CHAPTER 1

INTRODUCTION AND STUDY AREA
1.1 Introduction

Forest ecosystems, one of the largest repositories of biodiversity, are not only crucial in maintenance of the ecological balance but are also the major sources of fodder, fuelwood and timber. Yet it is these forest ecosystems all over the world which have suffered most in man's quest for development (decline in the world's forest cover, excluding plantations, has been 13 percent between 1960 and 1990, Mohapatra, 1999). With the swelling human and livestock populations these ecosystems are under tremendous anthropogenic pressures resulting in their degradation especially in Africa, Asia and south America (Erickholm, 1975, Upreti, 1987, Pearce et al. 1990, Ponting, 1990 cited in Upreti, 1994). The scenario is worst in developing countries where a combination of factors such as large scale commercial exploitation of forests in the past for timber and pulp, clearance of forest land for agricultural purposes to meet the growing needs for food of a soaring human population and unplanned industrialization has led to large scale losses in forest cover. This has resulted in drastic reduction, fragmentation and degradation of wildlife habitats leading to decline in wildlife populations. Since a very high proportion of human population in developing countries lives below the poverty line, forested areas continue to be degraded as local people exploit them for their everyday needs. The process continues unabated. On the other hand, degradation of forests adversely affects the quality and availability of water, causes increased urban and industrial pollution, in addition to loss of biological diversity. The consequent ecological crisis has resulted in increasing social conflict as different groups exercise competing claims on a dwindling resource base (Guha, 1994).
Majority of the developing countries contain the largest chunks of tropical forests which possess over half of the world's floral and faunal species in just 7% of the land area. These forests have been exploited and destroyed at an alarming rate. For example, from an estimated 569 million hectares of forests and woodlots in 1850, tropical Asia lost approximately 76 million hectares till 1950; a reduction of approximately 14% during one century (Thapa and Weber, 1990). The greatest reduction has been in Asia where about 70 percent of the original forest cover has been lost (Mohapatra, 1999). The scenario has not changed much since 1950. For instance, India has lost 4.3 million hectares of forest lands between 1951 and 1980. An appraisal of loss of forest cover showed that approximately 2.6 million hectares of forests have gone to agriculture, 0.5 million hectares to river valley projects and 0.1 million hectares to industries and townships (Lal, 1989). Needless to say that such large destruction played havoc with India's rich biodiversity. India, being one of the twelve "megadiversity" countries of the world, is home to 15,000 flowering plants, 372 mammalian species, 1200 avian species, 399 reptilian species, 1,693 fish, 181 amphibians and 5,000 mollusc. A large number of these plants and animals are endemic to India. However, large scale changes in land use patterns and practices have adversely affected the distribution and abundance of wild animals specially the large and medium sized species. For instance, out of 372 mammalian species found in India, fifty eight have been listed as endangered in Schedule I of Indian Wildlife (Protection) Act (Anon. 1972). Out of these, 18 have no or insignificant populations in protected areas (Rodgers and Panwar, 1988).

Although conservation of fauna and flora has been an integral part of people's...
ethics, religious belief and culture in India from time immemorial, organised forest management began in 1865 with the major objective of profitable exploitation of timber. Furthermore, the forest management was responsible for protection of the forests from the impact of resource use by the people. This was one of the objectives of the process of converting forests into reserved forests. By the end of the 19th century game associations started to appear across the country. This movement mainly emphasised avoiding extinction of endangered animals and also regulating hunting of those animals and birds which flourished in safe numbers. The year 1910 witnessed probably the first incidence of shifting people out of a protected area, when the Maharajah of Kashmir ordered the removal of human population from the Dachigam Deer Reserve (Tucker, 1991).

The first world war however, brought major changes in India. Access to sophisticated weapons, roads and automobiles opened up the far and inaccessible forest areas resulting in increased threats to its wildlands (Phythian-Adams, 1939). To counter this trend, a movement was launched with the Indian National Parks Act becoming a law in 1934 (Tucker, 1991). The Act however, was silent on tribal and peasant populations residing within reserved forests and protected areas. Consequent to this Act, India's first National Park (Corbett Park) was established in the same year, covering 99 square miles of tiger habitat in Terai jungles in the Himalayan foothills (Burton 1951). In 1935 the 'United Provinces Wildlife Preservation Society' organised a major conference of leading wildlife enthusiasts. It was the first organised effort to explore the implications of human presence in and around protected areas *vis-a-vis* their rights of subsistence and self protection.
near forests, access to wood and grasses for bona-fide use, poaching and sale of wildlife products both in local and international markets, shifting cultivation, etc.

However, the second world war brought devastation to wildlife interests as guns flowed into rural India enabling many more peasants to become hunters and poachers (Stracey, 1963). The war also resulted in increased demand for timber leading to accelerated rotational felling schedules. Partition and independence of India in 1947 led to major diversion of forests to cropland in the 1950's, to fulfill the growing demand for agricultural products (Farmer, 1974). At the same time regional marketing networks and expanding urban centres, particularly in hill regions, exerted new pressures on forest and wildlife zones. The establishment of the National Wildlife Board in 1949 however, led to the declaration of many national parks and refuges in the 1950’s.

With the enactment of Wildlife Protection Act in 1972 (Anon., 1972), serious efforts to conserve India's biodiversity were initiated at the state level. Moreover, the concept of scientific management of protected areas for perpetuation of wildlife gained momentum with the launching of "Project Tiger" in India in 1972. Since then the number of protected areas has increased steadily. Currently there are 85 national parks, 448 sanctuaries and 10 biosphere reserves in India covering approximately 4.2% of the land.

1.2 Concept of protected areas

A Protected Area (PA) by definition should be secure from unrestricted use of its resources. The modern concept of conservation is a combination of the two ancient principles of 'resource management' on the basis of accurate inventory and
'protective measures' for ensuring resources from being exhausted. Conservation at times has been considered as a protective 'locking away' of resources by the powerful elite. PAs in reality, however play a central role in the social and economic development of rural environments and contribute to the economic well-being of urban centres by reducing the negative effects of resource use (MacKinnon et al., 1986).

In areas outside the PAs people tend to over-exploit natural resources leading to degradation of natural resource base which also affects the water regime. In the long run this leads to serious difficulties for the rural society; as for example has been witnessed in the Himalayas, and other areas too, where over-exploitation of natural resources has resulted in rampant deforestation. This has adversely affected the rural people, especially the women who have to walk greater distances to get water, fuelwood and fodder.

In the present scenario of high population pressure resulting in degradation and loss of forest lands, interspersing of human habitation in wilderness areas and fragmentation of these areas, most developing countries find it convenient to have several categories of PAs, each with different management objectives and each permitting different levels of manipulation (Rodgers and Panwar, 1988; MacKinnon et al., 1986).

1.2.1 Importance of protected areas

Protected areas not only play an important role in a nation's economy by providing a range of benefits, they can also help to meet different objectives ranging from preservation of natural ecological processes to provision of timber, wildlife,
water or recreational use at sustainable levels (Dixon and Sherman, 1990).

1.2.2 Types of protected areas

Though the National Park (NP) is probably the most widely known form of PA, it is only one of many possible categories. In 1959, the IUCN, was given the task of maintaining a list of the world's NPs and equivalent reserves. The Commission of National Parks and Protected Areas (CNPPA) has defined ten categories of conservation areas representing different levels of protection and varying degrees of local, regional and global importance. The classification has eight protected area categories and two international designations viz., Biosphere Reserve and World Heritage Site (IUCN, 1984; MacKinnon et al., 1986). The eight protected area categories are:

i. **Scientific Reserve / Strict Nature Reserve**: Their objective is to protect nature and maintain natural processes in an undisturbed state so as to have ecologically representative examples of the natural environment available for scientific study, monitoring and education.

ii. **National Park**: Their objective is to protect large natural and scenic area of national and international significance for scientific, educational and recreational use.

iii. **Natural Monument / Natural Landmark**: They aim at protecting and preserving nationally significant natural features because of their unique characteristics of special interest.

iv. **Managed Nature Reserve / Wildlife Sanctuary**: This category aims at ensuring the natural conditions necessary to protect nationally significant species,
groups of species, biotic communities, or physical features of the environment requiring human intervention for their perpetuation.

v. Protected Landscape: They aim at maintaining nationally significant natural landscapes having a harmonious interaction between people and land, at the same time providing opportunities for recreation and tourism within the lifestyle and economic activity of these areas.

vi. Resource Reserve: Their objective is to protect an area's natural resources for future use and curbing any development activity that could adversely affect the resources.

vii. Natural Biotic Area / Anthropological Reserves: They allow societies living in harmony with the environment to continue their way of life undisturbed by modern technology.

viii. Multiple-use Management Area / Managed Resource Area: In this PA category the conservation of nature is oriented to the support of economic activities, e.g., sustained production of water, timber, wildlife, pasture and outdoor recreation.

