Rs 36. The aggregate demand created by the ecotourism development in the area was Rs 21,000 per day in the moderate season and the average employment generated in the ecotourism area was 95 labour days per day excluding the employment offered by the EDCs and the Thenmala Ecotourism project.

Demographic characteristics of visitors: In the gender-wise classification of the sample, males constituted the major share with 69.5 per cent and the females constituted only 30.5 per cent of the total sample. The age of the sample respondents varied between 16 and 69 with an average value of 30. The level of education indicated that 22 per cent were below SSLC and 27 per cent SSLC qualified. It was also observed that the graduates and post graduates constituted 26 and 18 per cent respectively and 7 per cent availed technical education. In the occupational structure of the sample, private sector occupied a prominent place with 33 per cent, while the government, business and agriculture sectors engaged 15, 9, and 7 per cent respectively. 17 per cent of the sample remained unemployed and 19 per cent came under the category of others, which included housewife and students. Leisure was the major motivation of the respondents (67 %). Other motivations highlighted study purposes (23 %), business (4 %) and pilgrimage (2 %).

Recreational expenditure: Nearly 53 per cent of the sample arranged their tour themselves and 9 per cent depended on the formal tour operators. In the visitors group, 41 per cent constituted friends group followed by study group (30 %), family (27 %) and individuals (2 %). The average travel distance of the sample tourists ranged between 1 hour and 4 days with an average 4.5 hours. Regarding the mode of travel, 36 per cent depended on tour coaches, 38 and 15 per cents used rented taxi and own vehicles respectively, the public transport was used by only 11 per cent of

the sample. Around 23 per cent of the sample indulged in shopping as part of their tour and the items in the shopping list included handicrafts, dress, ayurvedic products, and spices like cashew nuts, among others. On the expenditure side of the tourism development, an individual tourist incurs expenditure on various heads such as food and accommodation, travel, shopping and recreation fee. The expenditure patterns of the sample households (Table 5.2) were identified based on the average expenditure incurred on different heads and it was observed that the travel and accommodation got highest share with an average expenditure of Rs.1676.

Sl.No	Type of expenditure	Average amount (Rs.)	Responded sample visitors
1	Travel & accommodation	1676	1238
2	Shopping	1023	132
3	Food	832	1367
4	Recreation	435	945
5	Others	1250	634

Primary data estimates

Total Conservation Value of recreation

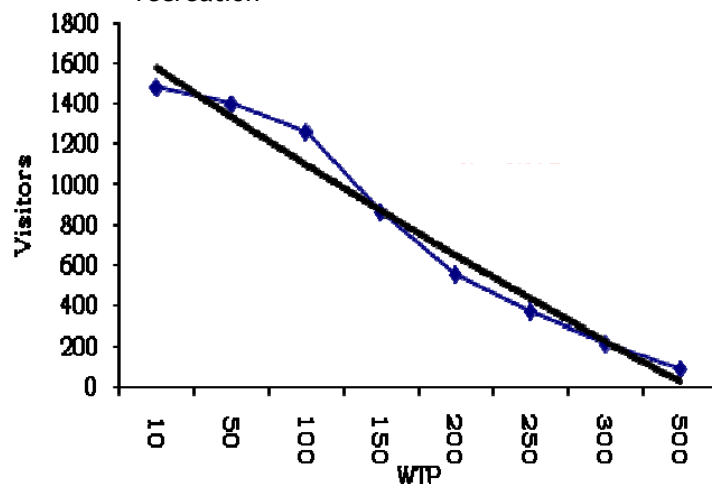
The real value of a natural resource / BR is infinity. Here, we estimated the conservation value of ecotourism benefits which is the value people are willing to sacrifice for conserving the PA but this does not reflect the actual value. It was based on the assumption that demand for conservation (number of people willing to sacrifice) is positively reflected by the amount that people are willing to pay for conservation.

The demand for the conservation of natural resources depends on various factors such as people's awareness about the importance of the resources, intensity of environmental problem due to the deterioration of the resources, standard of living of the people, among others. The conservation value is the amount people are willing to sacrifice for having the benefit in the future. The demand theory shows an inverse relationship between the quantity demanded and the price. The price represents the amount people are willing to sacrifice for having a particular benefit.

