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**CO-MANAGEMENT AS A STRATEGY FOR WILDLIFE
CONSERVATION ON PROTECTED AREAS**

- A case study on Lawachara National Park

Riadush Shalehin Jewel



FORESTRY AND WOOD TECHNOLOGY DISCIPLINE

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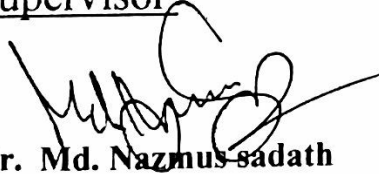
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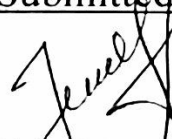
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DEDICATED TO MY RESPECTABLE
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ABSTRACT

This study shows how well the goals of wildlife conservation as well as the needs and interests of local communities are achieved through the co-management approach - an increasingly popular conservation and development practice in managing natural resources, owing to its ability to overcome the limitations of both centralized management and community-based approaches in harmonizing the interest among diverse stakeholders. Conclusions were drawn using criteria based on co-management principles alongside data collected from surveying the Lawachara National Park. There were factors, however, that affected the implementation of the co-management approach on Lawachara National Park, thereby yielding varies results. Thus, the study also analyzes different factors that give rise to the need to adopt the co-management approach, which include the availability of an ideal policy framework, capacity of local groups to co-manage wildlife resources, land tenure conditions, and accessibility of wildlife resources. The impact these factors have on the co-management approach could be as important to other developing countries as they are to Lawachara National Park.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Lying in the north eastern part of the South Asia (between 20°34' and 26°38' North latitude and between 88°01' and 92°41' East longitude) Bangladesh has a varied biodiversity and huge population (14,97,72,364/ density 1015) according to the BBS record for 2011 census. The tropical climate and tropical rain forest makes Bangladesh a biodiversity rich region. Bangladesh is a developing country and still a major portion of the population depends directly or indirectly on these biodiversity. Despite of being a country with high population density, Bangladesh remains a land of high biological diversity, a result of its location and the richness of extensive wetlands and remaining forests. IUCN reported a large number of native flora and fauna, including 3,000 - 4,000 species of woody flora, 125 species of mammals, 690 species of birds, 158 species of reptiles and 53 species of amphibians have been recorded. Rich aquatic biodiversity includes 260 species of finfish belonging to 55 families, 42 species of freshwater and land mollusks, 248 bryophytes species, 195 species of pteridophytes and 427 species of butterflies; among all these 201 species (fishes, amphibians, reptiles, birds & mammals) are being noted as threatened according to Bangladesh National Criteria. The over exploitation of these resources are making this diverse bio-community vulnerable and scarce. To protect this bio-diversity different management programs are being undertaken and areas with high ecological values are converted into Protected Areas (PA).

Protected areas are essential for protecting the biodiversity and maintaining their crucial services, but the establishment of PAs does not always mean that their objectives are or will be achieved. Presently, 12.5% of the Earth's land area is protected for conservation and more than 161,991 areas are declared PAs according to the World Database of Protected Areas. In 2004, the Convention on Biological Diversity (CBD) forced the member states to conserve 10% of their every ecological region by 2010.

Bangladesh has already established 34 PAs of which 17 are National Parks and others are Wild-Life Sanctuaries (Forest Department). Lack of continued institutional and political support as

well as increasing socio-economic pressures result in the degradation of PAs and with the loss of habitat a good number of wildlife has already become extinct, threatened and unable to maintain proper ecological functions and services. Also, conservation funds are scarce and it is worthy to mention that economic consideration plays a key role in decisions.

Bangladesh Forest Department (FD) managed the forest land within a set of objectives but these are rarely evaluated. The continuous deforestation has resulted into a shrunk in per capita forest land to 0.022 hectare. Taking this into account, people should not be considered as a threat but as an opportunity to help achieve nature conservation goals. Different management programs like, participatory approach, social forestry, community based approach, collaborative management (co-management) approach, etc. have been introduced to improve this situation. During the period of 1990 and 2000, the total forest area has increased at a rate of 1.3% per year (FAO, 2005). But still, there are evidences of biodiversity extinction in different levels, like species, ecosystem and gene, not only outsider of the PAs, but also inside of them. Collaborative management (Co-management), introduced by Nishorgo Support Project (NSP), is a recent management approach that focuses on the problem of keeping the locals from using the park resources only can worsen the condition, but if they are incorporated with the resources management system it can be fruitful. Subsequently, NSP included the locals in the decision making and resource sharing and it tends to be effective. However there is some lacking that is holding back the system to fulfill its desired goal. LNP is one of the five sites (Lawachara National Park, Satchari National Park, Rema Kalenga Wildlife Sanctuary, Chunati Wildlife Sanctuary, Teknaf Wildlife Sanctuary) where Co-management system was initiated. LNP is struggling to restrain its wild life abundance and the flagship species, Hoolock Gibbon (*Hylobateshoolock*). This study is to conform that "can co-managements ensure wildlife conservation".

1.2 Problem statement

Threats and problems of LNP identified by the key informants Interviews with local people identified some major threats to the integrity of LNP, as well as possible remedies to protect the park and its resources from these threats. According to the local people, specific threats include: illicit tree felling, encroachment by the local elite and politicians, collection of forest materials

for house construction, collection of wood for fuel, poaching and hunting of wildlife, traditional betel leaf cultivation, and planting of exotic tree species in the park.

Some of the interviews alleged that local people, backed by local elites and politicians are felling valuable mature trees from the park almost every night. For example, four meeting minutes of the Committee (held from April 2006 to March 2007) revealed that not only local people, but also some of the members of the community patrolling group (the lowest level of the co-management structure), are involved in these misdeeds. Illegal logging poses a serious threat to the integrity and sustainable management of the park's biodiversity. According to the local population, owners of sawmills in the area surrounding the park also facilitate this illicit activity by maintaining links with illegal loggers. Illegal loggers minimize their risk by selling logs to nearby sawmill in the forest, rather than carrying the whole logs long distances themselves. Several respondents claimed that some of the forest officials are also involved in the process of illegal tree felling, in coordination with local elites.

Although the authorities have developed co-management bodies for park management, some of their members are involved in illegal timber collection and trading. For instance, one of the respondents alleged that some of the people who had been involved in illicit tree felling within the park are now members of the Committee and/or Council, and are continuing their previous illegal activities.

Land encroachment for the expansion of agriculture also threatens the integrity of the park and its biodiversity. Key informants told us that local elite and politicians have trespassed on designated forest reserve lands adjacent to the park: "They expand their occupation (of agricultural land) day-by-day and conduct agricultural practices which are not compatible with the park ecosystem." Furthermore, a large and increasing number of local people regularly carry their agricultural goods through the park, and collect materials for house building and fuel wood from the park. Respondents also identified roads and highway development activities, gas exploration, and establishment of a gas transmission pipeline within the park as additional threats. They reported that a substantial amount of forest resources collected from the park is transported to urban areas, adding to the pressure on forest resources.

Some key informants from the villages inside the park said that a number of local people still poach and hunt barking deer, wild boar, jungle fowl (and its eggs), Hill Myna, and other birds and primates. On the other hand, people from the villages outside the park blamed the ethnic minority villagers and other local people for hunting and poaching these wildlife species in the park. Evidence suggests that a number of individuals from both the Bengali and ethnic minority groups are involved in these misdeeds (Mullah and Kundu 2003). Key informants of the study villages also identified the cultivation of betel leaf by the Khasia communities (Lawachara punji and Magurchara punji) as a threat to the park's sustainable management. They claim that traditional betel leaf cultivators clear all of the undergrowth in their allotted areas, explaining that this adversely affects the surrounding wildlife and their habitats. Key informants also noted the planting of exotic tree species in the park by the authorities, and said that these practices are not compatible with conservation goals. I also asked key informants about the status of some of the wildlife and tree species populations in the park. Their responses suggest a general decline in the populations of most of these species since 1990.

1.3 Objectives of the study

1.3.1 The main objectives of the current study:

Can co-managements ensure wildlife conservation in protected areas? A case study in Lawachara National Park, Sylhet.

1.3.2 Specific objectives

1.3.2.1 Objective 1: To compare present wildlife status with past wildlife status in LNP.

Specific research question for objective 1:

- a) What is the Species frequency and present status of wildlife in LNP?
- b) What was the Species frequency and past status of wildlife in LNP?

1.3.2.2 Objective 2: Find out the most prominent reason for wildlife decrease in LNP.

Specific research question for objective 2:

- a) What is the reason of wildlife reducing in LNP?

1.3.2.3 Objective 5: People's Knowledge about the wildlife.

Specific research question for objective 5:

- a) Is it important to you that wildlife populations are need properly managed and conserved in?

1.4 Limitations of the study

There were large scopes to work on the topic but I couldn't fulfill it due to various limitations, such as:

- This type of research has been conducted first time at the study area. So the respondents were not familiar about the research approach. The quantitative part of the questionnaire was difficult to respond for the respondents particularly for the local respondents as these questions were based on Liker scale to choose a particular answer about their choice. This was most difficult to respond in case of co-management satisfaction rating of ecotourism
- Time constraints of some respondents compelled to wrap up the interview short.
- Lack of Secondary data about wildlife.
- No financial support has been provided from my University or any other institution for this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Management History of LNP:

Lawachara National Park (LNP) is one of the Protected Area of Bangladesh which is located at the north-eastern part of Bangladesh. This National Park (NP) has been notified as a Protected Area (1250 ha area) by gazette notification in 1996 (Hossain, 2007; NACOM, 2003). But alike before 1996 the Park has been deteriorating by the direct and indirect influence of different stakeholder groups (NACOM, 2004). These influences threaten biodiversity conservation of the Park. Top down approach based traditional forest management system was not working for the Protected Areas (PAs) of Bangladesh due to various causes. The community people were not included into the management strategy of the forest so they were relaxed for the protection of the forests. As a result, community-based approach (especially collaborative management or co-management) for the management and conservation of natural resources of the PAs as well as the well-being of surrounding local communities has been emerged as an important tool to overcome these problems. In these consequences, PAs of Bangladesh brought under co-management initiatives under 'Forestry Sector Project (FSP)' (1996-2006) funded by Asian Development Bank for the first time. In this context, Bangladesh Forest Department (FD) worked with donor USAID to jointly develop a project named 'Co-management of Tropical Forest Resources of Bangladesh' to hasten and strengthen PA management by more active local participation in forest resource management. The two organizations set long-term greater vision for managing the forest resources with renaming the project as 'Nishorgo Support Project (NSP)' as a 5-year (2003-04 to 2008-09) pilot project for co-managing five PAs (Mollah and Kunda, 2004, Sharma *et al.*, 2007).

Specifically, in a collaborative management process, the agency with jurisdiction over the PA (usually a state agency) develops a partnership with other relevant stakeholders (primarily including local residents and resource users) who specifies and guarantees their respective functions, rights and responsibilities with regard to the PA (Borrini-Feyerabend, 1996). Co-

management is rooted in decades of field-based and theoretical efforts by individuals and groups concerned with:

- Equity and social justice
- Sustainable use of natural resource
- Community-based and community-run initiatives.

The objectives of the co-management plan of LNP are stated in. For this study the resources are the forests of LNP and its other natural resources as well as the plantations raised at the landscape zone of NSP viz. 5 km zone around the boundary of LNP. The equitable benefits and costs sharing of PAs' protection and management among the stakeholders is an essential part of the co-management approach. A functional linking between socio-economic and ecological incentives and biodiversity conservation is a vital instrument in eliciting stakeholders' participation in this approach. FD is the legal custodian of all PAs of Bangladesh's relevant to co-management (NSP, 2006). Here A two-tier institutional structure has been developed for sustainable PA co-management and achieving the objectives. These are: Co-management Council (consisting maximum 55 members) and Co-management Committee (consisting maximum 19 members from the Council body) to ensure active participation in co-management by the stakeholders in and around LNP in the purview of NSP (GoB, 2006).

2.1.1 Objectives of Management Plan for Lawachara National Park (NSP, 2006):

- To develop and implement a co-management approach to ensure long-term protection and conservation of biodiversity within the Park and sustainable use of designated zone by people as key stakeholders.
- To build partnerships and sharing benefits with all the stakeholders.
- To refine and strengthen the policy, operational, infrastructural and institutional capacity framework for protected area management.
- To conserve and maintain of viable wildlife population and plants.
- To restore and maintain as much as possible the floral, faunal, physical attributes and productivity of the forest ecosystems.
- To encourage ecotourism in suitable zones and develop visitor amenities.