The two international PA designations are:

i. Biosphere Reserves: These are sites of exceptional richness with respect to the diversity and integrity of biotic communities of plants and animals within natural ecosystems.

ii. World Heritage Sites: These are unique natural and cultural sites having outstanding universal significance.

1.2.3 Protected areas in India

The Wildlife Protection Act and the Indian Forest Act allow several levels of
protection (Rodgers and Panwar, 1988), under the following categories:

i. **National Park**: In a NP no consumptive utilisation of land or natural resources is permitted except for management to achieve conservation objectives. This category in theory, is the ultimate level of protection that can be given to an area.

ii. **Wildlife Sanctuary**: The conservation of biological values in a wildlife sanctuary holds priority over resource utilisation such as timber, fuelwood, minor produce harvesting and livestock grazing.

iii. **Reserved Forest and Protected Forest**: The principle objective of these is the maintenance of forest resources. However, while reserved forest allows less intensive produce collection or grazing, in a protected forest local pressures are higher. Although both reserved and protected forests cannot provide long term conservation of important wildlife resources, such forest cover is important as buffer and corridor area.

iv. **Game Reserve / Wetland Reserve**: This category was important in the past when game hunting was permitted. However, now it is an uncommon category because there are legal restrictions on hunting.

v. **Closed Area**: This category can be used to give protection to selected species in government forests, especially in areas without adequate government land. However, it has no control over the prevalent land-use practice and therefore, cannot guarantee the existence of suitable habitat for target species.

vi. **Biosphere Reserve**: These are ideally large planning areas which are integrated ecosystems containing legally protected core zones such as parks and sanctuaries within a framework of human settlement and resource exploitation.
areas. The Government of India proposed that examples of the country's richest and most distinctive biomes be given extra attention as biosphere reserves.

vii. Sacred Forest Groves of North-East India and Western Ghats: In both north-east and western ghats, sacred forests which have been a form of traditional resource conservation, are losing their status due to growing population and the younger generation's lack of interest in their traditional heritage. However, for long-term conservation these areas would require additional legal status.

1.3 Protected areas under study

The Satpura hills (better known for Hora hypothesis) in the Central highlands of India are one such region with a vast conservation potential vis-à-vis some highly endangered species such as tiger, threatened by the high dependence of local people on these forests. The Satpura Conservation Area (Fig. 1), protected under a cluster of four PAs viz., Melghat Tiger Reserve (1597 km²), in Maharashtra and Bori Wildlife Sanctuary (486 km²), Satpura National Park (524 km²), Pachmarhi Wildlife Sanctuary (417 km²) in Madhya Pradesh are under tremendous anthropogenic pressures due to exploitation of natural resources by more than 30,000 people (tribal and non-tribal communities) and 50,000 heads of livestock living inside as well as a much larger human and livestock population outside these PAs.

The Wildlife Institute of India, in 1990, initiated a project in the central highlands of India. The project titled "Developing area specific management guidelines for conservation of biodiversity taking into consideration the existing forestry practices and local people's needs", addresses as one of its objectives, issues
Fig. 1. Location of Melghat Tiger Reserve (MTR) and Bori Wildlife Sanctuary (BWLS) in Satpura Conservation Area.
Fig. 2. Location of villages in Melghat Tiger Reserve.
Fig. 3. Location of villages in Bori Wildlife Sanctuary.
relating to local people's forest based economies in two of the PAs viz., Melghat Tiger Reserve (MTR) and Bori Wildlife Sanctuary (BWLS); their dependence and impact on the forest and the possible mitigatory steps. This thesis pertains to the evaluation of: socio-economic status of the local people, dependence on MTR and BWLS, impact of resource-use on MTR and BWLS, and to suggest management strategies to mitigate the pressures for long term conservation of these areas.

Melghat Tiger Reserve (Fig.2) in Maharashtra and Bori Wildlife Sanctuary (Fig.3) in M.P. lie in the Satpura hills of Central India. Melghat was declared a tiger reserve in 1973. It covers an area of 1597 km² and comprises the Melghat Wildlife Sanctuary and Gugamal National Park. Bori was declared a sanctuary in 1975, and at present covers an area of 486 km².

1.3.1 History and past management practices

Not much historical information is found on this region except in the detailed account by Forsyth (1889), Russell and Lal (1975) and the various working plans of these forests. In the 16th century, a highway between upper India and the Deccan through the Satpura hills, opened the country to the immigrants, who monopolised the rich arable areas, now known as Berars. Consequently, the local inhabitants, the Gonds, were forced to retreat to the higher plateaus of central hills (the Gondwana highlands), where they practised shifting cultivation until the establishment of the British power in the region in the year 1818 (Fuchs, 1988). Thereafter they were encouraged by the British to settle down in permanent villages within the forests where they have been practising subsistence agriculture.

In due course a railway line was laid through the region and in 1861 the
Gondwana highlands were consolidated into the Central Provinces, primarily for economic reasons; these forests were capable of supplying good quality timber and black trap soil which produced cotton required by the Manchester cloth industry. The wealth of this region was recognised and one of the first steps taken by the administration of the Central Provinces was the organisation of a Forest Department in 1862, for the detailed examination and conservation of the timber bearing areas.

Before the Melghat tahsil came under British administration in 1853, the forests were being exploited by the local inhabitants, the Korkus, for trade in forest produce. Moreover, large areas in this tract were under shifting cultivation. In the subsequent years, forests of Bairagarh (1866) and Gugamal (1876) were declared as reserved. These forests were worked under Bagshaw's Working Plan (1893-1915). At the same time there were two working schemes, viz., Gugamal Reserve working scheme (1910-1915) and Tapti Reserve working scheme (1912-1915). By 1913, the indiscriminate felling by the local tribes had been brought under control. Following this the area was worked for 20 years under improvement felling (Dunbar Brander's working plan, 1915-16 to 1935-36). Subsequently, these forests were worked for 20 years under uniform system in the better quality teak forests and "Coppice-with-Reserve" (CWR) in comparatively poorer quality forests (Stein's Plan, 1935-1955); and for another 15 years up to 1970, under "Selection-cum-Improvement" (SCI) felling in better quality teak forests and CWR in relatively poorer forests (Sharma's Plan, 1956-1970). Joshi's Working Plan (1975-1985) prescribed a separate working circle for wildlife with the objectives of "maintenance of viable wildlife populations"
and "preservation of biologically important areas as national heritage".

In 1972, about 1600 km^2 of the Melghat forests were declared as a Tiger Reserve, which were later given the status of Melghat Wildlife Sanctuary in 1985. In 1987, a part of this sanctuary was declared as the Gugamal National Park. As a result of these changes, the first Management Plan for Melghat Tiger Reserve was written by Sheikh and Sawarkar, covering a period of 5 years (1973-74 to 1978-79). However, no regular long-term management plan was written thereafter until 1987-88, when the plan was written by Gogate (1988) for a 10 year period (1988-1998). The boundary of Melghat Tiger Sanctuary was proposed to be redefined in 1994, excluding 551 km^2 with 39 villages from the sanctuary to form the proposed multiple-use zone, as it was not possible to relocate the villages within the sanctuary. At the same time 104 km^2 with 3 villages were to be added to the southern part of the reserve. However, the proposal has been brought under a stay by the Nagpur High Court.