Symbolically $Y = f(X)$ where Y is the demand for the conservation of ecotourism spot, f and X represent the functional relation and amount the tourist is willing to pay respectively. In order to estimate the conservation value from the conservation demand curve (Figure 5.5) the integration method was adopted.

In the contingent valuation questionnaire survey, 1481 tourists responded to the question related to the willingness to pay for the conservation of the tourist spot. The estimated aggregate conservation value of the sample was Rs. 131410454 and the average conservation value of a visitor was Rs 88731. The willingness to pay ranged between Rs 10 and Rs 500 and the mean value of the willingness to pay was Rs 171.

Figure 5.5. The conservation demand curve of recreation



CULTURAL TOURISM

The cultural tourism in the Kerala part of ABR is mainly associated with the Agasthyakoodam pilgrimage. Agasthyamala is now a famous pilgrimage and trekking route. Agasthyamala attracts thousands of tourists and pilgrims annually to visit the sacred shrine at Agasthyakoodam peak. The significance of Agasthyamala (1,890m high) is that it is known as the home to a wide variety of plant species including rare medicinal plants. There is a full sized statue of sage Agasthya at the top of the peak and the devotees offer prayers and conduct rituals themselves. Women are not allowed up the peak based on traditional beliefs. The actual pilgrimage starts at Bonacaud and takes two days to reach the peak and back (Box 5.5). Agasthyamala attracts tourists and pilgrims from Tamil Nadu and other states as well. The season of pilgrimage is from January to April every year, the peak season (February - March) coincides with Shivaratri festival. The pilgrimage was recognized for the last 50 years but was made official by KFD in the year 1999. Since then each pilgrim requires the permission for visits and groups are allowed with guides provided by Kerala Forest Department.

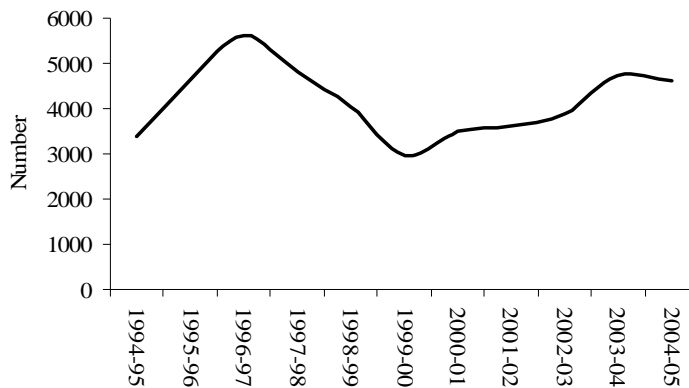
Kunhi and Sankar (2002) in their detailed Environmental Impact Analysis of this pilgrimage clearly mentioned the need to put in place strict rules and regulations and create awareness among all the stakeholders. Pilgrims and tourists influx is increasing every year and posing problems like forest fires, non degradable solid waste generation and destruction of valuable forests. Visits to the Kanis Sacred Area by outsiders are also causing acculturation among the indigenous communities. Due to heavy influx of people, the Kanis now take their pilgrimage to Agasthyakoodam during November - December prior to the tourist season.

Box.5.5.PILGRIM ROUTE & ACTIVITIES AT AGASTHYAKOODAM

- Group formation at Bonacaud (EDC strictly monitors -guides & food)
- Karamanayar and worship rituals
- Attayar - halt
- Athirumala - overnight halt
- Pongalappara - Pongala rituals
- Agasthya peak rituals

Pilgrim/Visitor flow: Average number of visitors per annum during the period 1993-94 to 2007-08 was 4083. Trend in visitor flow to Agasthyakoodam using three year moving average depicted a sharp increase from 1994-95 to 1996-97 (Figure 5.6). Then it sharply decreased upto the year 1999-2000. After that an increasing trend was noted. Average revenue generated per day was worked out by collecting daily revenue for 28 days during the 2009 season and it was Rs. 24,027.