- To implement income generation activities for sustainable livelihood development and skill enhancement of local stakeholders.

NSP was a slice of an extensive effort 'Nishorgo Program' of FD aiming to protect and conserve the forests and biodiversity and sustainable use of all types of PAs of Bangladesh through building gainful partnerships between FD and main stakeholders based on mutual trust and shared roles and responsibilities. Nishorgo Program also promotes the beauty of these natural forests through facilitating nature visits. NSP has been implemented at LNP (along with other 4 PAs) by the FD with the technical assistance of International Resources Group (IRG) aiming to develop co-management agreements by the collaboration of different stakeholders to lead measurable improvements in forest and resource conservation in the PAs and their buffer zones (NSP, 2008). LNP is now being managed by the co-management approach under a five years management plan since 2006 by involving local communities along with different other stakeholders to manage the forest and conserve biodiversity (NSP, 2006). Among the specific objectives of NSP, encouraging ecotourism in suitable zones and develop visitor amenities, building infrastructure within PAs to enable better management and provision of visitor services at PAs, and creation of Alternative Income Generation (AIG) opportunities for key local stakeholders were remarkable related to tourism interventions (NSP, 2008). "A popular community-based conservation strategy is to promote tourism to existing protected areas and channel a portion of profits back to communities" (Campbell and Vainio-Mattila, 2003: 424). From these standpoints, ecotourism and community-based tourism practice are being tried to develop at LNP due to her diversified nature and tribal people as unique selling points as an alternative strategy to generate income and environmental awareness to the locals and visitors to achieve the target of the NSP (NSP, 2006). NSP aimed to reduce the dependency of the local communities on the natural resources of LNP by involving them in ecotourism and CBT which were supposed to lead them sustainable livelihood. To fulfill this target some expected ecotourism outcomes have been identified under the 'Management Pan for LNP'.

2.1.2 Some important events of Lawachara forests:

Year	Important events
..... :	Historical mixed tropical evergreen forests
1848 :	British companies cleared the original forest for tea plantation
1923 :	Starting plantation for bamboo, cane and other species
1940 :	Lawachara punji established for logging and plantation purpose
1950 :	Magurchara punji established
1973 :	Declared as Reserved Forest
1996 :	Declaration of National Park by the Government
:	Launching Forestry Sector Project
:	Preparation of a Management Plan
1997 :	Magurchara fire accident
2003 :	Launching Nishorgo Support Project
2006 :	Formulation of Management Plan for LNP
:	Closing of Forestry Sector Project
2008 :	Jan-May: 3D Seismic survey by Chevron
: Nov:	Closing of Nishorgo Support Project
: Nov:	Launching of Integrated Protected Area Co-management Project

2.2 Location and Constitution:

Lawachara NP (in Kamalganj Upzila of Maulvibazar District) is located nearly 160 km northeast of Dhaka and approximately 60 km south of Sylhet city. It lies between 24030' – 24032' N and 91037' – 91047' E and is nearly eight km east of Srimongal, on way to Kamalganj. The NP and proposed extension comprise forests of southern and eastern parts of West Bhanugach Reserve Forest (RF) within Lawachara, Chautali and Kalachara Beats of Maulvibazar Range. The NP was notified (a copy annexed) in 1996 as per the Wildlife (Preservation) (Amendment) Act, 1974, with a total forest area of 1250 ha. In addition to the notified area, a proposed extension of 281 ha (incorporates the remaining old plantations in West Bhanugach RF) is also included in the Plan keeping in view the addition of habitat for biodiversity value and population viability of main forest-dwelling wildlife species. The proposed extension incorporates most of the

remaining plantations in West Bhanugach RF that are greater than 25 years of age as recommended in the Forestry Master Plan (GOB, 1992).

2.2.1 Access:

Bangladesh Railway serves well as the Park falls very near to the main railway line running through the forest division (Figure 4). Due to its well connectivity, the Park is very attractive for eco-tourism, particularly for the people of large urban centers such as Dhaka. Lawachara NP, representing the accessible hill forests of Sylhet forest division, is well connected by good roads, which also provide easy access to the nearest national/international airport at Sylhet. The Park is crossed by a paved road and railway line linking the towns of Sreemongal (nearly 8 km to the west of the south-western Park boundary) and Kamalganj (nearly 2 km to the east of the eastern Park boundary). Traffic inside Lawachara NP includes mainly motor vehicles and trains. A power transmission line largely parallels the highway corridor. These transportation corridors and traffic movements are important considerations in the Park management because i) traffic noise damages/disturbs wildlife, ii) the cleared rights-of-way are potential barriers to wildlife movements, iii) the cleared rights-of-way provide easy access to illicit fellers, and iv) the highways provide easy access to visitors to the Park.

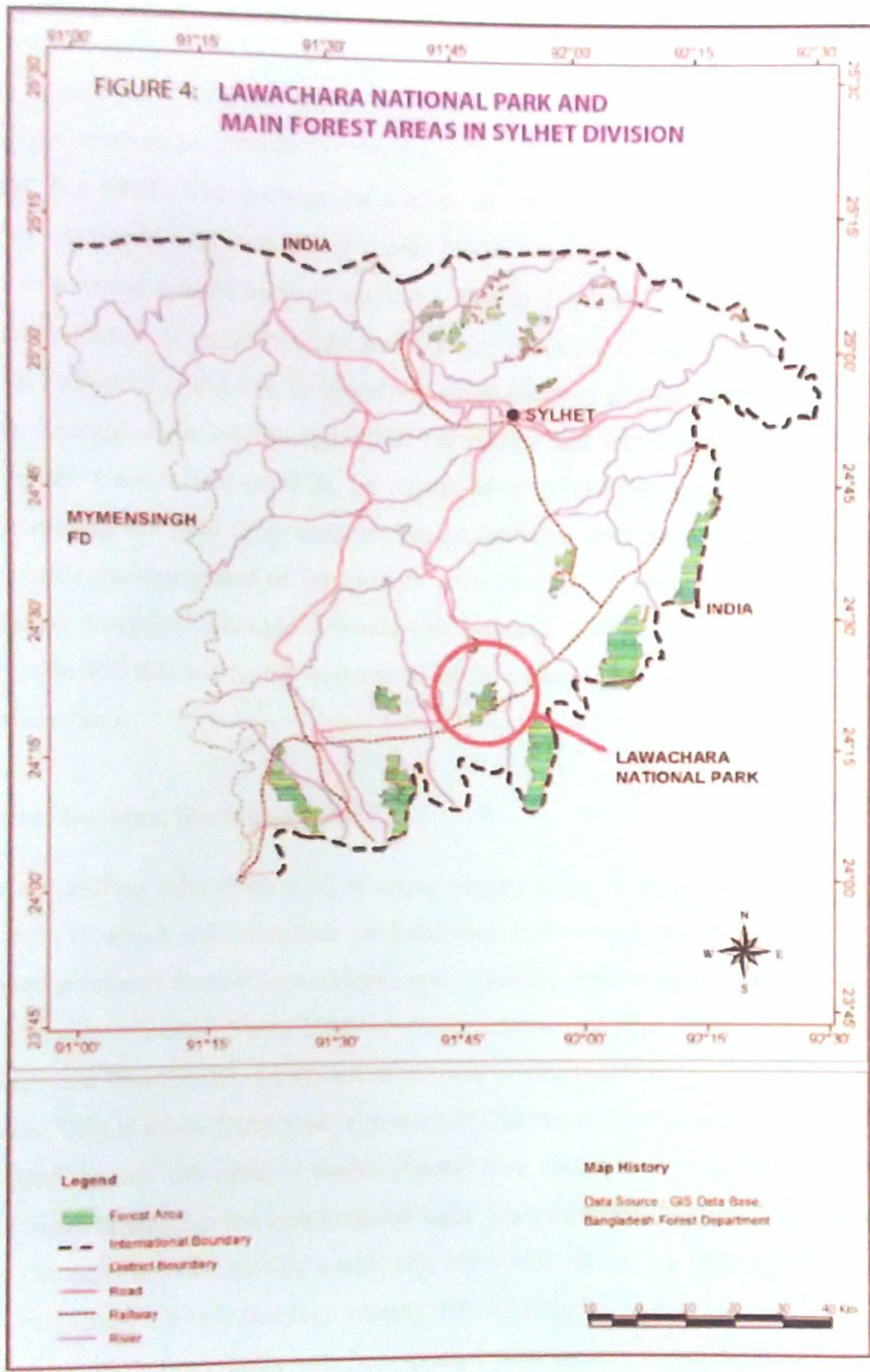


Fig 2.1.1: Road Map for Lawachara National Forest

2.2.2 Forest Boundaries:

The Park is part of West Bhanugach RF, which was reserved in early nineteenth century by following the reservation process per the Forest Act 1878, the Assam Forest Manual 1898 and the Forest Act 1927. The settlements claims of local communities were settled and legal boundaries identified with names of forest blocks, compartments, etc. Working Plans were prepared with topographical maps (1 inch to 1 mile or 1: 63,360) and specific recommendations for the maintenance of legal boundaries of forest blocks and compartments were given. The boundaries of forests could not, however, be maintained, as a result of which some forest areas have been brought under encroachment for cultivation and settlements. Although the Park was notified by the Government in 1996, no efforts have so far been made to physically demarcate the boundaries in the field. The situation got exacerbated with heavy biotic pressure on forests and large scale encroachment of forest land. As a result, these forests have become fragmented with reduced extent of suitable habitats and ensuing adverse effects on wildlife. This has adversely affected the ecological boundaries of Lawachara Park with limited wildlife corridors and breeding space.

2.2.3 Forest Geology, Rock and Soil:

The low and rolling hills (Figure 5) of upper tertiary rocks of the Park are composed of upper tertiary rocks in which soft sandstone predominates. For example, the Park covers an area of low hills formed primarily from soft sandstone, and originally supporting a vegetation cover of mixed tropical evergreen forests (Alam, 1988). A major portion of Sylhet forest division lies within the Surma-Kushiara floodplains, which are of alluvial origin, composed of clay and sand in varying proportions. This is a low lying area with smooth and broad ridges and basins, which are subject to deep flooding and the shallow basins (haors) may remain wet even during dry season. The area has been formed from the sediments brought down by rivers draining from neighboring hills of India. The soils are heavy, silty loams and clays with strongly acidic in reaction. A series of isolated low (nearly 150 m) and high (nearly 300 m) hills, derived from sandstones and shale's, and extending north from India and interspersed with narrow floodplains of small rivers, are found in Sylhet forest division. They represent northern and eastern hills, interspersed with northern and eastern piedmont plains. The forest soils of Lawachara Park can be categorized as

hill brown sandy loams with slight to strong acidity. They are shallow over sandstone bedrocks on high hills and accumulation of humus on the top of soil is small due mainly to rapid decomposition of debris under moist warm tropical conditions. West Bhanugach RF has well drained sandy loam soil with good humus but near nullahs and streams the soils are sandy.

2.2.4 Biophysical Situation:

West Bhanugach RF originally supported mixed tropical evergreen and semi-evergreen forests, which over the period have been substantially altered due to heavy biotic interference and the plantations of exotic species established after clear-felling of natural vegetation. Encroachments of RF land has resulted in conversion of many low lying areas into paddy cultivation. As a result, the habitat has fragmented, adversely affecting the wildlife by restricting their movements through a barrier effect. However, at places good natural regrowth, particularly of ground flora and middle storey, has come up due to favorable climatic and edaphic conditions, thereby enhancing the Park's *in-situ* conservation values. Old plantations raised in the Park area have grown up in shape of tall multi-storied structure with regrowth of ground flora and a middle storey of naturally occurring species. Consequently, the vegetation in many areas of Lawachara has approached towards natural structure and species.

2.2.5 Micro-Climate:

The climate of Lawachara Park is in general warm and humid but the weather is cool and pleasant during winter. The temperature varies on an average from minimum of 26.8 degrees in February to maximum of 36.1 degrees in June. The humidity is high in the Park throughout the year, with monthly average humidity varying from 74% in March to 89% in July. There is heavy dew during winter when rainfall is low. The water condensation is thus distributed throughout the year in different forms and greatly influences plants and wildlife. The area covered under the Park is one of the wettest in the country and so the rainfall is quite high with an annual average of 4,000 mm approximately, with maximum rainfall falling during June to September from South-West monsoon. Pre-monsoon Nor'westerly and cyclonic storms are accompanied by high speed winds and rains, which do considerable damage to property and trees.