Bori forests which are the oldest reserved forests (1865) in the country, were under the ownership of a Korku chief, Bhupat Singh, before the British took over the control in 1859. These forests have enjoyed a long history of systematic management since 1897, with systematic fire protection being introduced since 1884. The first working plan (Fernandez, 1897-1908) prescribed working the forests under improvement felling, so as to overcome the impact of decades of shifting cultivation. From 1909-1919, these forests were under Brander's plan, which continued with the improvement cycle. However, it was for the first time during this period, that accurate stock mapping was done. Improvement felling cycle was
continued for another ten years, followed by Sodhi’s plan (1928-1938), which prescribed conversion to uniform system and introduced an 80-years rotation. Under this working plan, 3 working circles were constituted, viz., Bori special teak, high forest and low forest. This continued under Macdonald’s plan (1938-1947), however, with the commencement of second world war, heavy felling was undertaken. Kulkarni’s plan (1948-1963) increased the conversion period to 120 years, followed by Jangley’s plan (1965-1979) which was extended up to 1985. However, some areas, which were not fit for regeneration were worked under SCI, while mixed forests were put under improvement felling circle with 40-years cycle. In 1975, an area of 1427 km² in northern Satpuras was notified as Bori Sanctuary. In 1977, Pachmarhi Sanctuary was carved out of this to facilitate intensive management. Later in 1981 an area of 524 km² was taken from these two protected areas to form the Satpura National Park. The last working plan for Bori sanctuary for the period 1986 to 1995, written by Gangopadhyay, prescribed the continuation of conversion to uniform system and changing to CWR system from improvement felling. However, it was for the first time, that wildlife and its conservation was taken into consideration in a working plan. Consequently, care was taken to retain snags and fruit bearing trees. However all working in the area was stopped in 1991.

1.3.2 Geographic location

Melghat Tiger Reserve in Maharashtra and Bori Wildlife Sanctuary in Madhya Pradesh are situated in the Satpura hills within the ‘Central Highlands’ province of the Deccan Biogeographic Zone of Peninsular India (Rodgers and Panwar, 1988). The Satpuras are a range of hills which run from east to west along
the boundary between Madhya Pradesh and Maharashtra. The most easterly branch of this range is called the Mykal, the centre as the Mahadeo and the western the Satpuras.

Melghat Tiger Reserve (1597 km²) in the southern Satpuras, is located in Dharni and Chikhalda Tahsils of Amravati district of Maharashtra (21° 15' N to 21° 45' N latitude and 76° 57' E to 77° 30' E longitude) about 50 km from Parathwada. The Tiger Reserve comprises the Melghat Wildlife Sanctuary (1315.65 km²) and the Gugamal National Park (361.28 km²). It is bounded on three sides by the forests of the East, West and South Melghat Divisions and by the Tapti river in the north and Betul district of Madhya Pradesh in the north and north-east.

Bori wildlife sanctuary (486 km²) is located in the south-eastern portion of Hoshangabad district of Madhya Pradesh state approximately 50 km from Itarsi. It falls in the Hoshangabad Forest Division, south of the Narmada river (22° 19' N to 22° 30' N latitude and 77° 56' E to 78° 20' E longitude). The sanctuary is situated in the midst of a large forest tract with the Satpura National Park in the north, Pachmarhi wildlife sanctuary, and forests of Hoshangabad and Chindwara divisions in the east and south-east, and forests of Betul division in the south, extending to the forests of Melghat and western Satpuras.

1.3.3 Physiographic characteristics and climate

Melghat Tiger Reserve, consists of a succession of hills and valleys, marked by abrupt variations in altitude, aspect and gradient. It lies to the north of the Gawilgarh ridge, with numerous spurs branching off from this ridge within the reserve. These ridges have flat tops known as 'ballas' and abrupt scarped sides.
forming narrow valleys below known as 'khoras'. The southern part of the reserve is more rugged compared to the rest of the region. The area is drained by a number of streams in addition to 5 major rivers viz., Khandu, Khapra, Sipna, Garga and Dolar, which form the tributaries of Tapti river. The drainage is towards north and north-west of the reserve. The highest point of Melghat region is at Bairat at 1178 m above MSL. The area of the reserve gradually descends towards the north-west about 950 m above MSL in the east and to about 381 m above MSL in the west, near the Tapti river.

The formation of Melghat region is the Deccan trap, with lava flows found in a horizontal position. The underlying rock is basalt, in several forms, chiefly due to difference in the successive lava flows. The most common form is a hard dark coloured rock compact or fine grained. It occurs in thick layers and its outcrops give rise to scarps on hill sides. At times it is also found in river and stream beds, in the form of columns. The second form occurs in the lower hills; it is grey vesicular of amygdaloidal basalt, with crystals of quartz and other minerals, lining its cavities. The third is the basalt tuff, which is found in thin layers and is a soft grey, fine grained rock. The soil although fertile is generally stony as it is derived from the weathering and disintegration of underlying rock. Its depth and drainage vary considerably, from greater depth on lower slopes and valleys to very shallow on the steep upper slopes. There are three major soil types found in the region; 'Bouldery soil', which is most common throughout the reserve, is shallow and found on slopes, and is excessively drained resulting in loss of moisture during dry season. 'Clayey soil' which is very fertile, is found in low lying areas, however, it does not drain well.
'Lateritic loam' which is very shallow and dry is found on hill tops and plateaus.

Bori wildlife Sanctuary lies in undulating terrain, with the general slope being from East to West. While the north and north-eastern part is more rugged it more or less flattens out towards the west. The altitude in the sanctuary ranges from 305 m to 1045 m above MSL, with the highest point at Belkandhar peak, near Rorighat. The entire area is crisscrossed by perennial and annual streams and rivers. It also forms the catchment of the Narmada river, with tributaries like Malini, Koti, Bori, Sonbhadra and Tawa.

Rocks of Bori region belong to upper and lower Gondwana series. In the Bori area these consist of sandstones and abundant Deccan trap intrusions besides sandy shales. Phyllite and schists, closely associated with limestone, are widely scattered. Extensive sandstones, with locally present clay represent the Damuda series. While Bagra and Denwa conglomerates occur in the middle reaches, Deccan trap with numerous dykes and sills is the major rock type in the lower reaches occurring in interspersion with alluvium along river banks. Soils are deep along the rivers, fairly deep and well drained on lower slopes and shallow on higher steep slopes.

In Melghat, the average temperature varies from a maximum of 43° C in summer to a minimum of 12° C in winter, with the higher hills and plateaus having a pleasant climate throughout the year. However while the valleys get very cold during the winter months (December to January), during summer, there is usually a marked difference in the day and night temperatures. Although the rainfall occurs during the rainy season from the middle of June to mid-October, occasional showers are experienced during December, January and March, with the annual rainfall
varying from 1000 to 2250 mm. However, the rainfall is not well distributed and wide variations occur with change in altitude and topography. Moreover, except for 3 to 4 months of monsoons, the rest of the year is dry. Although, dew formation takes place, especially during winter months, its contribution to available moisture is insignificant. Frost though not common in the area is not unknown and generally occurs in the valleys.

The hottest months in Bori are from May to June with temperatures varying from a maximum average of 40° C in summer to minimum average of 22° C in winter. January and February are the coldest months with a minimum average temperature of 8° C. While the pre-monsoon showers usually start by end of May, the heaviest rain comes in July and August, with occasional showers in winter. The annual rainfall varies between 1200 to 3200 mm, with relative humidity highest during July and August and lowest in April and May. The Bori valley, however, experiences heavy dew until March and therefore these forests remain green for a longer period than other Teak forests in Madhya Pradesh.

1.3.4 Flora and fauna

While the forests of Melghat and Bori are dominated by teak, Melghat typically represents the Central Indian dry deciduous forest and Bori represents the South Indian moist deciduous forest. These forests are one of the oldest reserved forests in the country.

Forests of Melghat belong to dry deciduous forest type of Central India, subgroup 5A of group 5 as per the classification given by Champion and Seth (1968). While teak is the dominant species (over 50%), depending upon altitude, gradient
and other physiographic features, its associates may differ (Dhore and Joshi, 1988). While the most common teak associates in almost all localities are Lagerstroemia parviflora, Lannea coromandelica, Emblica officinalis, Terminalia tomentosa, Anogeissus latifolia and Ougenia oojeinensis; at lower elevations its associates are Boswellia serrata, Wrightia tinctora, Acacia chundra, Cassia fistula, Miliusa tomentosa, Bauhinia racemosa and Butea monosperma; and at higher elevations and in moist localities its associates are, Mitragyna parviflora, Adina cordifolia, Schleichera oleosa, Albissia procera, Casearea elliptica. The "Flora of Melghat Tiger Reserve" (Dhore and Joshi, 1988) documents 650 naturalised plant species, out of which 90 are tree species, 66 shrubs, 316 herbs, 56 climbers, 23 sedges and 99 grass species. In addition to these there are 72 cultivated species. The Research wing of the Tiger Reserve has also set up about 60 permanent vegetation plots to monitor floristic changes in response to rigid protection and habitat manipulation practices. Plantations were raised in the area under different plantation schemes and development activities.