Figure 5.6. Three year moving average of visitors flow to Agasthyarkoodam



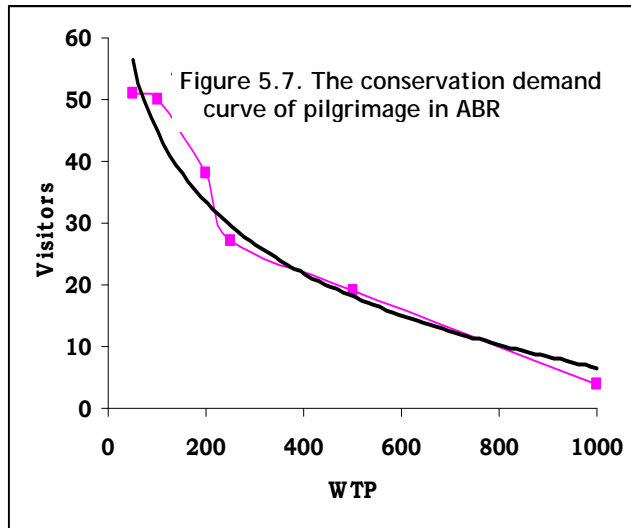
Current management and restrictions

The overall management and coordination of the BR rests with the Kerala Forest Department. The KFD has developed participatory management setup with the help of indigenous community i.e., the Kani Eco Development Committee. This

pilgrimage management is seasonal activity and the committee requires a lot of training and facilitation. KFD has also organized some training and awareness generation programmes in the past. Tourists are permitted to go on a trek to the peak only with permission from the Kerala Forest Department. Annual trekking passes to the peak are issued from the KFD during January-February only. Accommodation facilities are not available in Agasthyakoodam. The KFD has imposed restrictions on lighting of fires for cooking and other purposes. Use of liquor has also been prohibited as a precaution against vandalism.

Pilgrim profile: Profile of the respondents indicates that only males visit Agasthyakoodam and the average age of the visitors is 35.37 and the visitors are in the range of 21-53. Very rarely people visit the area individually; most of them visit the area in a group with average group size of 7. Sometimes children are accompanying the group. More than 95 per cent of the visitors fall in the category of friends. Family visits are very rare. Mode of transportation is either hired vehicle (29.6%), own vehicle (35.2%) and public transport (35.2%). Only four groups covered in the survey indicated having other destination points too. Remaining 92.6 per cent had only one destination. The total number of days staying ranged between 1 to 3 days with a majority (88.9%) staying for two days.

Additionally the respondents were willing to travel about 25 to 100 km. About 35.2 per cent were ready to travel about 100 km and about 40.7 per cent were ready to travel about 50 km. Of the respondents, 74 per cent were first time visitors. Some of them had visited the site a number of times. Almost all of them wanted to conserve the forest. Approximately 92 per cent of the respondents were willing to pay an amount to conserve the forest. They wanted to conserve the forest because of the ecological importance and for the pilgrim purposes. However, the demand curve (Figure 5.7) illustrates a decreasing trend and only 37 per cent of the visitors were willing to pay Rs. 500 and above. Average amount they were willing to pay was about Rs. 326 which was very minimal for the conservation of the ecosystem in the pilgrim area.



6. DISCUSSIONS AND CONCLUSIONS

Human interactions

Human consumptive use of resources and human land use practices in the Kerala part of ABR are incompatible in conserving biological diversity. The study area is subjected to various anthropogenic disturbances and commercial threats. Resource constraints and poor socioeconomic conditions coupled with proximity/ easy accessibility to the BR explains the anthropogenic dependence/pressure. The size of land holdings in ABR is highly skewed towards a few households who own a substantial area of land while other households have meager area. The average frequencies of forest entry and subsistence dependence of forest are positively related. Levels of education and subsistence dependence are inversely related. Growing tourism, pilgrimage, rubber plantations and forest development activities are helping Kanis to earn better livelihood. However, this enhanced livelihood is at the cost of their deep rooted traditions, culture and age old relationship with the environment. In the new strategies for developing NTFP sector, initiatives such as Kottur tribal market, a unique initiative supervised by Kerala Forest Department must be replicated where possible. This system is beneficial to the indigenous community ensuring fair trade and economic security. The functional Kani Women's Cooperative for Handicrafts in the Agasthyavan Biological Park formed for their betterment today faces adverse marketing problems needing immediate institutional support. Efforts are needed for reviewing and strengthening the existing institutional setup and benefit sharing process in relation with the empowerment of the Kanis in order to protect, preserve and maintain their knowledge (*of the anti-fatigue properties of the Arogyapacha plant, Trichopus zeylanicus*). As a part of the study area 'participatory conservation strategy' efforts to improve the sustainability of such initiatives should be given top priority.