2.3 Ecosystems:

A community and the surrounding environment with which it interacts is referred to as an ecosystem. The Park and its interface landscape encompasses terrestrial, aquatic and forest ecosystems. A variety of plants, animals and micro-organisms, and the ecological processes that govern their functions are found in the Park. The forests of Lawachara NP are composed of mixed tropical evergreen and semi-evergreen plant species, characterized by high rainfall and a multi-tier vegetational assemblage of rich biodiversity. The predominant influence of edaphic and microclimatic factors including rainfall, humidity, sunshine, aspect and soils is seen in the development of Lawachara ecosystems. The following six broad habitat types in Lawachara Park and its interface landscape are identified as:

- i) high forests represented by the remaining patches of natural forests,
- ii) plantations including the monoculture of exotics,
- iii) grasslands and bamboos,
- iv) wetlands,
- v) Tea Estates, and
- vi) cultivated fields.

The first three ecosystems being the largest in extent and also important from the Park management point of view. The cultivated fields (mainly of paddies) and grasslands, which harbour some mammals, ground birds and reptiles, get inundated during monsoon rains. The water bodies harbour important fish species, water birds and amphibians that are food to not only local communities but also hoolock and other wildlife. The following main components (fauna and flora including non-timber forest products) of biodiversity are described in order to have a better understanding of the habitat of Lawachara. Important land-uses and Tea Estates are described further in detail in Chapter 6 of Part I. Although the results from many inventories of fauna and flora conducted earlier in Lawachara are included in Volume 2 of this Plan, a new inventory will be conducted as suggested by FD. The planned biodiversity inventory study, for which adequate budget is earmarked under NSP, will identify composition and inter-relationships among fauna, flora and micro-organisms including food chain.

2.3.1 Forests:

The forests (mainly mixed tropical evergreen and semi-evergreen forests) of Sylhet forest division including the forest areas covered under the Park were reserved in early nineteenth century. Before reservation many forests were cleared for jhum (shifting cultivation), after which secondary vegetation developed over the period. Presently the Park has few patches of natural forests, and the plantations raised earlier by converting high forests of great biodiversity value. Large deciduous trees are mixed with evergreen smaller trees and bamboos. The top canopy includes *Artocarpus chaplasha*, *Dipterocarpus turbinatus*, *Elaeocarpus floribundaas*, *Dillenia pentagyna*, *Castanopsis tribuloides*, etc. The shrub species comprise of *Adhatoda zeylanica*, *Carea arborea* and others, whereas bamboos species are *Bambusa tulda*, *Bambusa polymorpha*, *Bambusa longispiculata*, etc, and *Saccharum*, *Daemonorops*, *Thysanolaena* as main grass species. A number of fodder and fruit bearing plants occur naturally in the Park. Forest fires in summer have adversely affected the natural forest regeneration in the Park. The natural forests of West Bhanugach RF, now part of of Lawachara NP, were converted by raising long rotation plantations (of teak, mahogany, garjan, karai, sal, gamari, shiso, toon, pynkado, agar, jarul, cham, jam, etc) taken up since 1922 for production forestry. Most of the original forests have been removed and the conservation value of the Park currently stems mainly from old plantations, which have developed a tall, multi-storied structure. The area represents the most accessible hill forests (Figure 7) in Sylhet forest division, and its biodiversity conservation and eco-tourism values have long been recognized. In the oldest of these areas the vegetation cover has taken on the structure of natural forest. On review of the old compartment history files of West Bhanugach block, it can be concluded that the natural regeneration in different compartments was still good (in sixties) with dense undergrowth in mixed irregular top canopy. Therefore, it can be concluded that the conversion of high biodiversity value natural forests was not justified in view of traumatic disturbances to the forest ecosystem brought by clearfelling of natural forests and followed by plantation activities. In fact, the name of the Park itself indicates its significance as a watershed of local streams as *chera* in local language means a stream. An estimated 483 ha of plantations over 50 years of age are included within the Park, representing 40% of the total notified area. Much of the remainder of the area (244 ha, or nearly 20% of the notified area), and the proposed extension area are covered by mixed plantations of

more than 50 years of age (Table 4.1). Some remnant patches of original high forests, including an 8.6 ha unlogged BFRI research plot, remain scattered and are a good source of seedling origin natural regeneration. This includes nearly 130 ha of natural forest used for betel-leaf cultivation by ethnic minorities.

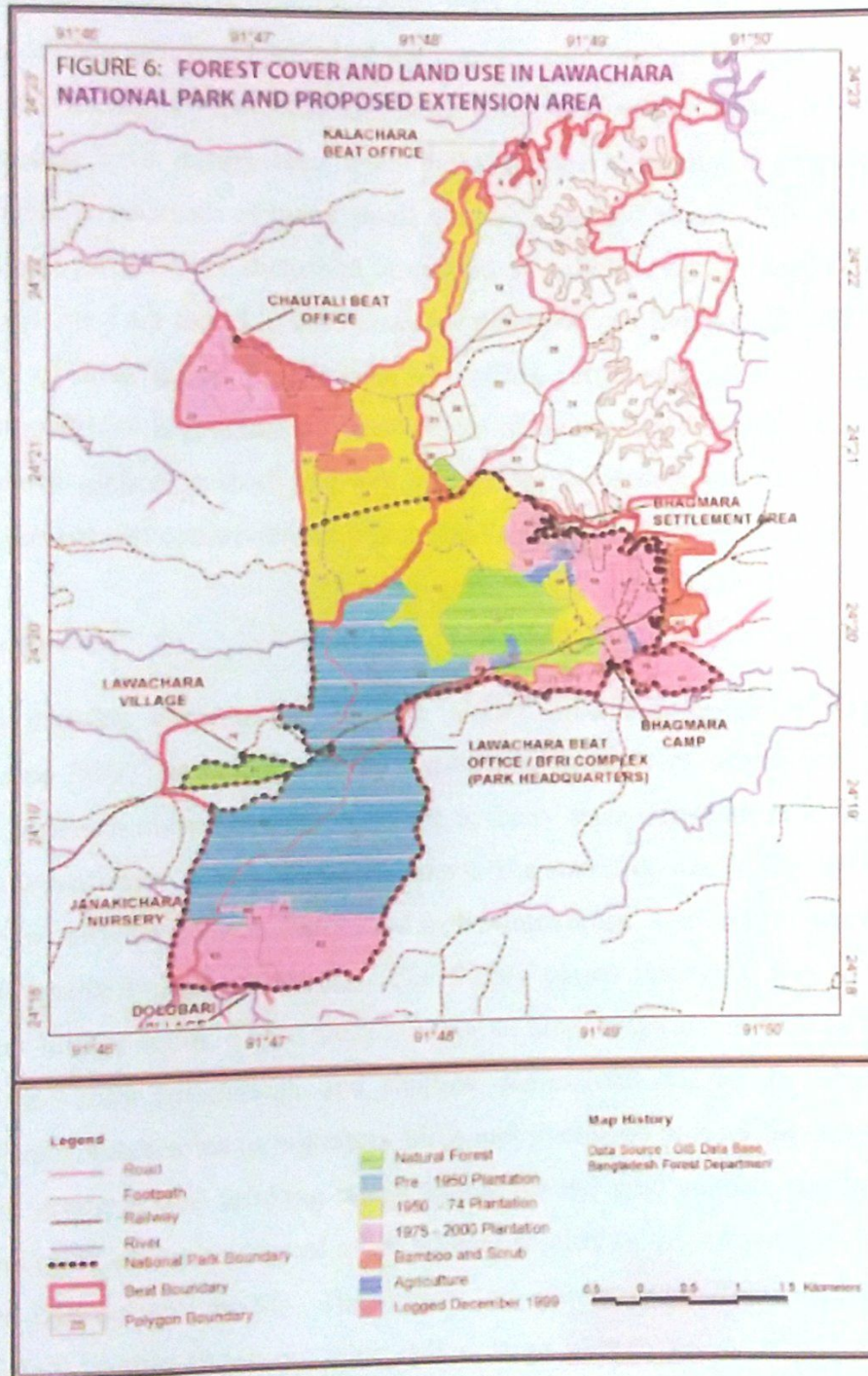


Fig 2.3.1: Forest Area of LNP

2.3.2 Fauna:

A number of animal species (mammals, birds, reptiles and amphibians), both forest-dwelling and wetland associated species, of different genera and families are found in the forests of Sylhet forest division. Lawachara NP and adjoining West Bhanugach RF are home to avifauna of 237 species (representing nearly one-third of the country's known bird species) dependent on good forest undergrowth and cover. Although large mammals such as tigers, leopards, bears, wild dogs and sambar have disappeared from the Park due to habitat degradation and hunting. However, viable populations of many small and medium sized mammal species that can survive in limited forest areas and/or disturbed or secondary habitats (e.g., jackals, small cats, barking deer, wild pigs, etc.) are found in the remaining disturbed and fragmented habitat of the Park. A rich diversity of other faunal groups such as reptiles, vertebrates, gibbons, langurs, hanumans, fishes and amphibians is present. Aquatic species including turtles and frogs are found in water bodies. Hoolock gibbon is used as a key species for the development and implementation of forest management and conservation measures in Lawachara.

2.3.3 Water Bodies:

Sylhet forest division, characterized by high rainfall and a large amount of water drained from the surrounding hills, comprises a valley fed by two main rivers, Surma and Kusiara. In the absence of adequate steep gradient required to carry huge monsoon rainfall, the water gets collected in depressions, locally known as *haors*. The water recedes during dry season, enabling local people to cultivate the remainder land with winter crops. The level of swamps is, however, being raised gradually due to siltation. The Surma passes through Sylhet city and joins the Meghna river further south. There are a number of other small rivers such as Khaway, Dholai and Manu (and their tributaries), and shallow depressions (e.g. *haors*), which are wetlands providing marshy sanctuaries to migratory birds and livelihood to local fishermen. They provide good habitat, drainage and drinking water source for the wild animals and local people. The rivers possess main characteristics of a flat alluvial country as the current is sluggish, the course tortuous and the bottom muddy. The waters are surcharged with materials brought from surrounding hills during monsoon rains and a large portion of the silt is deposited in the immediate neighborhood of the streams. Lawachara NP lies between the Dholai river on the east,

the Manu river on the north, and the road from Moulvibazar to Srimongal on the west. A number of sandy-bedded streams and nallahs pass through the Park and so aquatic habitats associated with forest cover and riparian (streamside) vegetation and animal species are important part of overall habitat composition. The Park forms the catchment of a number of small streams, locally known as *cheras*. In most cases the catchment areas of each *chera* constituted a bamboo working coupe (*mahal*) under Working Plan and so named after the name of concerned *chera*. The ridge dividing the *chera* valley was taken usually as the *mahal* boundary. So the watershed line of each *chera* has been taken as the boundary of the mahal. If *cheras* had big valleys, the *chera* itself is taken as mahal boundary by naming it as right or left bank.

2.3.4 Wildlife Management:

The management plans of Balmforth and Howlader (1988-97) and Chowdhury (1991/92 2000/01) provided for preservation working circle for the management of PAs of Sylhet forest division. Although the main prescription of stopping commercial fellings in the PAs was implemented, other recommended wildlife management practices could not be improved due mainly to paucity of funds. The plans also recommended to prepare separate schemes/plans for the management of PAs. Accordingly separate Management Plans were prepared for Lawachara and Rema-Kalenga by Rosario (1997), and Salter and Alam (2001) but the same could neither be approved nor implemented.

2.3.5 Habitat Protection:

The forests of West Bhanugach were subject to indiscriminate felling prior to their reservation in early nineteenth century. The forests were brought under scientific management during British rule when FD was established in 1865 and the Forest Acts of 1878 and 1927 were implemented. The hill forests were declared as RFs by following due reservation procedures. As a result, the legal status of these forests got enhanced and the protection of habitat against illicit felling, encroachment, forest fires and grazing was organized by FD staff. The provisions of Wildlife (Amendment) (Preservation) Act, 1974 provided further protection to the Park and its constituent wildlife after gazetting the Park. Participatory forestry is being implemented in Sylhet forest division under FSP. The buffer plantations raised around the Park (in the interface landscape

zones of the Park) are protected by the participants, organized into user groups, who get usufructuary benefits from the harvests as per the guidelines of FSP. The Park areas are approachable by jeeps, bicycles and foot, and this easy accessibility available to huge local population (combined with fertile soil and suitable topography) have contributed to encroachment of forests lands, over-exploitation of forest produce and degradation of habitat. A large labour force working in Tea Estates derive forest produce from nearby forests resulting in vegetation degradation. A close proximity of the forests to international borders gives rise to transnational protection problems which require international coordination between the Forest Departments of Bangladesh and the neighbouring Indian states.