While teak (Tectona grandis) is the dominant species, the major forest type in Bori is 3B, South Indian Moist Deciduous Forest (Champion and Seth, 1968), consisting of six different communities, viz., moist miscellaneous forest at higher altitudes and in sheltered depressions, characterised by Mangifera indica, Syzygium cuminii, Terminalia chebula and Ficus species; mixed forest on gentler slopes along foothills, with Terminalia tomentosa and Anogeissus latifolia; low quality mixed forest in areas with sandstone as the underlying rock, characterised by Chloroxylon swietenia, Pterocarpus marsupium and Lannea grandis; good quality
teak forest widely occurring in areas with soils derived from the trap, having a high percentage of teak with bamboo as understorey; low quality teak forest occurs in areas with drier trap soils and have an undergrowth of Lantana and Petalidium; and alluvial teak along river banks, characterised by really tall and well formed stems. Another category is that of Shorea robusta mixed forest which grows on the adjoining Pachmarhi plateau and extend down its westerly slopes to integrate with the teak growing in Bori valley, however it does not extend into the Bori forest. A floristic survey conducted in the area by State Forest Research Institute (SFRI), Jabalpur, identified as many as 1381 species belonging to different categories.

The forests of Central Indian highlands have been historically renowned for tiger, gaur and sambar, the latter two reaching their best form in this part of the country (Forsyth, 1889). Both Melghat Tiger Reserve and Bori Wildlife Sanctuary are rich in wild fauna, major species being the tiger, leopard, wild dog, hyena, jackal, sloth bear, gaur, sambar, barking deer, spotted deer, chausingha, nilgai, wild boar, along with more than 250 bird species, 21 species of reptiles, 24 species of fishes and 4 amphibians. Although in Melghat animals like ratel, flying squirrel, python, pangolin and mouse deer are present they are not common. Regular tiger census and block and water hole counts are carried out annually in Melghat Tiger Reserve for monitoring densities of wild animals. Bori forests are inhabited by 14 endangered species of mammals, birds and reptiles. The flying squirrel (Petaurista petaurista), the Indian giant squirrel (Ratufa indica) and the mouse deer (Tragulus meminna) are one of the most sensitive to habitat changes (Sawarkar and Panwar,
Both Melghat and Bori have environmental and derived values, in terms of soil conservation and maintaining water regimes (Sawarkar and Panwar, 1987), as well as the floral and faunal diversity which provides sustenance and livelihood to the people who depend on them in addition to fulfilling aesthetic, cultural, educational and recreational requirements of the people from all over the country. The area is rich in flora and fauna in addition to being a valuable habitat of some of the country's endangered species. Thus, these forests form a rich biological reserve of genetic resources. Along with these, there are people depending on these forests, whose increasing population is aggravating the pressures on the reserve in terms of their domestic requirements of food, fuelwood, fodder and timber. Thus, a closer look and change in attitudes and policies is required if we are to protect these forests and their values for posterity.

1.3.6 Communities living within the protected areas

Both Melghat and Bori regions are mostly inhabited by tribes (80%), who with the establishment of British administration in the region in the 19th century, were encouraged to give up shifting cultivation and settle down. Korku is the predominant tribe. Melghat Tiger Reserve has Gond, Nehal, Thatia, Burad and Rathiya tribes apart from the Korku tribe. Bori Wildlife Sanctuary however, has only Korku, Gond and Thatia tribes. The remaining 20% of the population in the two PAs is non-tribal, i.e., scheduled castes and other backward classes. Most of them belong to agropastoralist communities (15%), viz., Gawli. The remaining 5%
belong to scheduled castes and other backward classes, majority of which are the Balai, Vanjari and Lohar. Bori Wildlife Sanctuary however, has only Gawli caste in addition to the tribal community.

Various tribes and castes co-existing in MTR and BWLS displayed a basically patriarchal structure. Tribes and non-tribes mostly lived in nuclear family units, that is to say, husband and wife, along with their unmarried children. Within the community, in general, and the family in particular, the division of labour was traditional to a certain extent i.e., women were necessarily responsible for performing all the household chores like cooking, rearing and nurturing the children, etc. Festivals like Holi and Diwali also were occasions when the young and the old as well as the men and the women joined in drinking mahua (country liquor) and dancing and generally having a good time. Seeing them on such occasions it was difficult to visualise how a people so completely dependent on the forest for sustenance and living within limited means could exhibit such enthusiasm. It was probably in this manner that enthusiasm for life kept them smiling and prevented them from giving up their struggle for survival even in the worst of times. The solidarity of the tribal community is perhaps expressed through their dancing and drinking as has been observed by other anthropologists / sociologists like Durkheim (1976) and Radcliffe-Brown (1979).

1.3.7 Classification of community groups

In earlier anthropological studies "methods of securing of food" have been used for the classification of societies into broad categories, e.g., food gatherers, hunters and fishers; pastoralists; agriculturists; and artisans (Firth 1956).
purpose of this study however, different communities living in MTR and BWLS have been classified into three major categories depending on their social group and lifestyle. While 'social group' may be defined as tribal, backward or scheduled caste and others; 'lifestyle' may be defined as the way of living and earning livelihood, values, practices and activities (Park and Park, 1991). For this study, the activities and practices of each social group were taken into consideration to define 'lifestyle'.

i) Scheduled tribes (traditional labourers)

These people are culturally and ethnically distinct, but over the years have adopted the ways of the mainstream contemporary urban Indian society through the process of acculturation. All the major tribal communities studied, i.e., Korku, Gond, Nehal, Burad (Basor) and Rathiya have been grouped in this category. While Korku, Gond, Nehal (considered an offshoot of the Korku tribe) had been original hunters and shifting cultivators before the British took over these forests. The Burad / Basor tribe were original bamboo basket makers. The British encouraged the tribal communities living in these forests to settle down in villages so that they could provide labour for the timber extraction activities. Consequently, since the beginning of forestry operations in this region, these tribes have been involved in logging and related forestry activities as labourers. Earnings from employment in forestry sector has formed a major source of income for these people. The Rathiya tribe however, have only recently settled in the Melghat region. They were originally from Madhya Pradesh and had come to Melghat as labourers. Most of these families are landless however, they grow cash crops on rented land. Agriculture is primarily for subsistence although some landholders especially in
MTR are engaged in a limited amount of cash cropping.

ii) Scheduled and backward classes (assorted professions)

The other major community group is a large mix of various scheduled and backward classes, who are practising agriculture in addition to being employed in jobs or being engaged in commercial activities. Balais who form majority of this group were originally weavers (Bunkars). Balai, Vanjaris, Lohars and Gaolan were grouped under this category, as these people were generally practising agriculture, but have also taken up various jobs and professions over the years due to facilities and concessions provided to them.

iii) Agropastoralists

The third major community group comprises of the caste of cowherds, milkmen and cattle-breeders, i.e., Gawli. Their lifestyle is agropastoralist in nature. Originally the agropastoralists did not belong to these areas, but over the years have migrated into these forests from adjoining regions due to increasing population pressure and depleting resources.

1.3.8 Socio-economic scenario

There are 61 revenue villages within the Melghat Tiger Reserve, with 25196 people and 26499 livestock heads and another 20 villages outside the reserve within a distance of 5-10 km of the boundary. In addition to the people living in and around the Tiger Reserve, there are over 3000 migratory cattle from Gujarat and Madhya Pradesh which passes through it annually. Most of the people living in and around Melghat Tiger Reserve are dependent on it not only for subsistence but also as a source of income from forestry works, which are continuing in adjoining reserved
forests and from collection of NTFP and commercial head-loading of fuelwood.

Bori Wildlife Sanctuary has 17 villages within it in addition to 4 villages within a distance of 10 km of the southern boundary. There are about 4000 people and 7000 heads of livestock living in the forest villages situated within the sanctuary.