The study area having high recreation and cultural tourism potential is under adverse socioeconomic/commercial pressures. This poses a real challenge in designing and implementing recreation/ecotourism initiative (Box 6.1). The growing cultural tourism, i.e., the Agasthyakoodam pilgrimage attracts thousands of pilgrims to the Agasthyakoodam peak which is posing several environmental problems. Currently it is managed by the Kanis Eco development Committee. Environmentalists are concerned that the pilgrimage would eventually exceed the carrying capacity leading to irreplaceable damage to the ecosystem. Kunhi and Sankar 2002 suggested involving EDCs of Bonacaud, Podiyam and Chathankode in the pilgrimage management. Forests of Agasthya peak area are degraded severely and are converted to grasslands due to repeated burnings and growing pilgrim/tourist influx. Forest cover in some parts of ABR especially in the pilgrimage area has reduced to 13.30 per cent in the region. Most of the abandoned and closed down tea estates could be used for recreation. This calls for an open policy for involving companies for such development.

Box 6.1 ISSUES & CHALLENGES OF DEVELOPING TOURISM SECTOR IN THE KERALA PART OF AGASTHYAMALA BIOSPHERE RESERVE

- The primary stakeholders in many remote pockets remain mere spectators to development initiatives due to their inherent social backwardness
- Growing ecotourism and cultural tourism have adverse impacts on the environment and the people, for ex: waste accumulation and associated pollution, acculturation process
- Commercial threats
- Opportunity costs not taken into account while implementing recreation initiatives
- The expenditure pattern of tourists/pilgrims not monitored adequately
- Lack of adequate data on the economic, social and environmental aspects with the authorities.

Land use alterations and impacts

The study area exhibits a similar land use pattern as in the State. The major portion of the geographical area is allotted to agricultural cultivation, which highlights the importance of agriculture sector in the study area. The prevalent cropping /system in the study area is the cumulative result of the past and present decision by individuals, communities or governments and their agencies based on experience, tradition, expected profit, personal preference and resources, social and political pressures among others. More land is allotted to non-food crops than to food crops. The difference in the allocation of land between food and non-food crops indicates the commercialization of the agricultural sector in the Kerala part of ABR. The very low extent of the irrigation facilities highlights the backwardness of the agriculture practices which are seasonal in nature due to heavy dependence on rains. The Rubber Board is providing subsidies and also assuring the buyback to Kanis. There is a need to have a policy decision on prohibiting new plantations within the study area limits or on the fringes. To achieve this, an integrated approach between the concerned Departments is required. In future, due to strict regulations of BR alternative seasonal employment for the dependent populace need be worked out.

Growing recreation and cultural tourism

The outdoor recreation system with its economic parallels identifies certain comparisons between the recreation economy and market economy in the study area. Recreation development in the study area has the potential to make an

economic impact via income generation, increasing the foreign reserve of the State, developing the basic infrastructures and creating new avenues for the employment. It also provides avenues for the sustainable development of the remote rural areas. Such propositions also create new threats resulting in the acculturation of the indigenous communities as well.

Although there is immense ecotourism potential, it has both favourable as well as adverse impacts; in many cases the involvement of local communities is not an easy task. There exists a lot of opportunity for the resident population as well as local communities from ecotourism, (for instance, the local Golden Valley Ecotourism Committee at Kallar village and other EDCs) in the study area. The Thenmala ecotourism facility developed by KTDC in Shendurney WLS is a successful initiative. The Kerala Forest Department has promoted nature tourism by developing tourist information centre and other facilities at Neyyar and Peppara and is also providing employment on a daily wage to primary stakeholders as guides for trekking, among others. The District Tourism Promotion Council (DTPC) catering to the tourism facilities at Neyyar and Thenmala reservoirs has impacted the surrounding areas in many ways. It has resulted in the uncontrolled tourist influx and associated pressures. The Kerala Forest Department has also developed various nature and wildlife tourism facilities, but all these initiatives lack an integrated collaborative approach.

All these developments have degraded local culture and the landscape in such a manner that there is an urgent need to seek answers for its conservation programme through linking conservation and forest management with sustainable livelihoods and resource use. In spite of the efforts of the Government agencies, many problems continue to be unresolved, the major one being the continued influx of a large number of tourists. However, an earnest step taken by the Forest Department has eased the friction considerably. In both the states diverse EDCs are currently in progress, especially within the fringe areas of the Biosphere Reserve.