2.3.6 Eco-Tourism:

The easy accessibility of Lawachara Park from Sylhet and Dhaka through air, rail and road networks makes the Park very attractive for eco-tourism, particularly to urban dwellers. A large number of tourists visit, particularly easily accessible parts of Lawachara to have a feel of luxuriant vegetation of evergreen forests and good landscape of the Park with rolling hills and interspersed valleys. However, chartered ecotours on the pattern of Sundarbans have not been yet organized in Lawachara. But with increased facilities for visitors it can be anticipated that the number of eco-tourists will increase manifold in future.

2.4 Conservation Research, Monitoring and Training:

There is neither any wildlife research staff nor research facility (e.g. laboratory) for the the Park. Similarly there is no established monitoring mechanism presently for assessing the health status of wildlife and biodiversity. The assessment of regeneration or degeneration of forests is necessary for which a suitable monitoring mechanism need to be put in place for better management. Although no special wildlife in-country training of FD staff has been organized, some officers have been trained overseas in wildlife and PA management. Wildlife management is one of the several subjects being taught during the regular forestry training imparted to cadre officers at Forest Academy, Chittagong. There is a need for organizing special training (in-country and overseas) courses on protected area management, co-management of PAs, legal

aspects of PA management, capture of wildlife, census operations, captive breeding, etc. Such topics should be included in regular syllabus prepared for training of FD staff.

2.4.1 Administrative Set Up:

Under the overall charge of the CCF, a wildlife and nature conservation circle (with CF as head and assisted by a staff officer of DCF rank) operates with six field level DFOs as approved by the Govt. of Bangladesh. Of the six DFOs, four are to be in-charge of Wildlife Management & Nature Conservation (WMNC) Divisions with HQs at Chittagong, Sylhet, Khulna and Dhaka. However, of the four designated DFOs, only two (at Chittagong and Khulna) are in position presently. There is a need of immediately posting a DFO for the PAs of Sylhet forest division as per the approved organogram. They should be well assisted with adequate staff including trained ACFs posted at each PA level within a Wildlife Division.

2.4.2 Tea Estates:

There are 4 Tea Estates (Fulbari, Khaichara, Jakchara and Gilachara) bordering the Park and 2 neighbouring Tea Estates (Noorjahan and Bharaura), which have substantial impacts on the forests covered under the Park (see Figure 9). Some parts of adjoining Tea Estates have not so far been brought under tea cultivation and have over the period developed unmanaged secondary vegetation, which provide additional wildlife and plant habitat as a transition zone between mixed forests/plantations and tea gardens. Small areas along Tea Estates have been converted to citrus, pineapple and banana plantations by individual families. The trend of converting secondary vegetation areas into monocultures has not been good for wildlife as it adversely affected their additional habitat comprising secondary vegetation. A large number of labour employed by the Tea Estates and their family members depend on the forests for meeting livelihood consumption needs. The unemployed villagers from Fulbari, Jakchara and Khaichara Tea Estates are particularly involved in fuelwood collection and illicit felling. Huge amount of labor required for managing Tea Estates gives rise to tremendous pressure on nearby forests for fuelwood, fodder, timber and other forest products. Shade tree species such as *Albizia lebbec* are planted inside the tea plantations for providing shade to tea bushes. Sometimes illicit fellers pass through adjoining Tea Estates (e.g. Bharuara, Jakchara and Gilachara) to fell trees inside the

Park (Figure 9) and transport routes but also shade trees inside the estates. This means joint efforts are required from FD staff and estate managers for controlling illicit felling. Some of the poor families of Tea Estate workers may be involved in protecting the forests covered under the Park. User groups can be formed and money from landscape development fund (LDF) can be used in development activities. But this will require a policy decision from the Tea Employers Association, Chittagong, who will issue suitable instructions to Tea Estates management. The FD will approach the Chairman of Tea Employers Association to issue such instructions to the identified 6 Tea Estates authorities. Exploratory drilling for natural gas on Tea Estate lands adjacent to Lawachara NP has indicated that an extensive gas-bearing structure underlies the Park. An intense fire resulting from a drilling accident in 1997 jumped across the highway and railroad line and burned an estimated 8 ha of natural forest used for betel leaf cultivation adjacent to Magurchara village. Fortunately this drilling was subsequently stopped. Any future proposals for pipeline construction or other infrastructure development will need to be rerouted well outside of the Park in order to avoid habitat loss during construction and operation.

2.4.3 Forest Villages:

Two recognized Forest Villages, Magurchara Punji (40 households) and Lawachara Punji (23 households) inhabited by khasia ethnic minority and located within the core zone, were established by FD in 1950's under an agreement signed between the FD and the representatives of the tribal community. Three acres of forest lands was assigned to each household (presently a household has 8-10 family members) for the practice of betel leaf cultivation and in turn they provided voluntary labor required for FD activities including nursery, plantations and protection of forests. They continue to practice betel leaf cultivation for which they plant betel cuttings near trees and start harvesting betel leaves after three years upto 25-30 years. Betel vines are grown on the trees which are lopped every year. Mulching is practiced by using cleaning and weeding materials and no fertilizer is added. Each forest village has a chief (locally known as Mantri), who looks after the interests of his community and maintains a close liaison with FD. Of the two forest villages, Magurchara is comparatively more developed due mainly to its location (it is situated on the Srimangol-Kamalganj Highway) and the money received by the villagers as compensation to the damage done by the gas fire.

FIGURE 9: LANDSCAPE OF LAWACHARA NATIONAL PARK

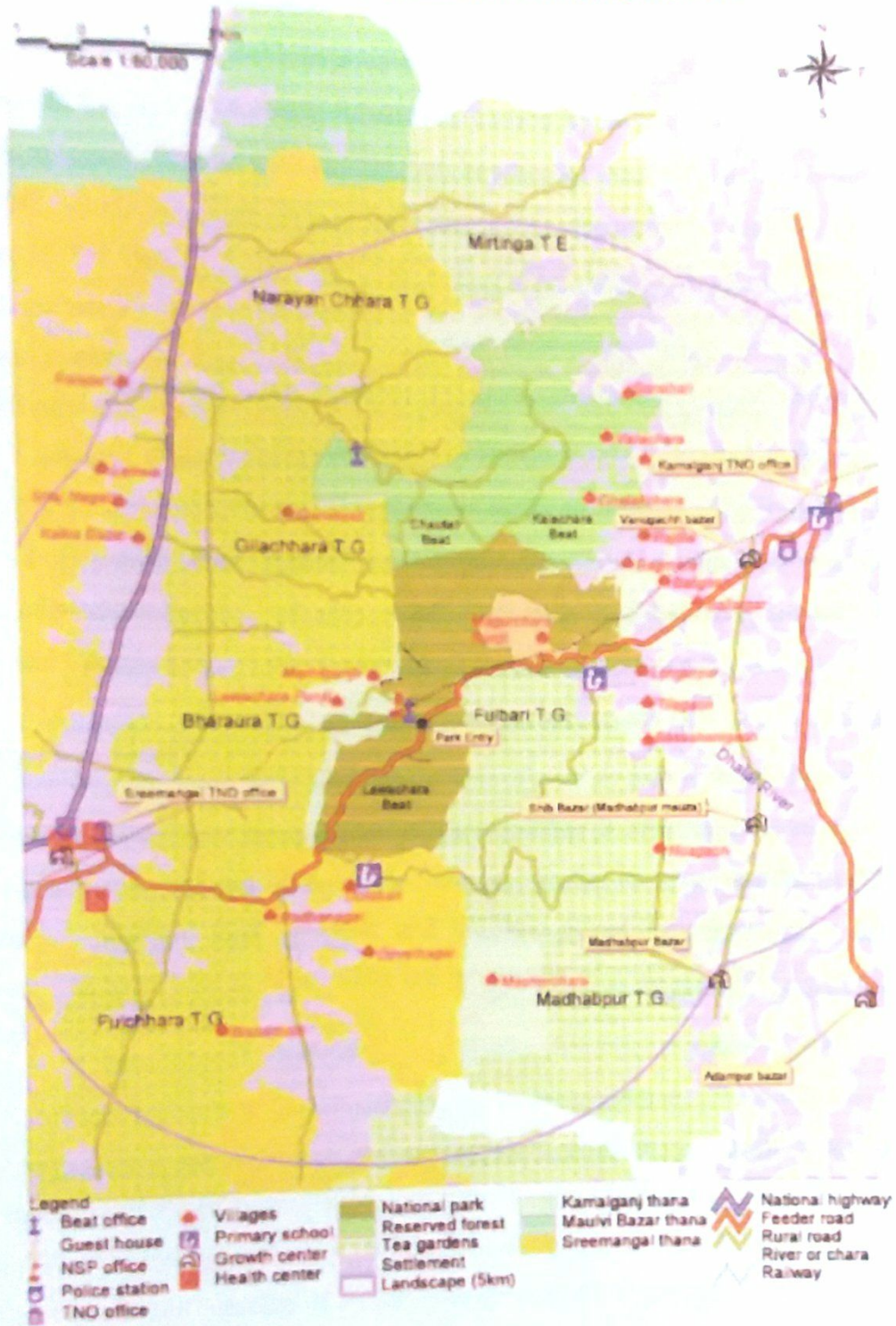


Fig 2.4.3: Forest Villages

2.4.4 Interface Villages:

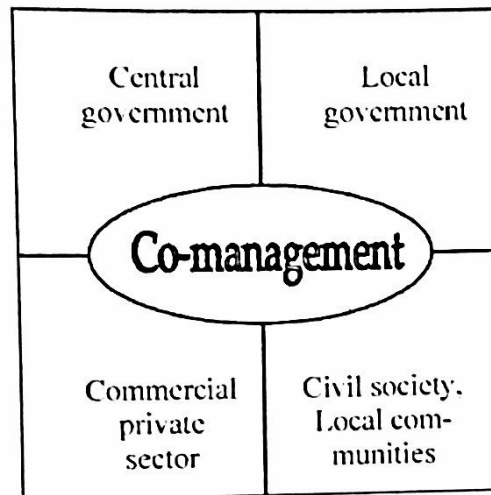
In addition to 2 Forest Villages, a total of 16 villages (Figure 10) have been identified having varied stakes in the forests, through RRA/PRA carried by NACOM (2004) during May-July 2004. These villages lie within 1 km. of the Park boundary; 4 villages (Baligaon-300 households, Bagmara-300 households, Rashtila-171 households and Chatakchara-61 households) are just at the outskirts of the Park. Of the 18 villages, 6 villages (Bagmara, Magurchara, Lawachara, Baligaon, Dolubari-84 households and Biranpur- 300 households) have been identified as having major stakes, another 6 villages (Botertol slum, Rashtila, Saraibari-190 households, Veerachara-118 households and Radhanagar-325 households) with moderate level of stakes and the remaining 6 villages (Langurpur-92 households, Ballarpur-61 households, Noagaon, Tilagaon, Bhasaniganj and Bongaon-47 households) with minor level of stakes in the forests covered under the Park. Local people from Lawachara, Magurchara, Dolubari and Birainpur are involved mainly in fuelwood collection, whereas people from Bagmara, Radhanagar, Rashtila, Baligaon, Verachara and Chatakchara are involved in illicit felling.

2.5 Co-management :

Co-management, or the joint management of the commons, is often formulated in terms of some arrangement of power sharing between the State and a community of resource users. In reality, there often are multiple local interests and multiple government agencies at play, and co-management can hardly be understood as the interaction of a unitary State and a homogeneous community.

“Co-management is a collaborative and participatory process of regulatory decision-making between representatives of user-groups, government agencies, research institutions, and other stake-holders”. “Co-management is a process that evolves over time and through an interactive process that requires participation of stakeholder groups and organization and a proactive state”, (Jentoft and al, 2009). Sen and Nielsen define Co-management as “an arrangement where responsibility for resource management is shared between the government and user-groups” . It means that there are institutionalized relationships between the government and user groups and user-groups managing a resource with the assistance of government, be it central and/or local.