With the stoppage of forestry operations within the Tiger Reserve the major source of income for the people has been lost. However, people are still able to find alternative employment in and around Melghat, primarily because Melghat region is fairly well connected by roads with the adjoining townships of Parathwada and Dharni. Moreover, being revenue villages they benefit from the employment generation and welfare schemes of different government agencies working in the region, in addition to various forestry activities (other than logging) being carried out by the forest and wildlife departments within the Tiger Reserve. Still, quite a few of the people, especially landless tribes migrate to adjoining areas for major part of the year in search of labour employment and return to their homes/villages only during festivals and monsoons when there is a demand for labour in the agricultural fields. Despite the dependence on forests and subsistence agriculture, labour employment forms the major source of income for most of the people, except the agropastoralists, whose main livelihood is derived from dairy activities. The non-availability of employment opportunities within the PA and the consequent seasonal migration of the landless and unemployed, especially those belonging to the tribal community, to nearby townships leads to hardships for the entire family as at times even the children have to be taken along. This not only leads to frequent
displacement from the environment they are used to, it also makes it difficult for the children to take up regular schooling or benefit from other welfare activities. Similar is the case of the agropastoralists, majority of whom migrate with their cattle to areas outside the reserve in the dry season in search of agricultural fields or pastures for grazing. However, on the whole, because of its location and being under the purview of tribal welfare department the area is much better off than Bori Wildlife Sanctuary in terms of schools, dispensaries, animal husbandry activities and public distribution systems.

Bori Sanctuary on the other hand is quite remote because of which the people living in these villages do not have an easy access to the nearby towns and markets. Consequently, in the absence of alternative sources of employment, the people completely depend on whatever little is produced in their fields and whatever timber and non-timber forest produce they can get from the forest, both for domestic consumption and for earning some money. However, the tribals periodically go to adjoining townships and agricultural areas for short periods, especially during harvest season of cash crops as they are able to secure temporary employment in the fields for that period. As far as the role of government agencies in the villages in Bori is concerned, except for few residential schools, local dispensaries and annual visits by the animal husbandry staff in the sanctuary, not much can be said. Moreover, the means of public transport and communication are non-existent, leaving the villagers completely stranded during the monsoons especially due to the flooding of many of the streams which drain the area. This results in great deal of hardship to the people especially in times of illness and food shortage.
The intervention of all these agencies over the years and the change in the status of these forests into a Tiger Reserve and Wildlife Sanctuary has resulted in significantly changing the lifestyles of the resident communities. In Melghat Tiger Reserve, the government agencies have provided civic and medical facilities for the local people, which has helped in fighting illness and infant mortality. Moreover, these agencies have also helped by giving loans and technical inputs to these people. This has resulted in raising people's aspirations and increasing human and livestock populations.

The closing down of logging operations in Bori Wildlife Sanctuary, has however resulted in loss of livelihood for majority of the indigenous communities; especially the traditional labourers (tribals), who have been involved in these operations since the British times. This has resulted in increasing their dependence on the forest and agriculture. At the same time, better protection of forests and wildlife and restrictions on hunting or killing and commercial exploitation of forest produce, for more than two decades, has helped in restoring the forests and in increasing the numbers of wild animals. This has resulted in conflicts between people and wildlife in the form of higher incidence of crop raiding by wild ungulates and also cattle lifting and mauling by wild animals, which are probably under stress due to increased human activity. This leads to growing antagonism towards the forest officials and wildlife, resulting in sporadic killing of wild animals as a form of retaliation.

In addition to all this, there are the agropastoralists, who have gained uncontrolled access to the forest for grazing their large herds of cattle. Their
economy which revolves around dairy-farming and dairy products, is heavily
dependent on the forests. It is likely that these people would irreversibly damage
the ecosystem.

In view of the above observations it appears that people's dependence on
forest resources and the consequent pressures on the forest have been increasing
over the years due to increasing population and non-availability of alternatives
(income sources like forestry operations and other remunerative employment
opportunities). This makes it necessary to look at the existing situation in greater
detail and to examine the underlying factors responsible for the degradation of
forest resources.

1.3.9 Land-use pattern

Agriculture in the region has been primarily for subsistence however, it also
helps the people to supplement their incomes. Moreover, most of the landholders,
except those with large landholding, depend on the monsoons for irrigation. Thus
most of the landholders practice dryland agriculture. Over the years population
growth and the consequent increase in family size has resulted in fragmentation of
agricultural fields leading to small unviable parcels of landholding.

1.4 Rationale for undertaking the present study

With increasing human and livestock populations and people's aspirations,
it is believed that both Melghat and Bori will come under increasing pressure due
to increasing resource demand. Although various socio-economic aspects of people's
dependence on forests have been studied in several PAs, such a study had not been
carried out in either of the above mentioned PAs. Thus there was a need for a better
understanding of socio-economic status of tribes and non-tribes and their
dependence on the forest in general and MTR and BWLS in particular. Also there
was a need to explore the web of both tribal and non-tribal life as the intervention
of market economy and population increase have led to change in the basis of
subsistence economy.

1.5 Objectives and hypotheses

The study was undertaken with the following objectives:

1. To assess socio-economic status of the people and their dependence on the
   forest.

2. To study changes in family organisation in view of depleting forest
   resources.

3. To quantify impact of resource-use.

4. To examine park-people conflicts and their implications for the
   management.

Taking into consideration the above objectives, the following hypotheses were
formulated for this study:

(1) Family structure has undergone change due to depleting forest
    resources.

(2) The traditional forest based communities in Melghat and Bori have
    sustainable lifestyles.

(3) The agropastoralists in the two protected areas are damaging the
    ecosystem because of their unsustainable activities.

(4) The changing lifestyles of these forest based communities has resulted in
conflicts between people and the wildlife.

1.6 Past research on the study areas

Keeping in mind the above stated objectives and hypotheses, a review of research undertaken by others in the two study areas is necessary. Apart from this a review of literature pertaining to the topic under study has also been done. Although no long-term ecological studies have been carried out in either of the protected areas, they have been a source of interest to biologists for a long time (Hora, 1937a). In his papers on geographical distribution of Indian fresh water and Himalayan fishes, Hora (1937a and b) has tried to explain the reason behind the similarity in the species found in these forests and those of the east Himalayan, Indo-Chinese and Indo-Malayan regions. In Bori forests a floristic survey was conducted by SFRI, Jabalpur. Apart from this Sawarkar and Panwar (1987) wrote about the need for an integrated strategy of land-use for the Satpura conservation area. Also, Sawarkar and Uniyal (unpublished data) wrote about the diversity of the Satpura hills.

Melghat comparatively has had more attention focused on it, probably because, it was declared a Tiger Reserve in 1972. Therefore, research especially on its flora has been carried out in great detail (Patel, 1982 and Dhore and Joshi, 1988). In addition to this, several papers have been written by the staff of Melghat Tiger Reserve. A study on aspects of predation on domestic livestock by tigers in Melghat Tiger Reserve was carried out by Sawarkar (1979) during 1973 to 1976, followed by Wankhade and Mahajan (1992) on the same aspect. Ladkat and Chopkar (1992) wrote about the people in Melghat, their ethnic identities and
dependence on forest. Gogate (1992) wrote about the need to regulate grazing by domestic livestock in the interest of wildlife management goals. A Grazing Settlement Report which was submitted before Gogate's management plan, while calculating the available area for grazing and the carrying capacity of the reserve did not take into consideration either the wild herbivore populations or the inaccessibility of certain areas and terrains, both to livestock and wildlife.

As far as tribal or people related studies are concerned, several anthropometric studies have been conducted by Gorlitzer, V. along with Koppers, W. and Fuchs, S. in 1939 on the Korkus of Melghat. The findings of this study were analysed and published by Weninger (1952). Several other authors e.g., Chattopadhyay (1941), Basu (1970) have also carried out studies on Korkus of Melghat region. Fuchs (1972) has done an anthropometric analysis of both Korkus and Nahals of Melghat. In addition to these studies, short surveys in Melghat villages have also been carried out by colleges and universities in the Vidharba region, especially after the starvation deaths in 1984. However, as far as family structure and organisation are concerned no studies have been carried out on these parameters in either Melghat or Bori. Therefore, no empirical data is available on effect of change in forest on family life of the local inhabitants for the two study areas.