In brief, the various developmental interventions that have taken place in the study area over the years have had adverse impact on the people as well as on the conservation of biodiversity. In this background extreme caution is necessary while considering this for declaration as a world heritage site. Site specific studies need to be undertaken in this regard.

CONCLUSIONS

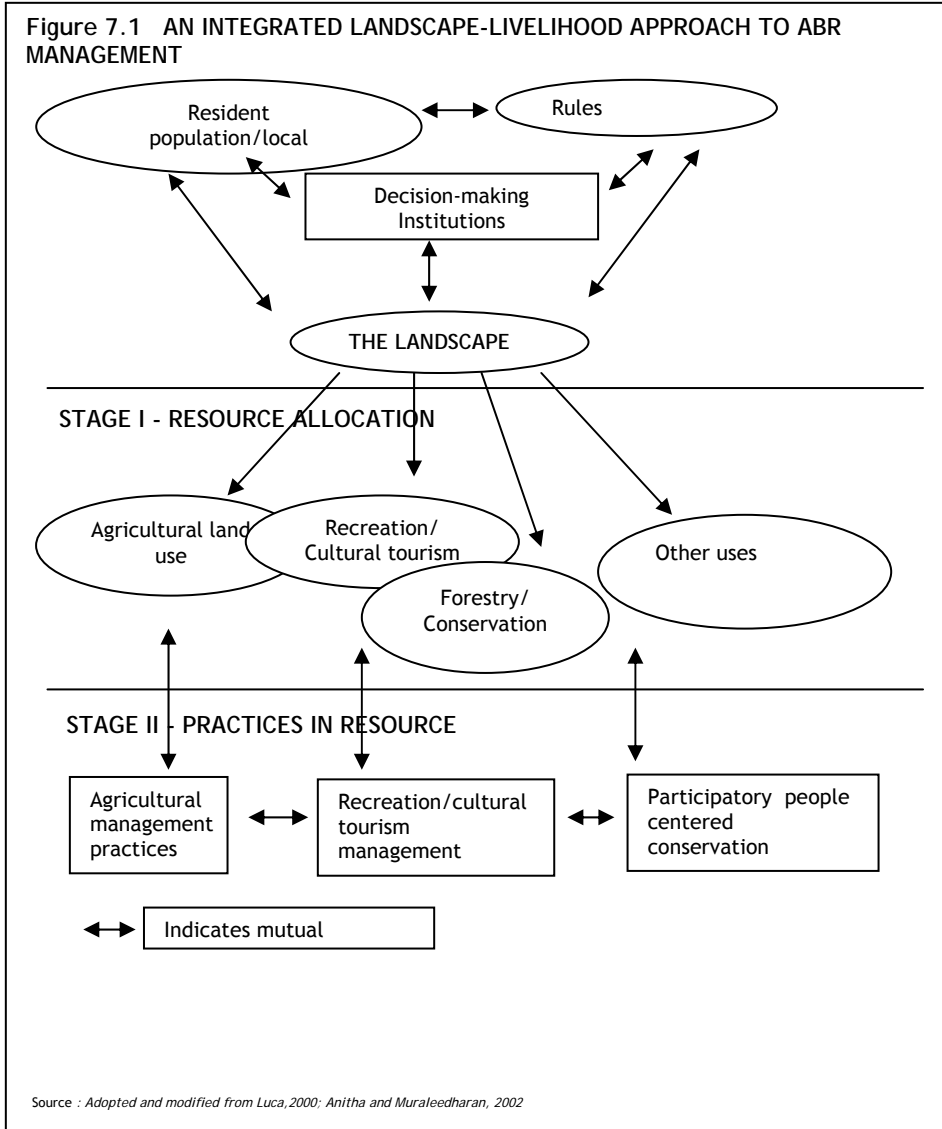
1. The shifting paradigms in land use call for critical land use evaluation for stability and sustainability in the sphere of agricultural production, environmental conservation, socioeconomic factors and societal welfare.
2. Need for a clear policy for stopping further expansion of rubber plantations within the BR and fringe areas.
3. Need for participatory management of Non Timber Forest Products to ensure economic and environmental security.
4. Facilitate integrated interactive dialogue among various institutions especially Government Departments (KFD, Irrigation, Tourism, etc.)
5. An 'integrated landscape livelihood approach' to be considered for livelihood sustainability as well as biodiversity conservation in the Kerala part of ABR.
6. To develop and facilitate 'people-centered institutional setup' for ensuring sustainable livelihood in which the key actors are the primary stakeholders themselves who should identify and address livelihood priorities.
7. Neyyar, Thenmala, Peppara and Agasthyakoodam are fast emerging as a potential ecotourism and cultural tourism sites in the study area and can be considered a viable alternative to the conservation of forest and enhancing the standard of living of the depending communities.
8. Ecotourism /cultural tourism development poses various threats to the conservation of natural resources and developing efficient *site-specific* management strategies is the need of the hour.
9. Strategies and Action Plan for sustainable recreation should essentially be in line with the 'Pro-Poor Tourism' focusing on economic, non-economic and policy reforms.
10. Implementation of a site-specific 'One Tourist One Rupee Ten tree Programme' will ensure economic and environmental security.