The World Bank has defined co-management as ‘the sharing of responsibilities, rights and duties between the primary stakeholders, in particular, local communities and the nation state; a decentralized approach to decision making that involves the local users in the decisionmaking process as equals with the nation-state’ (The World Bank, 1999: 11). This definition is illustrated in (Fig. 1)



Stakeholder categories and Co-management (The World Bank, 1999:11)

2.5.1 History of co-management in Bangladesh:

Local people have participated in forest management in Bangladesh through pilot projects and other experimental activities. Most of these practices have been oriented toward the planting of forests, but not necessarily toward their conservation. The first examples of participatory forest management can be traced back to 1979, through the personal initiative of Prof. A. Alim and Dr. Mohammad Yunus in Betagi and Pomora villages, Chittagong District. Under this program, each landless participant was provided with 1.62 hectares of land for growing trees and horticultural crops. The Forest Department (FD) also provided them with technical and financial assistance. Although the program was proven successful, it was not replicated in other areas due to a lack of initiative by the FD. The Government of Bangladesh first incorporated social forestry programs into its annual development planning process in 1998, and has also declared 16 protected areas (PAS) under the Bangladesh Wildlife Preservation Order, 1973. However, no effective step has been taken for the management or co-management of these areas. Several plans were formulated,

but none of them have proven successful (Roy 2004). According to personal interviews and records of the FD, there are several problems with PA management approaches in Bangladesh (Roy 2004):

- ✓ The main orientation of the plans was to increase wildlife populations or to attract visitors, but almost nothing was done to compensate local people dependent on PAs for the loss of access to livelihood resources as a result of PA creation.
- ✓ Most of the FD personnel responsible for managing PAs lack adequate management capacity, training or motivation.
- ✓ Most initiatives were taken to satisfy specific donor agencies and thus lacked an integrated perspective. As a result, after the completion of funding, many initiatives were abandoned.
- ✓ Many of the responsible forest officers are dishonest.

The Nishorgo Support Project launched an initiative to implement co-management in protected areas in February 2004. This was the first attempt to conserve protected areas through reducing forest dependency by providing local people with alternative income generating activities. Co-management is now practiced in five protected areas of Bangladesh. According to the co-management model practiced by NSP, a number of forest user groups have been formed. The term forest user group (FUG) refers to a group of people formed, motivated and trained by NSP for the collective management of the forest, as stated in its project goals.

2.5.2 The successful Co-management conditions :

According to Pinkerton (1989) and Ostrom (1990, 1992) some key conditions are essential of for successful conditions for a Co-management regime.

- Clearly defined boundary
- Membership is clearly defined
- Group cohesion
- Benefits exceed costs
- Participation by those affected.
- Management rules enforced
- Legal rights to organize

- Co-operation and leadership at community level
- Decentralization and delegation of authority
- Co-ordination between government and community

2.5.3 Co-Management Agreements:

The existing traditional use of forests for bonafide consumption inside the three PAs needs to be formalized through co-management agreements to be signed with groups of users. For example, there are forest villages established inside PAs (e.g. Lawachara and Magurchara forest villages in Lawachara NP) by allotting forest lands and have villagers' established rights for betel leaf cultivation and their responsibility in forest protection and labour supply for forestry works. Detailed discussions will be held with the users about their roles and responsibilities, and the type and quantity of benefits to be accrued to them on long-term basis in lieu of their current exploitative forest use to be foregone.

Under FSP the plantations (woodlots, strip plantations and agroforestry) are being raised in buffer areas of 7 PAs (including the 5 pilot PAs of NSP). Participants formed into user groups take responsibility for protecting and managing the plantations in lieu of usufructury benefits ensured through participatory benefit sharing agreements (PBSAs) signed between them and FD. These PBSAs will be valid (and so renamed as co-management agreements) under NSP as well. The participants will have responsibility for the protection of neighbouring natural forests in addition to the plantations assigned to them under FSP.

As per the Wildlife (Preservation) (Amendment) Act, 1974 no commercial harvesting is allowed inside the core areas and hence other relevant mechanisms of benefits flows to local communities need to be explored. Moreover, no regular plantations are planned to be established in the core areas. This means that no benefits will flow from the harvests of either plantations or naturally occurring trees. Some enrichment plantations of indigenous tree, shrubs, herbs and grass species will be taken up by gradually opening the top canopy through selectively felling of exotic trees that are not suitable for wildlife. It is envisaged that the enrichment plantations of indigenous species will over a period of time develop similar to natural stands of forests to be retained in future as a part of suitable habitat for wildlife.

An important source of benefits to local people could be from the sustainable harvesting of NTFPs from the forests of PAs. The forests of Sylhet are particularly rich in NTFPs, which may supply raw materials for NTFP-based village and cottage industries. Similarly some forest produce will be available as a by product of subsidiary silvicultural operations (SSOs) to be carried out for the improvement of wildlife habitat. Water yield as a result of habitat conservation can be an additional incentive to local people for agricultural purposes. A draft co-management agreement format applicable for the benefits sharing from natural forests (particularly from core areas of the Park) is developed.

The above-enumerated benefits may not be sufficient to motivate local people and so additional benefits need to be mobilized through off-PA activities including alternative income generating (AIGs) activities. The upscaling of skills by RDRS and CODEC will be helpful in generating value additions through capacity building of local people. Landscape Development Fund (LDF) will help provide finance for RMOs to set up micro-enterprises, offering self-employment opportunities to the skilled members. Benefits from eco-tourism can also be ploughed back for the development of local communities and PAs. The FD may countersign the benefit sharing agreement. A new co-management agreement format to be signed between RMOs and the implementing NGO is developed for the AIG activities to be carried out through LDF.

Existing traditional users from established Forest Villages (Lawachara and Magurchara) will in groups formalize their existing bonafide consumption use practices by signing a benefit sharing agreement to be signed between them and FD with the assistance of implementing NGO. The existing use areas will be marked and shown on maps of FD.

2.6 Wildlife Definitions:

Wildlife does not have a universal meaning and its definition generally depends on the user. Some definitions are listed below. In general the wildlife profession defines wildlife as free-living plants and animals of major significance to humans. The habitats that support these plants and animals are equally important because a species and its habitat are interlocked and cannot be properly considered properly. Since wildlife belongs to the public, humans also have to be considered (Krausman, 2002). The goal of wildlife management is generally to increase populations, but may also include decreasing or simply sustaining current populations. Often management aims at balancing the benefits for both wildlife and humans in terms of habitat and land use. It is also important to note that the manipulation of populations and habitat by wildlife managers also includes natural changes that occur over long periods of time. Improving habitat is a common manipulation to improve a species population. To do this managers must not only understand what the animal needs to live, but also how changing the habitat to benefit one species might affect others using the same habitat (Sargent and Carter, 1999).

Definition presented by congress (1973): "The term fish or wildlife means any member of the animal kingdom, including without limitation any mammal, fish, bird (including any migratory, non-migratory, or endangered bird for which protection is also afforded by treaty or international agreement), amphibian, reptile, mollusk, crustacean, arthropod or other invertebrate, and includes any part, product, egg, or off-spring thereof, or the dead body parts or parts thereof (Krausman, 2002)."

The Wildlife Society defines wildlife as "free-living animals of major significance to man (Krausman, 2002)."

The Maryland Dept. of Natural Resources defines wildlife as "any living creature, wild by nature, endowed with sensation and power of voluntary motion and including mammals, birds, amphibians and reptiles, which spend a majority of their life cycle on land (Maryland DNR, 2005)."

The Natural Resources Defense Council defines wildlife as "animals living in the wilderness without human intervention (NRDC, 2006)."

2.6.1 Wildlife conservation:

Wildlife conservation activities relate to the protection of plants and animal species, and their habitats. Conservation efforts are made with a goal to preserve the nature, and the endangered species for the future generations. Wildlife conservation is very important because wildlife and wilderness play an important role in maintaining the ecological balance.

Organizations, both on international and national levels are dedicated to wildlife conservation. The World Wildlife Fund is an international organization making worldwide efforts for the conservation of nature, and the protection of endangered species. Wildlife conservation organizations/societies can be private or government owned. Wildlife conservationists work to identify plant and animal species that require protection.

2.6.1 Summary of Wildlife in LNP:

2.6.1.1 Amphibians and reptiles: Leech and Ali (1997) recorded 4 species of amphibians and 4 species of reptiles. Tecult Group (FSP 2000b) during their field trip made observation on two additional species of reptiles of the forest.

REPTILE AND AMPHIBIAN SPECIES REPORTED FROM LAWACHARA FOREST AREA

The list of Reptiles and Amphibians is based on the following sources:

1. Leech, J. and S.S. Ali. 1997. Extended Natural Resources Survey: Part IV – plant and animal species lists. GoB/WB Forest Resources Management Project, Technical Assistance Component. Mandala Agricultural Development Corporation, Dhaka, Bangladesh. Note: species list derived from RIMS database.
2. Information from local villagers May-December 1999.

Common name	Scientific name	Source	Remarks
Reptiles			
Wall Lizard	<i>Gekko gekko</i>	(1)	
House Lizard	<i>Hemidactylus brookii</i>	(1)	
Common Skink	<i>Mabuya carinata</i>	(1)	
Agama (?)	<i>Oriocalotes paulus</i>	(1)	
Monitor Lizard	<i>Varanus</i> sp.	(2)	
Python	<i>Python</i> sp.	(2)	
Amphibians			
Common Toad	<i>Bufo melanostictus</i>	(1)	
Skipper Frog	<i>Rana cyanophlyctis</i>	(1)	
Bull Frog	<i>Rana nigra</i>	(1)	
Tree Frog	<i>Rhacophorus leucomystax</i>	(1)	

Table 2.6.1.1: list of reptiles and Amphibians

2.6.1.2 Birds: Thompson and Johnson (1999) studied the avifauna in 19 sites in Bangladesh including Lawachara NP and recorded 237 spp. of birds from there. The authors also recorded the sightings of each individual bird species and used the data in calculating their relative abundance. Thompson and Johnson (2003) further made new records of 4 species of birds from the forest.

BIRD SPECIES REPORTED FROM LAWACHARA FOREST AREA

The following list is based on:

Thompson, P.M. and D.L. Johnson. 1999. Checklist of birds recorded at 19 sites in Bangladesh. Updated to 1 February 1999. Unpublished MS.

Frequency/abundance categories are defined as:

rare (1-5): number of sightings of rare species since 1977, where known

rare: 5+ sightings since 1977; unlikely to be seen during a visit

uncommon: a fair chance of being seen on a single visit

common: can expect to be seen on a single visit

abundant: seen on every visit; usually many seen

Nomenclature follows:

Inskipp, T., N. Lindsey and W. Duckworth. 1996. An annotated checklist of the birds of the Oriental Region. Oriental Bird Club, Sandy, U.K.

(Some of this list is given)

Common name	Scientific name	Status
White-checked Partridge	<i>Arborophila atrogularis</i>	Uncommon
Red Junglefowl	<i>Gallus gallus</i>	Common
Kalu Pheasant	<i>Lophura leucomelanos</i>	Uncommon
Speckled Piculet	<i>Picumnus innominatus</i>	Uncommon
White-browed Piculet	<i>Sasia ochracea</i>	Uncommon
Grey-capped Pygmy Woodpecker	<i>Dendrocopos canicapillus</i>	Rare
Fulvous-breasted Woodpecker	<i>Dendrocopos macri</i>	Rare
Rufous Woodpecker	<i>Ceelus brachyurus</i>	Common
Lesser Yellownape	<i>Picus chlorolophus</i>	Common
Greater Yellownape	<i>Picus flavinucha</i>	Common
Grey-headed Woodpecker	<i>Picus canus</i>	Common
Himalayan Flameback (Goldenback)	<i>Dinopium shorii</i>	rare (1)

Table 2.6.1.2: List of Birds Species (Some of this list is given)

2.6.1.3 Mammals: Feroz and Islam (2000) recorded 6 species of non-human primates, viz. one species of slow loris (*Nycticebus bengalensis*), Rhesus macaque (*Macaca mulatta*), pig-tailed macaque (*M. nemestrina leonina*), capped langur (*Trachypithecus pileatus*), Phyre's leaf monkey (*T. phayrei*), hoolock gibbon (*Hoolock hoolock*). Lawachara National Park. Among them, *Macaca mulatta* was relatively common (17.1/km²) with larger group size (51 indiv./group) in the forest while *Trichypithecus pileatus* was less abundant (0.41 individual/Km²). The densities for *Macaca nemestrina leonina*, *Trichypithecus pileata* and *Hylobates hoolock* were estimated to be 3.8, 2.6 and 1.2 indiv./km², respectively. The authors identified 12 major threats to the wildlife in the forest and suggested a management plan for the forest. The author also identified about 23 fruit species that are shared with human by the non-human primates. Feeroz (2000) made a population survey of non-human primates in 17 forested areas of Bangladesh, including Lawachara forest. Seven species of non-human primates were recorded. The overall populations of primates surveyed were higher in Lawachara than the other forests surveyed. Leech and Ali (1997) reported 6 species of mammals, while Ahsan (1995) described two species of non-human primates from the forest. Feeroz *et al* (1994) reported 6 species of non-human primates, Khan (1982) sighted 1 species of leopard, while Lockwood (1998) reported 6 non-human primates

from the forest. Siddiqui and Faizuddin (1981) reported 7 species of mammals and Thompson and Johnson (1996) reported 8 species of mammals from the forest.