1.7 Review of literature

The impact of anthropogenic activities on the environment in general and forests in particular has received great deal of attention all over the world resulting in a large amount of literature on the subject. Ponting (1990) while lamenting the
disappearing forests and resulting desertification of formerly productive natural ecosystems, holds responsible the inappropriate anthropocentric activities for their conversion into less productive desert like ecosystems (e.g. Lebanon and Syria). A similar view is held by several others who talk of this ongoing process throughout the world, especially in Africa, Asia and South America (Erickholm 1975; Upreti 1987; and Pearce et al. 1990). Large land settlement projects in Asian, African and Latin American countries, have been considered by Thapa and Weber (1988 and 1990) as a major cause for deforestation. Moreover, they have blamed European colonization of tropical Asian countries, leading to exploitation of their forests by the Europeans for their requirements; the expansion of agricultural land through land grabbing or encroachments by local people; and shifting cultivation in its present form. Lal (1989) too has blamed diversion of forest land to other uses, for the destruction of forests in India. Bajracharya (1983) and Blaikie (1985) have identified increasing landlessness and marginalisation of farmers as the factors which have compelled people to encroach on forest lands along with intensifying land-use.

McNeely (1990) argued that globalisation has resulted in far reaching impacts of any policy or action. He further stated that natural resource depletion in developing and underdeveloped countries is more of a consequence of foreign demand than local consumption. His argument is supported by Upreti (1994) who blames American and European transnational corporations operating in Third World countries for massive destruction of forests and other natural resources. Myres (1981), Uhlig (1984) and Thapa and Weber (1990) too have blamed the
rapidly rising demand for timber in developed countries for the alarming trends of
destruction of tropical moist forests in South and South-east Asia. Moreover
growing population, urbanisation, industrialisation and illicit felling at large scale
in developing countries, have also been considered as factors leading to
deforestation.

Several reports and papers (GOI, 1976 and 1982 and Haimendorf, 1982) have
drawn attention to the extent of forests being affected annually by shifting
cultivation and the seriousness of the situation in various parts of the country.
Fernandes et al. (1988) are of the opinion that destructive effect of shifting
cultivation is a recent phenomenon. They argue that this is a result of the
deterioration of the socio-economic situation of the forest dwellers as result of
deforestation.

Both ecologists and social scientists (e.g., Dasmann et al., 1973 and Myres,
1981) have suggested that economic development has a strong impact on
conservation activities. This view is supported by Machlis and Tichnell (1987), who
have explored the linkages between threats to environmental conservation and
stages of economic development. All these authors agree that protected areas in
particular, are vulnerable to significant ecological changes resulting from
industrialisation, intensified agriculture, forestry, mining and other economic
development projects in and adjacent to these parks. Hart (1966), Forester (1973),
Nelson (1978) and Blower (1984) follow a similar line of argument. According to
their studies, socio-economic characteristics of the region determine the type and
intensity of threats to the parks. Yet another set of authors e.g., Pearce (1975),
Clark and Munn (1986), Perrings (1987) and McNeely (1988), are of the opinion that environmental degradation is the outcome of imbalances in costs and benefits of conservation and lack of coordination between the various agencies / institutions responsible for policy-making and implementation. Rodgers (unpublished data) has discussed in detail the negative effects of land-use policies and management strategies on biodiversity. According to him, silvicultural and management systems in India have been guided by the principle of improving the economic value of the forests by removing less valuable species. This has resulted in loss of biodiversity. Forest exploitation by local people for fuel, fodder, grazing and NTFPs has also been considered as another factor responsible for this. This view is supported by Dixon and Sherman (1990). According to them, nearby residents who depend on the resources of a PA pose a greater threat to its conservation, than development projects. They have suggested that effective protection can be achieved if, the economic forces that motivate these resource-use patterns are accounted for.

While drawing attention to the difficulty in measuring the true economic value of PAs, Dixon and Sherman (1990) have given a comprehensive overview of the rapidly changing field of economic valuation of natural resources. Pant (1977) also argues that conceptual difficulties exist in quantifying various intangible services of the Forestry Sector and including them in the GNP computations. The contribution of forest resources to India's NNP and GDP have been discussed by Sarin and Khanna (1981) and Gupta and Guleria (1992). The latter have also discussed the reasons for the relatively low returns from India's forests.

Durbin and Ralambo (1994) talk about the major lacunae in planning a PA
i.e., overlooking human needs and aspirations of the local population and the lack of and / or inadequacy of mechanism to deal with ensuing conflicts. They also consider the relations with local people of paramount importance to PA management. This viewpoint is supported by several others who have given examples of conflicts between local communities and PAs throughout the world wherever these areas have been created without addressing local people's social, political and economic needs and aspirations and long-term viability of these (Lusigi, 1981; Abel and Blaikie, 1986; Carew-Ried, 1990 and Talbot and Olindo, 1990). Hannah (1992) argues that in developing countries these problems are further magnified due to rapidly growing population putting increasing pressures on fragile ecosystems on one hand, while on the other, lack of resources with the governments to invest in these PAs.

At a macro-level, McNeely (1990) has talked about the importance of economics in achieving the objectives of conservation. He suggests that, strategies for conservation should use economics to direct government policies for promoting sustainable development. Upreti (1994) emphasises the need for designing government policies which would minimise deforestation, desertification and destruction of habitats and species etc. This, according to him can be achieved by integrating resource accounts in national accounting to represent the real costs of development in economic decision-making. Barbier (1987) and Repetto (1992) also support this view as it would give a more accurate picture of the effect of economic policies on ecological systems. These opinions are in contrast to traditional economic analysis which was mostly developed during the Great Depression and was
therefore, more concerned with direct economic issues rather than with economic valuation of natural resource stocks.

At the micro-level, the importance of local people's participation and project design have been emphasised by Kiss (1990), Brechin et al. (1991) and Wells et al. (1992) for achieving community based management. Pinkerton (1987) too has argued that conservation strategies are more successful when they are worked out in a true co-management framework. Consequently, they are viewed as 'more legitimate' by the local people. Schelhas (1991) has rightly emphasised the need for understanding the external situations affecting a PA. He argues that the management of a PA should be tailored to effectively address the adjacent land and local people's issues. Similar line of argument is taken by Rodgers (1991), when he states that the park management cannot be indifferent to the resource needs and perceptions of local people. He too emphasises the need to understand both the natural resource and the neighbouring people. Therefore, a joint or participatory management of the PA is considered a better option.

This view is supported by the findings of the study on Shoolpaneshwar Sanctuary by Sarabhai, et al. (1991). They have talked of the necessity to develop the concept of Joint Sanctuary Management (JSM) on the lines of Joint Forest Management (JFM). They feel that such an approach will not only resident communities to continue living within the sanctuary, but also involve them in planning and protection of the PA. At the same time this can be made into a paying proposition for the local communities by providing them with incentives. Tewari (1991) too has argued for strengthening the PA-people relationship by
involving the tribes in generation and protection of forests through sharing of usufruct and by providing gainful employment to them. Thus the forestry sector must act as a nodal agency for alleviating poverty.

The importance of tackling rural poverty of local communities as an important component of conservation planning is emphasised by IUCN's World Conservation Strategy (1980) and Brechin et al. (1991). Similar views are held by Bunting and Sherpa (1991). They have cited examples from Annapurna Conservation Area Project which links conservation with quality of life issues and basic needs of the people living in the mountainous region of Nepal. Schelhas (1991) and Lehmkuhl et al. (1988) while discussing external issues facing the PA management talk of allowing the local people controlled access to some of the PA resources to meet the people's critical resource needs. They further feel that this would also help in improving relations between PA management and local communities. McNeely (1990) recommends sharing of information by all institutions involved and evolving a consensus between stakeholders on development objectives as a means of achieving conservation objectives.

Upreti (1994) has emphasised the need for co-operation, equity and understanding of ecological and social sustainability for achieving environmental conservation. Lusigi (1981), Barbier (1987) and Durbin and Ralambo (1994) have recognised the importance of cultural and ecological factors for sustainable development and benefits in terms of financial gain, improved social services, and energy benefits. Saharia (1984), de Blohm (1992) and Upreti (1994) lay emphasis on the socio-economic context and ethical aspects of the neighbouring people and the
conservation of natural resources. Simon (1989) has also emphasised the influence of political factors on uneven development and underdevelopment.