7. STRATEGIES AND ACTION PLAN

Based on the discussions and conclusions of the study the following strategies and action plans are suggested for the sustainable management of natural as well as human resources in the Kerala part of Agasthyamala Biosphere Reserve.

A. INTEGRATED LANDSCAPE LIVELIHOOD APPROACH

An integrated landscape livelihood approach is considered most appropriate to Biosphere Reserve management. Adverse socioeconomic dependencies of the resident population and local communities/ commercial pressures on the study area should be in line with necessary changes in formal planning. Such an integrated approach will encompass all the landscape elements (forests, degraded forest, plantations, village ecosystems, human activity, changing land use, growing recreation and cultural tourism, among others) in resource allocation and use. The Kerala part of Agasthyamala Biosphere Reserve is being put to different uses, viz., agriculture, recreation /cultural tourism, conservation/ forestry, and other commercial interests. There is an interrelation between the first three forms of uses, for instance, sustainable agricultural practices conserve soil on the one hand and provides economic security to the people. This interrelation is incomplete, for other land use options within the BR (i.e., the growing recreation and cultural tourism sector), often result in biodiversity loss and associated issues/challenges. This is the first stage of planning (Figure 7.1) in landscape allocation where extreme caution is needed. This calls for appropriate allotments between different uses, thereby leading to an integrated approach to management rather than having adverse mutual impacts. The second stage would concern itself with the practices adopted in the different use spheres of agriculture, recreation /cultural tourism, conservation/forestry and various commercial interests. This again holds significance because of the resource allocation at a given point of time, for instance, an improvement in forest management practices lead to increase in biodiversity by habitat improvement. This would bring about awareness among the resident population and the local communities on the need to bear caution in all their land use practices which are detrimental to the conservation of biodiversity. Such an approach will go a long way in conserving ecosystem within the study area and also cater to the basic livelihood requirements of the dependent population.



ONE TOURIST ONE RUPEE TEN TREE PROGRAMME for environmental and economic security

Raising funds from the efficient use of direct non-consumptive use values of forest is a rational way to make the conservation activities economically sustainable (Anitha and Muraleedharan, 2007). The absolute support and participation of the resident population as well as the local communities along the fringes of the BR is indispensable for the successful development of tourism. In order to ensure the conservation of the ecosystem in and around the recreational sites in the study area as well as societal welfare at large, a site-specific programme called “One Tourist One Rupee Ten trees Programme” is proposed.

This programme aims at the conservation and expansion of the forest cover in recreation sites in the study area with people’s participation. In this programme one rupee from each tourist (to be included in the entrance fee) is collected and a common fund called Conservation fund is set up. When the fund increases to Rs.500, one person is employed for planting ten trees in the recreation area, to start with the visitor activity zone or the affected forest area. In the programme preference should be given to women in the local area who are engaged in labour work. The employed person is directed to plant ten trees given by the authority and conserve it for a period of six months. This six month period is called conservation period and during the period the person employed is directed to irrigate the plants at least twice in a week and provide all required protection. After the conservation period of six months if the tree is sustaining and healthy, the employed person must be paid Rs 500 from the conservation fund as an incentive. This programme also envisages giving the ownership of the tree to the person who planted it. The ownership should be conditional in nature such that the person is the primary owner of the tree and his right is restricted to the conservation only. The main features of the programme (Box 7.2) should be such that people are environment conscious and feel responsible for conservation.