MAMMAL SPECIES REPORTED FROM LAWACHARA FOREST AREA

The list of mammals is based on the following sources:

1. Ahsan, M.F. 1995. Human impact on 2 forests of Bangladesh: a preliminary case study. International Wildlife Management Congress: 368-372.
2. Feeroz, M.M., M.A. Islam and M.M. Kabir. 1994. Food and feeding behaviour of hoolock gibbon (*Hylobates hoolock*), capped langur (*Presbytis pileata*) and pigtailed macaque (*Macaca nemestrina*) of Lawachara. Bangladesh J. Zool. 22(2):123-132.
3. Khan, M.A.R. 1982. On the distribution of the mammalian fauna of Bangladesh. Pages 560-575, in: Proc. of the Second National Forestry Conference, Bangladesh-1982. Dhaka, Bangladesh, 21-26 January 1982.
4. Leech, J. and S.S. Ali. 1997. Extended Natural Resources Survey: Part IV – plant and animal specieslists. GoB/WB Forest Resources Management Project, Technical Assistance Component. Mandala Agricultural Development Corporation, Dhaka, Bangladesh. Note: species list derived from RIMS database.
5. Lockwood, I. 1998. Bangladesh's declining forest habitat. Sanctuary Asia XVIII: 22-33.
6. Siddiqui, N.A. and M. Faizuddin. 1981. Distribution and population status of some mammals in Bangladesh. Bano Biggyan Patrika 10 (1 and 2):1-6.
7. Thompson, P.M. and D.L. Johnson. 1996. Birdwatching areas. Lawachara Forest and Srimangal area, Bangladesh. Oriental Bird Club Bulletin Number 24:25-29.

8. Information from local Forest Department staff, May-December 1999.

9. Information from local villagers May-December 1999.

10. Observations by the FSP Biodiversity Conservation and Management Specialists, May-December 1999.

Common name	Scientific name	Source	Remarks
Slow Loris	<i>Nycticebus coucang</i>	(2,4,5)	
Pig-tailed Macaque	<i>Macaca nemestrina</i>	(2,4,5,7,10)	
Rhesus Macaque	<i>Macaca mulatta</i>	(2,4,5,6)	
Assamese Macaque	<i>Macaca assamensis</i>	(5,6,7)	
Capped Langur	<i>Presbytis pileatus</i>	(2,4,6,7,10)	
Phayre's Leaf-monkey	<i>Presbytis phayrei</i>	(2,5,6,7)	
Hoolock Gibbon	<i>Hylobates hoolock</i>	(2,4,5,6,7,8,9,10)	
Jackal	<i>Canis aureus</i>	(1,8)	
Wild Dog	<i>Cuon alpinus</i>	(9)	extirpated
Sloth Bear and or Himalayan Black Bear	<i>Meursius ursinus</i> <i>Ursus thibetanus</i>	(9)	extirpated
Yellow-throated Marten	<i>Martes flavigula</i>	(7)	
Tiger	<i>Panthera tigris</i>	(9)	extirpated
Leopard	<i>Panthera pardus</i>	(3,9)	extirpated
Fishing Cat	<i>Felix viverrina</i>	(7)	
Leopard Cat	<i>Felix bengalensis</i>	(7)	
Wild Pig	<i>Sus scrofa</i>	(6,9)	
Sambar	<i>Cervus micolor</i>	(9)	extirpated
Barking Deer	<i>Muntiacus muntjac</i>	(1,6,8,9)	
Indian Giant Squirrel	<i>Ratufa indica</i>	(4,10)	

Table 2.6.1.3 : list of Mammals Species

2.6.2 Present state of floral and faunal resources in LNP:

Survey of available literature shows that biological resource inventories for the Lawachara NP are incomplete, inadequate and therefore are misleading. FSP (2000b) compiled lists for animal and plant resources based on several sources. These data are also available on RIMS. Only few new additions could be added to the list during current review of literature (Ahsan 1995b and Feeroz and Islam 2000). The later studies were not intended for any faunal or floral surveys, however, recorded the name of plants and animals only relevant to their intended studies. The

compiled lists for plants, amphibia and reptiles, birds and mammals based on the above studies are given in Annexures 1, 2, 3 and 4, respectively. The findings are summarized below:

Plants	167 species
Amphibians	4 species
Reptiles	6 species
Birds	246 species
Mammals	20 species
Odonate insects	17 species

Table 2.6.2 Present state of floral and faunal resources in LNP

CHAPTER THREE

MATERIALS & METHODOLOGY

3.1 Location and area

LNP is located in the civil administrative units of Kamalganj upazila (subdistrict) of Maulvibazar district under Sylhet division and nearly 160 km northeast of capital Dhaka, 60 km south of Sylhet city and 10 km north of Srimangal city of Bangladesh and lies between 24°30' - 24°32' N and 91°37' - 91°47' E (NSP, 2006; Mollah and Kunda, 2004). Current notified area of the Park covers an area of 1250 ha, moreover 281 ha area has been proposed for including within the NP area of West Bhanugach Reserved Forest (FSP, 2000). Besides this Park its surrounding nine villages have taken as the study area. There are total 18 villages located inside the Park and within the landscape zone of 5-km from the Park boundary. Two (viz. Lawachara punji and Magurchara punji) of these villages are located inside the Park and the others are at the fringes of the Park boundary. These villagers have different level of stake with the forest and have been categorized into three levels of stake viz. major, medium and minor level of stake (NACOM, 2003 and 2004; Hossain, 2007; CNRS, 2000 cited in NACOM, 2003; Mollah and Kunda, 2004). Human settlement started at these villages during early 1940's with the people who were employed for logging and plantation activities in the forest. Lawachara punji was established in the 1940's and presently consists of 23 HHs. Forest Department allotted 1.2 ha land to each registered inhabitant of the two inside villages for betel plantation but they use much more than this area (FSP, 2000a and Chemonics, 2002 cited in NACOM, 2003). Magurchara punji was established around 1950 and presently consists of 41 households (HHs). There was a gas field explosion near this village in 1997 and after this accident a number of households had been shifted to a nearby place within the forest. Both of these villages are Khasia ethnic group based whose primary occupation is betel leaf cultivation (majority portion of the population) and wage labor (CNRS, 2000 cited in NACOM, 2003). The remaining villages are located just adjacent to the Park boundaries whose main occupation is agriculture (Hossain, 2007). Most of the people of the local community lie under extreme poor status (85-90%) (DeCosse, 2006). They use the forest of Park area for their subsistence and commercial use. The park and its proposed extension area are bordered by 7 tea estates which provide a large number of refuges as the laborers and their dependents having a stake with the forest to some extent (CNRS, 2000 cited in NACOM, 2003).

3.2 Data collection

3.2.1 Sampling technique and sample size:

Social survey methods involved a combination of participatory research methods followed by structured interviews and a questionnaire survey of a sample village from each site. A structured questionnaire was developed to collect my data. The information generated from participatory rural appraisal (PRA) was validated by results from other surveys. Present and past status of wildlife and their quality is collected from social survey primarily. The interviews were conducted from 19th May 2014 to 25th May 2014.

An assessment of impact of wildlife conservation on communities was undertaken by conducting household interviews in the sampled villages. A structured questionnaire was posed to an adult individual in 102 households selected by stratified random sampling to ensure representative proportions of households from different geographical areas and across the main ethnic groups. It should be noted that the study areas were relatively homogeneous both in terms of the environment (forest cover) and population (ethnic groups). The survey covered 10% of all households in the sampled villages; this represented around 1% of the total number of households and 10% of the villages throughout ACA and in those areas studied outside. Information was collected on wildlife issues and wildlife status such as present and past status of wildlife, damage caused by wildlife, benefits from wildlife, Action taken to protect wildlife, endangered wildlife, and protection measures adopted and attitudes toward wildlife conservation etc.

3.2.2 Preparation of questionnaires

Questionnaires were made for interviewing the CMC, local common people, traditional leaders (Tripura, Khasis), political leaders (chairmen, members of local government), government officer (Forest officer, Administrative officer, Police, BGB etc) and non-government officer (NGO's officer, Journalist, Researcher etc) and local community who directly involved with forest resources collection and those are taking benefits from forest. My main target group was local common people around the park.

3.3 Research Approach

This research was based on both literature review and interview with structured questionnaires of target group and it was analyzed 14 years (2000-2014), which was collected through interview of the local people, local community who directly in collecting forest product (fuel wood, fodder, fruit etc), traditional leaders, political leaders and NGO's officer from Lawachara National Park, Wild Team (working on python project) and Forest Officer of National park Range.

3.4 Source of Data

- I. Collection of primary data: A survey questionnaire form (Appendex-1) was developed to collect primary data. The data was collected through surveying different village people living on Lawachara National Park and outside the Park area. At the time of collection of primary data the people were asked about different question on co-management and wildlife conservation. The data were collected within 19th May 2014 to 25th May 2014.
- II. Collection of literature and secondary data: The literature and some information were collected from the forest Office and different NGO's. And most of the secondary data is collected from different journals.
- III. Sorting and compilation of data: After collection of available information only the necessary and relevant information were set aside for compilation and the unwanted part of the collection data were discarded.

3.5 Data analysis

The data were analyzed using SPSS v. 21.0 (SPSS Inc., Chicago, Illinois, USA). V2 tests were used to analyses frequencies. A t-test was used to compare means. Normality of the data was tested using the Anderson–Darling test. If the observations were not normally distributed, the data were log transformed prior to analysis. Nonparametric tests (Mann Whitney U-tests) were used if the data were not normal even after transformation.

CHAPTER FOUR

RESULT & DISCUSSION

4.1 Process outline:

This Chapter focuses on the local community's perception on co-management impacts on wildlife of Lawachara National Park and its surrounding areas. The co-management impacts have statistically analyzed and discussed according to the social survey and field survey data. Then expected outcomes of wildlife conservation under the management plan for LNP and these perceived impacts by the co-management have been compared at the end of this Chapter.

4.2 Characteristics of the respondents

I interviewed 102 respondents in seven villages around the Lawachara National Park. In terms of involvement in co-management activities 26 respondents (25.5%) were members of Co-managements communities (CMC). According to the secondary sources, most of the people of the local community lie under extreme poor status (85-90%) (DeCosse, 2006). The respondents of Lawachara (Khasia ethnic group), Magurchara (Khasia), Duluchera (Tipra) and Garopalli (Garo) are belonging to ethnic minority groups (40% of total respondents). According to a study (Anon, undated), roughly 97% are poor or hardcore poor among the ethnic people. Agriculture is the main occupation at the study area (Hossain, 2007). In some places of the study area there are far more percentage of people who are agriculture-based. Primary occupations of Khasia ethnic group is betel leaf cultivation (majority portion of the population) and wage labor. The Tipra ethnic group primarily depends on pineapple and lemon cultivation (70%) and wage labors (30%). In some other villages there are around 60% people involved in agricultural and agricultural related professions (CNRS, 2000 cited in NACOM, 2003). Respondents of the study account 54.90% as their primary profession agriculture and 17% as secondary profession. The respondents who work in agricultural activities have been considered here under the profession of agriculture. Most of the people are permanent of this area and living here since long period. Most of the respondents have a low level of education. Usually they use fuel wood for cooking purposes. Some other basic information of the respondents of local community has been shown in graph.