Brechin et al. (1991) and Raval (1991) bring out the negative side of establishing a PA viz., relocation of people and denial of access to the PA resources. This they argue, not only affects the attitudes of the local people towards the PA but also results in adverse social impacts to residents. The former argue that the local poor communities are most heavily affected by exclusionary policies of NP and PAs, as their daily subsistence and domestic commodity production needs dependent on park resources are curtailed. Therefore, it is necessary to take into consideration the social and economic structure of the region when planning a PA or displacing the resident communities. This view is supported by others (Guppy, 1980; Goodland and Irwin, 1975; and Davis, 1977) who argue that disregard for tribal people and their land rights is not only one of the greatest injustices in most third world countries but also a fundamental issue with a bearing on some of the current problems of colonisation of tribal lands and exploitation of forests for foreign exchange by a powerful minority.

Nepal and Weber (1994) too discuss the conflicts arising out of the establishment of Royal Chitwan National Park and imposition of regulations restricting the use of its resources by local people. Such restrictions which curtail traditional rights of people to an area lead to illegal activities like poaching, logging and hunting which are justified by them on the ground of threat by wild animals to their lives, livestock and crops (Milton and Binney, 1980; Mishra, 1982; Lehmkuhl et al. 1988, Nepal and Weber, 1993). Saharia (1984) and Schelhas (1991) also talk
of the conflicts between local societies and the PAs due to crop depredation by large unguulates and man-eating and cattle lifting by predators like tiger and panther. Shelton (1983) has discussed the PA-people relationships in Kenya's Amboseli NP. He admits that protection given to a PA and its wildlife may result in direct hardships to the local people. While at the same time, the people might want to continue exercising their traditional rights on these forests. He also talks of benefits like recovery of plant cover leading to lessened flooding and provision of employment opportunities in the park, as a result of protection, in addition to increase in wildlife populations. Brower and Carol (1987) strongly feel that an understanding of the causes of conflicts among the users of the natural resources is imperative if environmental degradation is to be curbed. Moreover, mechanisms to resolve user conflicts and balancing competing interests is considered essential for developing special area management.

Nepal and Weber, (1993) and Sharma and Shaw, (1993) have discussed the dependence of local people on the resources of PAs for most of their necessities like thatch, timber, firewood, leafy fodder and supplementary grazing by livestock. Thapa and Weber (1990) have on the other hand, discussed access to opportunities like non-farm employment, marketing support, agricultural extension including veterinary services as means of reducing pressure on and destruction of forests. Guppy (1980) has suggested reducing or diverting demand to products with alternative sources. Eidswik (1980) also has discussed the pressures on natural resources and has given suggestions for mitigating the resulting conflicts between man and forests. He argues that conservation and development can be achieved by
increasing financial support to PAs.

Singh (1981) has discussed the factors which are responsible for encroachments on forest lands. Moreover, he emphasizes that forests near habitations are subjected to indiscriminate grazing, lopping, over-felling, fires, etc., resulting in depletion of growing stock.

Shelton (1983) emphasises the need for setting up areas which allow controlled exploitation of some resources. He has rightly stated the difficulty faced in justifying the existence of PAs in developing countries vis-a-vis the economic needs of the people. This is because the benefits from PAs are not only inconspicuous but are available only in the long run. Brechin et al. (1991) too have critically viewed the concept of PA in developing countries, as "locking away precious resources", while the majority suffers under poverty and starvation. They have also discussed examples of 'ecodevelopment' in various protected areas where benefits like grasses, fruits and employment opportunities are provided to the local people.

Over the years the buffer zone concept has been evolved as an area of controlled and sustainable land-use separating a PA from direct biotic pressures and at the same time providing benefits to local rural communities (MacKinnon et al., 1986; Orsdol, 1987; Ishwaran and Erdeleu, 1990). However, more recently buffer zones have been considered as areas with restrictions on resource-use or where special development measures are undertaken for enhancing their conservation value (Sayer, 1991 in Wells and Brandon, 1993). The applicability of buffer zone concept, for reducing park-people conflicts in Royal Chitwan National
Park, has been discussed by Nepal and Weber (1994).

Out of the various resources for which local communities depend on the PAs, fuelwood extraction, its effects and consumption patterns seem to have got a lot of attention, especially in India. According to Fernandes et al. (1988), fuelwood which is a major cooking and heating medium in the entire rural sector as well as in a large part of the urban areas is one of the major causes of deforestation. Lanly (1982) too considers tree cutting for fuelwood as the most important cause of destruction of forests in developing countries. Moreover, he states that almost all rural households in developing countries use fuelwood for cooking their food and heating their houses. Therefore, increase in population and deteriorating economic conditions causes increase in fuelwood consumption.

Exploitation of forests for fuelwood in developing countries of Africa and Asia, is considered by several authors, as a major cause of accelerating the degradation of forests leading to land degradation in the watersheds (Osemeobo, 1988; Bowonder et al., 1987; Thapa and Weber, 1990; and National Environment Secretariat cited as NES, 1992). Purohit and Trivedi (1991), have also blamed fuelwood consumption for reckless exploitation of natural resources and land degradation. Maikhuri's (1991) study in North-east India has blamed the use of fuelwood as a primary energy source, for causing severe deforestation in the region. Thapa and Weber (1994) argue that this pattern has in turn affected the supplies of fuelwood, fodder and fertilizer for the farm-household economies. According to a Food and Agriculture Organisation Report (cited as FAO, 1984), 90% of all energy consumed was from wood out of which 65% was for domestic purposes. Moreover, upto 99% of
the fuelwood consumed was harvested from indigenous forests and bush land. It was found that harvesting was heavy in areas near major settlements, urban centres and along some roads where charcoaling occurs.

This finding is supported by Fernandes et al. (1988), who have argued that, while it is the forest dwellers who are often accused of over-exploiting the forests, all the firewood collected by them is not for local consumption, but for meeting the fuel requirements of the urban consumer. They consider poverty as an important factor which forces the forest dwellers to depend on fuelwood sale for their survival. This view is also supported by Thapa and Weber (1991) and Adhikari (1988) who consider fuelwood demand by urban households as an important factor; landless and marginal farmers resort to fuelwood collection from forests for selling in market centres as it provides them with additional income for meeting their subsistence needs. Bowander et al. (1987) and Sharma (1987) have also stated that in Nepal and India where majority stays in rural areas around urban centres, fuelwood collection and sale can form a lucrative enterprise for the villagers.

While on one hand Adhikari (1988) attributes the use of fuelwood as a major source of energy in developing countries to free and easy access to forests and to the simple technology of wood-fuel use. On the other, Openshaw (1980), Wallace (1981), Eckholm et al. (1984) and Blaikie (1985) consider large scale consumption of fuelwood as a factor of poverty. They argue that in most of the Asian countries a large percentage of population is poor and subsists on marginal agriculture. Consequently they do not have the resources to obtain alternative sources of energy and are therefore forced to cut trees. Singh's (1981) study also revealed that for
those living at subsistence level there was no viable alternative to fuelwood. Studies by Agricultural Projects Services Centre (cited as APROSC, 1983) and Sharma (1987) further support this. According to these studies, in developing countries most of the poor and a substantial proportion of the middle and upper-middle urban households, depend on fuelwood to fulfill their energy requirement as they cannot afford conventional fuels.

Both Kaul and Gurumurti (1981) and Singh (1981) while reviewing pattern of energy-use in rural India have discussed the feasibility of social forestry, commercial fuelwood farming, and community forestry schemes for establishing village fuelwood forests. Moreover, Singh (1981) has also emphasised the need for a suitable energy policy. Smiet (1990) in his study on fuelwood in Java has stated that agro-forestry based fuelwood production can successfully meet the fuelwood demands of millions of households; According to his study, the main sources of fuelwood in Java are forested land, tree crop estates and private land.

Over the years several studies have been carried out to relate domestic fuelwood consumption in rural areas to various socio-economic factors (Sagar, et al., 1981, Maithani, et al., 1986, Negi, et al., 1986 and Misra, et al., 1988). Purohit and Trivedi (1991) also found that socio-economic variables like family size, settlement pattern, caste groups and landholding, were associated with fuelwood consumption. Maithani et al. (1986) have however found that enhanced use of alternative sources of energy can balance the increasing demand of fuelwood and make use of fuel more economic. Mahendra et al.(1992) found household size to be directly related to quantity of firewood consumed. Maikhuri (1991) has studied the fuelwood
consumption patterns in four tribal communities under varying ecological and socio-cultural conditions in North-east India. Another group of studies related distance from forest to domestic fuelwood consumption. Mahendra et al. (1992) e.g., in their comparative study of firewood consumption in hilly areas, found that distance from forests had a significant effect on total and per capita firewood consumption.