Box 7.2. MAIN FEATURES OF ‘ONE TOURIST ONE RUPEE TEN TREES PROGRAMME’

This is a ‘*savings program*’ of the primary stakeholder

- It is for the expansion of tree cover.
- It promotes the savings of the unskilled labour in the local area
- It increases the environmental awareness and consciousness of the local community
- Providing ownership of the natural resource to the people restricted only to conservation makes them responsive against deforestation.

How to implement

- The VSS secretary (a Forest Department official) should supervise the programme
- VSS secretary should provide a plant and direct the employed person to plant the tree in a particular place. The species to be planted may also be identified and listed by the community.
- The site for planting should be initially concentrated on the Affected Forest Area and then on degraded forest areas, roadsides, school compound or any other public places as identified by the community as a whole.
- There should be a memorandum of understanding between the VSS secretary, the person employed and some (at least two) VSS members as witnesses.
- All the VSS members should be given a chance to plant trees and also act as witnesses in this programme.
- A person from outside the VSS can also participate in the programme and VSS member should be the witness
- VSS secretary should document, explain and report the progress of the program to the VSS members.
- All the VSS members are responsible to monitor and independently evaluate the program.

This programme once implemented, will ensure economic as well as environmental security in recreation sites as well as Agasthyakodam pilgrim site where there is significant disturbance because of human activities and development. This may be started as a site-specific programme and subsequently be extended to the District/State level (rural as well as urban areas).

Strategies for sustainable recreation /cultural tourism

Strategies for sustainable ecotourism/cultural tourism must focus on the overall societal welfare similar to the 'Pro Poor Tourism' concept prioritizing on immediate economic benefits, non-economic benefits, and finally on a more supportive policy (Table 7.1).

Table 7.1. STRATEGIES FOR SUSTAINABLE RECREATION /CULTURAL TOURISM IN THE KERALA PART OF ABR		
Economic benefits	Non-economic benefits	Policy reform/ research
Increasing business opportunities for the poor	<p>Human Resource development</p> <p>Improve human development Index (<i>eg. literacy, health and nutrition, housing potable water, women empowerment, etc.</i>) and community infrastructure (<i>eg. markets, etc.</i>)</p>	<p>Building a more supportive policy -</p> <p>The recreation activities supported by Government represent a significant source of economic security and regional economic activity. Special emphasis must be placed on methods of economic analysis and practical policy instruments that will simultaneously protect natural habitats and alleviate poverty.</p>
Providing employment opportunities for the poor	<p>Capacity building, Training and empowerment</p> <p>Creating necessary human resources of the resident population through training (<i>in confidence building, leadership, managerial skills, accounting, costing, etc.</i>)</p>	<p>An integrated planning framework which encourages ecotourism partnerships where the Forest Department plays the role of a facilitator. Successful ecotourism is with building strong partnerships such that multiple goals of conservation and equitable development can be met. The key participants must include the managing authority, the government agencies, the local community, the NGOs, private sector, community organizations and individuals, among others.</p>
Enhancing collective benefits	<p>Mitigating the environmental impact of growing recreation and cultural tourism on the poor</p>	<p>Promoting participation of the primary stakeholders , especially the already functional EDCs and VSSs</p> <p>Devolve control to the local communities, as is being done under the participatory management approach through the VSSs backed by a legal and policy framework empowering local communities to assume responsibility and authority for natural resource management and land management contracts with representatives of the government.</p> <p>Introduce and implement the ‘one tourist one rupee ten tree programme’</p> <p>Contd.</p>

Economic benefits	Non-economic benefits	Policy reform/ research
<p>Revenue generation - recreation and cultural tourism offers opportunities to generate revenue in diverse ways, such as entrance fees, user fees, concessions</p>	<p>Addressing social impacts of growing tourism sector</p>	<p>Promote private sector to provide services that benefits the tourists and local community as well, for ex: in the abandoned tea estates of bonacaud, among others.</p> <p>Increasing avenues of service sector development is reducing the dependence of the population over the agriculture sector and helps to reduce the disguised unemployment in the local economy.</p> <p>Private sector concessions include snack shops, restaurants, lodges, gifts shops, tour guides, all these can be privately owned or managed with a portion of the profits returned to the sites.</p>

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