4.3 Some basic information of the respondents of local community:

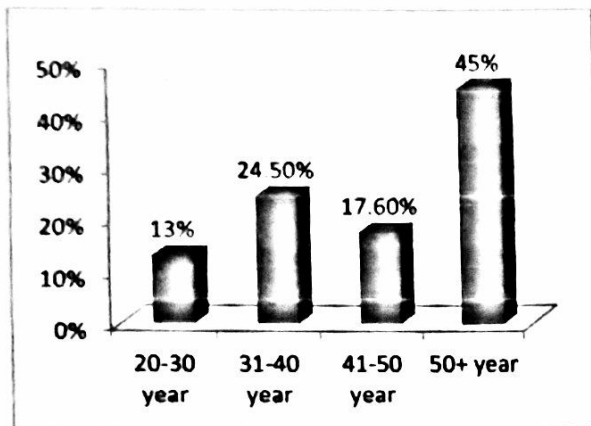


Fig 4.3A: Age structure (yrs)

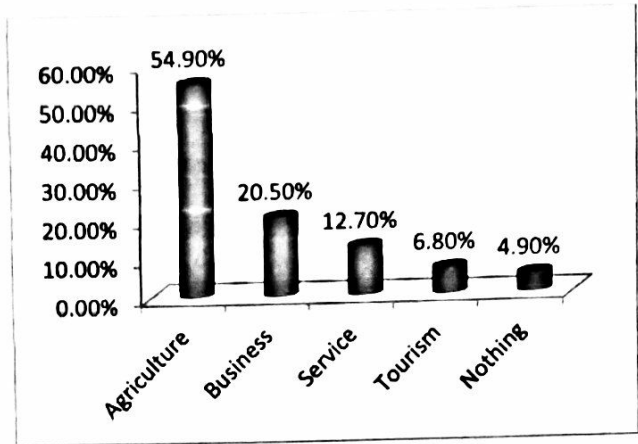


Fig 4.3B: Sources of income (Primary)

For my study purpose I selected most of the older people (45% people are over 50 years old) because they have the idea about the co-managements from starting to present. Most of my respondent's income sources are agriculture (54.90%), Businessman (20.50%), Service (12.70%), Tourism (6.80%), nothing (4.90%).

4.4 Forest dependence of local livelihoods:

Poor peoples of LNP dependent on the national park and adjoining reserve forest since long past. Among the forest products peoples rely mostly on timber, fodder, fuel wood, fruits etc. The dependency is higher on fuel wood collection (66.50%), while minimum for fruit collection (12.70%). Earlier illegal logging embraces a major part in local livelihoods of the area. After the beginning of various co-management programs, this illegal activity becomes minimized. Figure 4.4 shows peoples dependency on major forest produce in my study area.

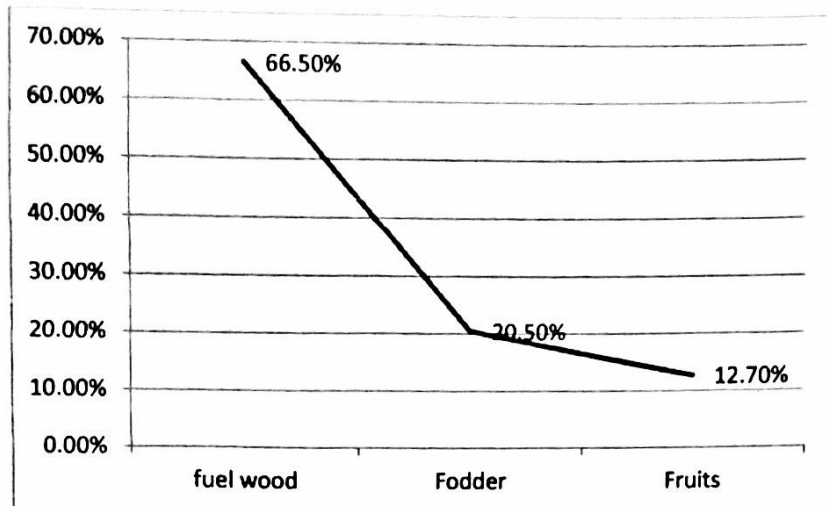


Fig 4.4: Forest dependence of local livelihoods

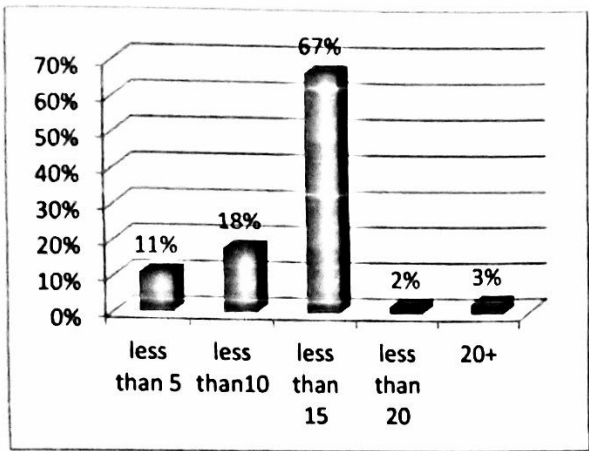
4.5 Perceptions on wildlife conservation and co-management:

This case study revealed that the current co-management have an effect on wildlife Conservation of LNP. Almost 85% respondents of FGD agreed on the decreasing wildlife of the park. Unfortunately, there is no inventory of the wildlife in this area, but from the dwellers, park ranger and the beat officer it can be confirmed that presently some of the wild species are not found in the area. The major reason behind it is the hunting and uncontrolled harvesting of resources at the first phase. Though harvesting has been checked later, the increasing number of tourists and their irrepressible manner has hampered the natural lifestyles of the wild animals, causing a decline in the number of wildlife community.

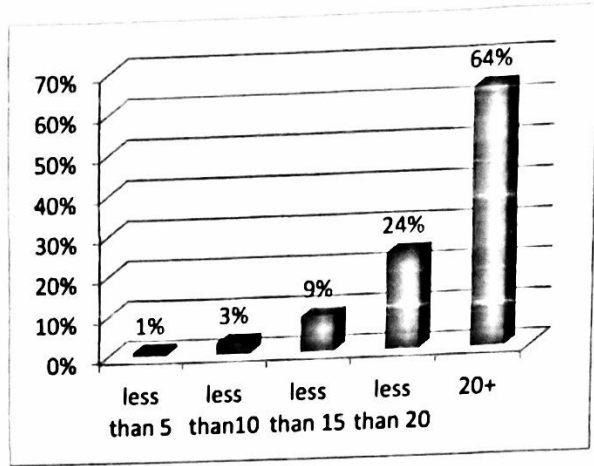
4.5 Comparative study on wildlife Status (Based on respondent's perception):

4.5.1 Present and past status of birds:

Sixty-seven percent of the respondents (fig: 4.5.1A) of the study villagers answered that now a days there have only few birds (less than 15 species) in LNP. And my personal observation, I watch some new species on LNP and their number were very few. By respondents perception I found that in past there was a lots of birds species. Sixty-four percent respondents (fig: 4.5.2B) answered that there was at list 20+ birds species is past. But most of them are now exotic. They also said that the main reason is forest disturbance and hunting. They also said that the co-managements committee peoples are helping to commit this kind of work.

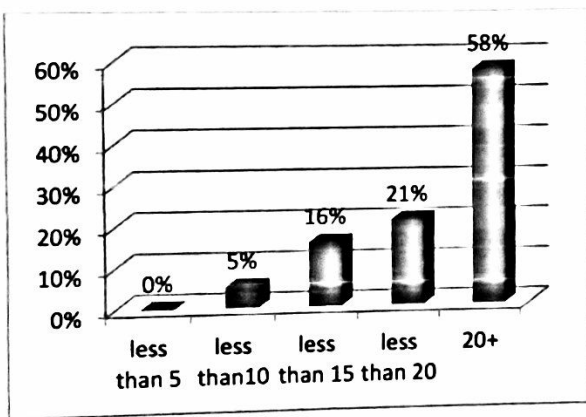


Present status

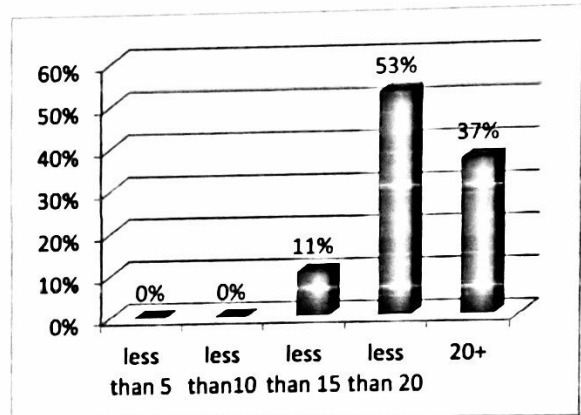


Past status

Fig 4.5.1A: Present and Past status of Birds on LNP (Local people's perception)



Present status

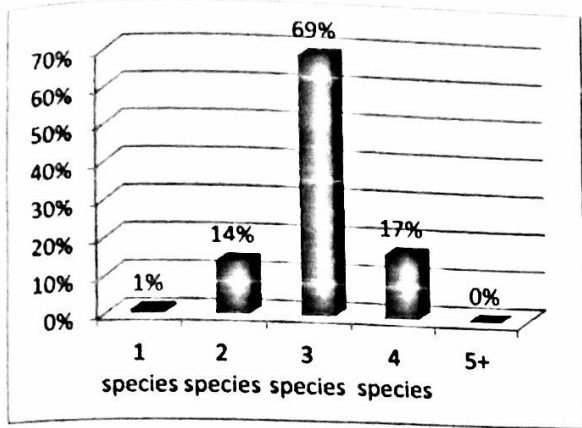


Past status

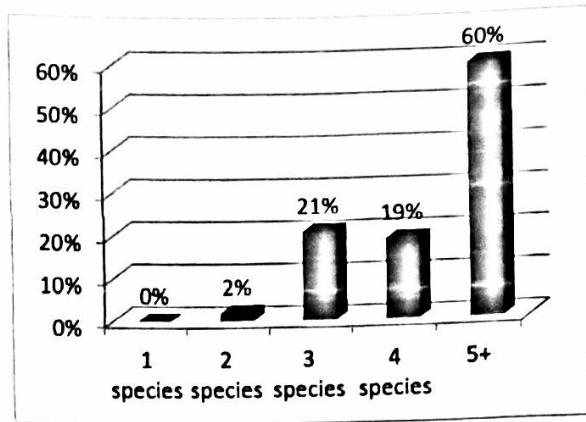
Fig 4.5.1B: Present and Past status of Birds on LNP (CMO worker's perception)

4.5.2 Present and past status of Reptiles:

Sixty-nine percent of the respondents (fig: 4.5.2A) of the study villagers answered there are only 3 species of reptiles exist. Most of them are hardly seen. Sixty percent respondents (fig: 4.5.2B) answered that there was at list 5+ reptiles species is past. But most of them are now exotic. They also said that the main reason is forest disturbance and hunting.