Several other studies have considered the effect of both distance from forest and socio-economic variables on fuelwood consumption. While Fernandes et al. (1988) found that increase in the distance travelled for collecting fuelwood due to deforestation led to decreased collection. Their study also revealed that areas close to the villages were monopolised by the upper classes. Therefore, the poorer classes had to go far from the villages for collecting firewood. Mahendra et al., (1992) in their empirical study of fuelwood consumption in the hills analysed the effect of distance from forest, household size, annual income and land and livestock holding on fuelwood consumption of a household. Their study also revealed that fuelwood was collected from neighbouring forests by the rural people for which they did not incur any cost except the labour involved in collecting and carrying it.

Few studies seem to have been undertaken over the years on non-timber forest produce (NTFP), which is another major resource being extracted from the forests mostly by the local people. Sarin (1981) had rightly emphasised the need for 'action research' for better management of NTFPs. Fernandes et al. (1988) who have discussed this at length, found a class-based dependence on NTFPs. They argued that while most of the NTFPs were collected by upper classes it was the weaker sections which depended for their survival on these in the lean season. NTFPs were
also discussed by Kennedy (1991) who studied the interaction and relationships between the tribals in Kodikanal (Tamil Nadu) and the surrounding forests.

The possibility of employment generation through collection, processing and sale of NTFPs has also been explored by several authors. For example, according to Pant (1977), NTFPs accounted for generating employment of about 1.2 million man-years or over 55% of the total employment in the forestry sector. Furthermore, it was estimated that NTFPs could engage 1.85 million man-years. He also stated that several forest based activities like grazing, lopping and grass cutting are capable of generating self-employment of nearly 8 million man-years. While Sarin and Khanna (1981) have discussed the role of women in NTFP collection, Gupta and Guleria (1992) have discussed the possibility of employment generation for the rural unemployed in the forestry sector, especially the NTFPs. Moreover, according to them the contribution of forestry sector can be increased by giving more attention to exploitation and marketing of NTFPs.

Yet another form of dependence on forest is for livestock grazing. This has got a lot of attention in the tropical countries as it is considered one of the major causes of degradation of forests. According to Thapa and Weber (1990) increasing livestock numbers along with conversion of forest lands to agricultural land, are responsible for adversely affecting the regenerative capacity of forests. Moreover, financial and infrastructural constraints, were responsible for the small farmers increasing the numbers of those livestock species which had a low per unit cost, e.g. goats, sheep etc. However they noted that, foraging by these medium-sized animals severely affects forest regeneration. Sheikh (1986) had also argued that fragmentation of
land and marginalisation of farmers led to the farmers increasing their livestock inventory to complement their insufficient crop production. Both Thapa and Weber (1990) and Sheikh (1986), have considered rising market prices of livestock products, unavailability of farm fodder and inadequate veterinary and extension services also responsible for increasing livestock numbers and consequent pressure on forests. They argue that this has made pastoralism a lucrative business both for the farmers and the pastoralists.

Bajracharya (1983) and Blaikie (1985) have argued that non-availability of non-farm employment opportunities and lack of agricultural support facilities have led to the people increasing the number of their livestock holdings. Moreover, several studies e.g., Hudson (1980), Fenerstein et al. (1987) and World Resources Institute and International Institute for Environment and Development (cited as WRI and IIED, 1987), have found that, social status and economic prosperity also play a role in large livestock holdings in most tropical Asian countries. Thapa and Weber (1990) and Sheikh (1986) also consider the increase in livestock numbers in developing countries as the outcome of both economic and social factors.

Homewood and Rodgers (1987) have discussed the different opinions held by ecologists and social scientists regarding the factors responsible for over-grazing. While the ecologists view it as the outcome of traditional patterns of communal land tenure and individual herd ownership (Lamprey, 1983 and Hardin, 1968). Social scientists attribute it to external constraints like loss of rangelands to other forms of landuse (Hjort, 1982), or breaking down of traditional controls under external influence (Sandford, 1983; Little, 1981). Mahat (1987) has blamed the lack of
availability of farm-fodder which has put constraints on stall-feeding resulting in free uncontrolled grazing.

While the effects of grazing on plant species, along with the destructive effects of pastoralist grass fires and tree felling have been discussed by Lamprey (1983). Impact of grazing on grasses, ground cover, soil structure and water availability and rainwater infiltration has been discussed by Kelly and Walker (1976). Fox (1983) found livestock grazing combined with fodder collection as the major cause of destruction and degradation of forest resources in the Middle Hills of Nepal. While Sandford (1983) argued that short-term changes in plant species composition and abundance can be easily demonstrated. Homewood and Rodgers (1987) are of the opinion that it is difficult to establish the relative importance of grazing regime versus other factors as ecological studies are recent and short-term.

Thapa and Weber (1990) have attributed the carrying capacity of different forests and rangelands to the type of grass and tree vegetation and its growth characteristics. They state that when the size of livestock herds exceeds the carrying capacity of the land it results in severe forest and grass destruction. Mahat (1987) while discussing the comparative carrying capacities of open grasslands and forests in Nepal and India, found that the stocking rates in both the countries were several times greater than the carrying capacity of their open grassland and forest. In India e.g., they were greater by 10 and 5 times respectively. Under these conditions he considers, regeneration of forest and grass resources unfeasible.

The relationship between protected areas and the local communities have been the focus of several studies. Bunting and Sherpa (1991) have cited the example
of Annapurna Project while suggesting that park-people relationships can be improved by fulfilling the daily needs of indigenous people through sustainable use of natural resources like firewood and fodder. Upreti (1994) e.g., has suggested that government policies should take into consideration the problems of the landless people and explore viable alternatives for them in order to reduce pressure on forests. Studies by Shelton (1983) and Sarabhai et al. (1991), have also dealt with the dependence of local people on the protected area and means by which their dependence can be met through viable solutions, thus improving the park-people relationship.

Several people oriented studies have been done e.g., Russell and Lal (1975) have done a detailed documentation of the tribes and castes of Central India, their religion, social customs, inheritance laws, etc. Fuchs (1988) in his study on the Korkus of Vindhya hills has also referred to various studies on Korkus of Melghat region. Apart from this many studies on family structure and change have been conducted to examine the impact of urbanisation and industrialisation in the rural and urban areas. It is however, worthwhile to note that few studies have directed their attention to structure and organisation of tribal families per se. The paucity of such literature has been pointed out by Shah (1996).

1.8 Duration of study and limitations

The data collection was carried out in two phases:


The major limitation was people's unwillingness to answer questions and to give accurate information. Since the study area included two PAs, and consequently a large number of villages, it was not possible for the researcher to concentrate only on a few villages, and familiarise herself with the people as well as give them the opportunity to trust her, which is important for a socio-economic study.

Moreover, due to the same reason as mentioned above it was not possible to interview the adult members of each family separately, which would have helped in finding the accuracy of information provided. It was also found in most cases, the women were not willing to be interviewed in the absence of adult male members of the family.

Except for monitoring a limited number of families for fuelwood consumption, it was not possible to carry out monitoring for fuelwood and NTFP extraction, grazing, fodder collection, agricultural production and crop raiding by wild herbivores and therefore, the author had to depend on the respondents' memory in recalling the quantities extracted etc., over the past one year.

1.9 Organisation of the thesis

There are five chapters in this thesis.

Chapter I is a general introduction to the study, concept of protected areas, the description of the two study sites i.e., Bori Wildlife Sanctuary in Madhya Pradesh and Melghat Tiger Reserve in Maharashtra, and their history and past management practices. The objectives and hypotheses formulated, the past research in the areas and review of literature as well as the duration and limitation of the
study and the organisation of the thesis.

**Chapter II** gives the detailed methodology followed for the collection and analysis of data of each of the objectives undertaken for the study.

**Chapter III** deals in detail with social organisation and structure of villages in the two study areas, including community structure and religion, family organisation, socio-economic status and demographic characteristics of people, an assessment of their dependence on the forests of the two study sites and the verification of the first hypothesis.

**Chapter IV** deals with the quantification and impact of resource-use on the forest and its comparison with the status of a forest which is free of biotic interference, in the case of Melghat and the verification of second and third hypotheses.

**Chapter V** deals with the problems faced by the people living in these protected areas, park-people conflicts arising out of resource-use, verification of the fourth hypothesis. Furthermore it deals with hypothesis testing and the implications for the management of the protected areas under study.