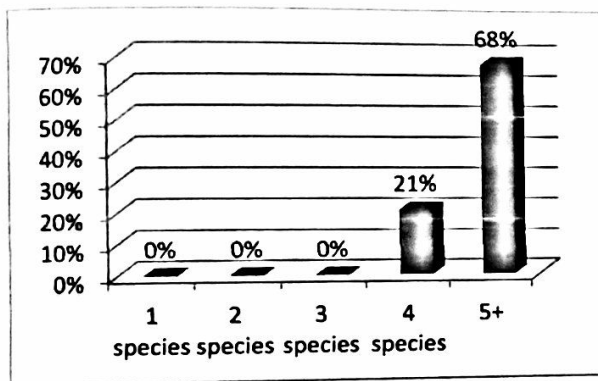


Present status

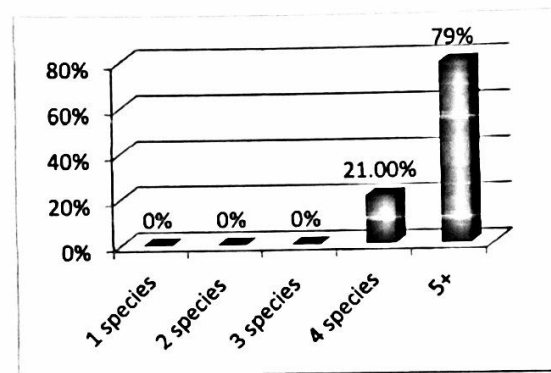


Past status

Fig 4.5.2A: Present and Past status of Reptiles species on LNP(Local people's perception)



Present status

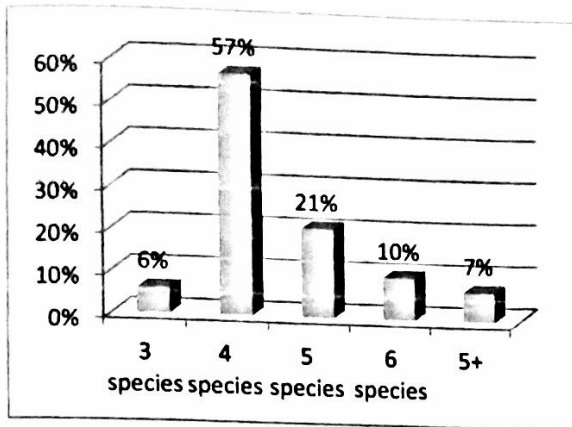


Past status

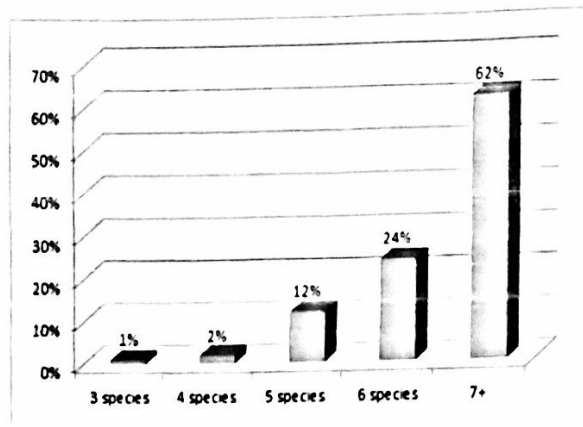
Fig 4.5.2B: Present and Past status of Reptiles species on LNP (CMO worker's perception)

4.5.3 Present and past status of Mammals:

Fifty-seven percent of the respondents (fig: 4.5.3A) of the study villagers answered there have only 4 species of mammals are exist. Those are Pig-tailed Macaque (*Macaca nemestrina*), Hoolock Gibbon (*Hylobates hoolock*), Capped Langur (*Presbytis pileatus*) and Barking Deer (*Muntiacus muntjac*). Most of them are hardly seen. Sixty percent respondents (fig: 4.5.2B) answered that there was at list 5+ reptiles species. But most of them are now exotic. They also said that the main reason is forest disturbance and hunting.

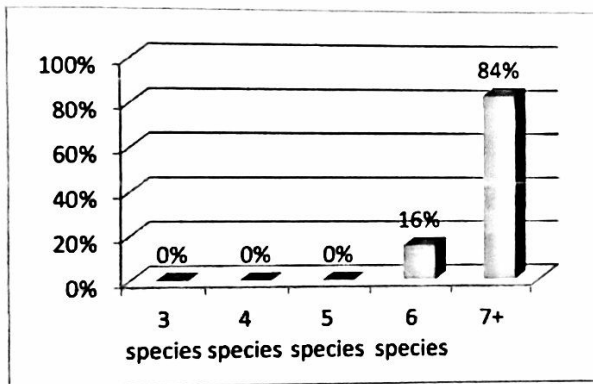


Present status

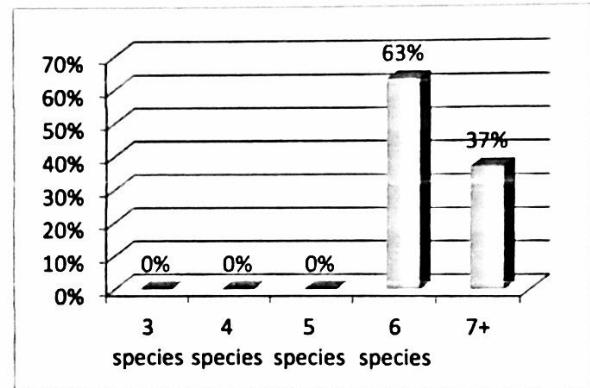


Past status

Fig 4.5.3: Present and Past status of Reptiles species on LNP(Local people's perception)



Present status



Past status

Fig 4.5.3: Present and Past status of Reptiles species on LNP (CMO worker's perception)

4.6 Wildlife Issues:

4.6.1 Most important wildlife issues:

No quantitative data are available on hunting of wildlife. However, several authors tried to correlate disappearance of some large mammals, including tigers, leopards, bears, wild dogs, sambar etc., from the park to combined effects of hunting and habitat fragmentation. Feroz and Islam (2000) report that still some monkeys, mainly the rhesus, and wild boars are sought for hunting for consumption by khasia tribes of inside village. Sometimes, monkeys are

trapped by local people and sold to interested people (Ahsan 1995b). People still hunt for sambar (barking deer) in the forest (Ahsan 1995b). In winter hunters from adjacent areas come to the forest for hunting fowls and some other birds (CNRS 2000). But now peoples think that the main reason is human disturbance (38.20%), food problems (18.60%), reduce of forest area (19.60%) and some of the other reasons. In past year hunting was sever and it was only reason for decrease of wildlife but at present human disturbance and food problem is main problem.

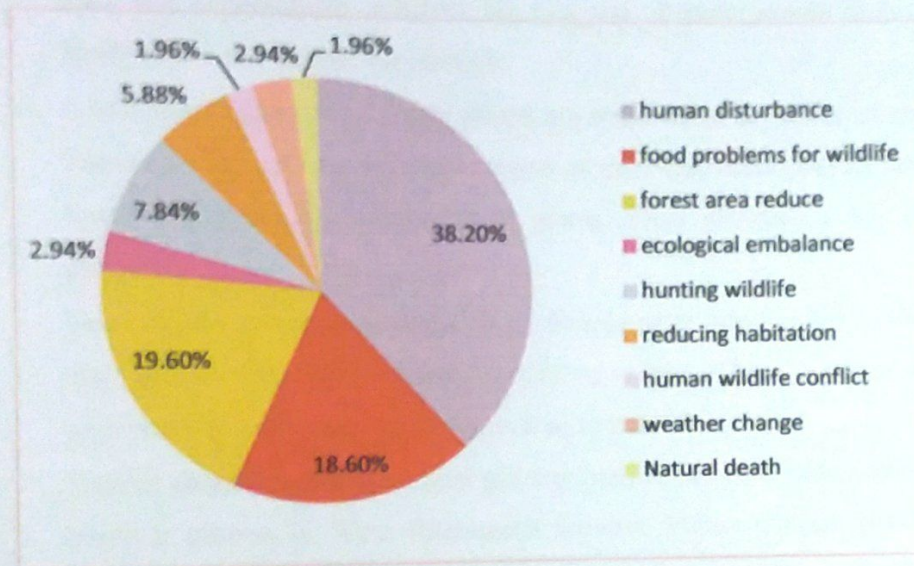


Fig 4.6.1: most important wildlife issues

4.6.2 Common issues:

It is reported that monkeys and wild boars damage the crops at the forest edge and vegetables and pineapple gardens of nearby areas. Local people therefore drive them away by making sounds, chase them and/or kill them by trapping or spearing (CNRS 2000 and Feeroz and Islam 2000, Ahsan 1995b). Due to the co-management and truism purpose people are also entering into forest that's why the free movement of the big mammals has been restricted. The large trees are selectively removed and destroy the habitat of important wildlife species. This lack of free movement and habitation has resulted in the decreasing of the wild animals rapidly. This negative impact arises since after creating the co-management Projects, the wildlife density and diversity has decreased.

The plantation history has been the major tragedy in LNP. Plantation practices in Lawachara have brought several consequences on the forest ecosystem and wildlife.

- Plantation has changed the species composition and their original abundance that's why the wild animals are suffering by food scarcity and habitation.
- Plantation involved clear felling and burning of undergrowth thus destroying the entire ecosystem and its biodiversity.
- Monoculture of exotic trees had led to the habitat fragmentation and degradation to biodiversity.
- Care and maintenance involves the removal of undergrowth thus reducing the biodiversity and habitat for animals
- A substantial amount of young plants are removed in the cover of dead trees and branches. This reduce the regeneration of trees and contribute to thinning of the forest and remove the underneath plants. Thus threatening the plant species diversity.
- Tourism in Lawachara is unmanaged. People enter into the forest, chase wildlife, play music with high volume, and leave wastes. These sorts of activities are unfriendly to environment and as well as to wildlife.
- Habitat destruction, tourism and gas exploration has been linked to the decline of hoolock gibbon in West Bhanugach Reserve Forest (Ahsan 2003). The other threats include cattle grazing, fodder collection, hunting, army training, fruit collection, bark collection etc.

4.6.3 Impact of Magurchara gas field explosion on Lawachara NP

Feeroz and Islam (2000) gave a brief account of the damage caused to the forest due to Magurchara gas field explosion. A gas field was established at the edge of the south-east part of the forest, after clearing of 10 ha area. Accidentally, the gas field exploded in June 1997 and a crater of about 200m formed. A column of flame of about 75m height was formed and burnt for about 15 days. As a result about 5 ha forest area in the north of the field was completely burnt. On the open side of the field, bushes and scattered trees also burnt. One forest village was also affected and the inhabitants were shifted to a new place in the forest. The waste materials from the gas field are creating some chronic disease and that is great issue for wild animals decrease in LNP.

4.7 Discussion

In this study I have found that the forest coverage has decreased by about 15 per cent, forest thickness and abundance of tall trees by about 60 per cent compared to pre-liberation period. Abundance of herbs, shrubs and sungrass has also decreased by about 80 per cent due to clearing and claiming of forest land for plantations. Except for birds, the abundance of major wildlife has also decreased by about 80 per cent, according to a survey conducted by Nishorgo Support Project (NSP) of Forest Department during May-July, 2004.

Many wildlife species have become locally extinct including bear, goyal, titir, Kedu bagh leopard and sambar deer. In addition there are a few locally endangered species such as small deer, Hoolock Gibbon, Honuman, Dhanesh, parrot, wild fowl, hedge-log, doves, turtle (2 species) and laudoga snake. Hoolock Gibbons are rare and endangered species. It is only found in four countries in the world. The animals never touch the ground. They live in the higher canopy of forests and survive on leaves and fruits. With increasing tree felling, Hoolock Gibbons and other animals living in upper canopy are finding it difficult to survive at Lawachara as elsewhere. Now there is less than 180 Capped Langurs living in Bangladesh. Without healthy growth of Malakana, Lohakath, Segun, Raktan and associated trees, these animals will not survive for long. Given the rate at which the trees are felled every year and the rate at which the population of Hoolock Gibbon is declining, the shy and harmless animal is likely to disappear from Bangladesh in near future.

The prevailing extreme poverty in the locality, unemployment coupled with weak law enforcement has made poor people become reliant on forest resources for meeting their needs. Scarcity of resources is also an underlying cause for dependence on forest resources. There are six tea estates around the park, of which four border the park i.e. Fulbari, Khaiachara, Jakchara, Gilachara tea estate, and the other two namely Bharaura tea garden and Noorjahan tea estate are nearby. These tea estates have a substantial number of unemployed inhabitants; some of them enter into the national park and exploit forest resources.

The Nishorgo Programme of the Forest Department funded by USAID is working to develop a process of co-management of protected areas since February 24 last year. Local elite, union parishad (UP) leaders, NGO groups, representatives of 19 stakeholder groups, officials of the Forest Department, Department of Agriculture Extension, Social Welfare Department, Livestock and Fisheries departments and members of law enforcement authorities will be

involved in it. But some of them are committing crime to hunting and cutting trees. Common people are also damaging forest when they are collecting their daily foods and fuel wood.

CHAPTER FIVE RECOMMENDATION & CONCLUSION

5.1 Recommendations:

To overcome the problem of Wildlife conservation in LNP proper action should be taken immediately. Here some recommendations are given as short term and long term remedy wildlife conservation. If these are properly implemented, there is a great chance of getting success in reducing Wild animals in LNP.

5.1.1 Short term recommendations

The short term recommendations are as follows

5.1.1.1 Biodiversity conservation awareness and education among the visitors and locals:

The summary table shows, the expected outcomes 'biodiversity conservation awareness and education among the local and visitors' have been perceived as satisfied expected outcome of ecotourism by the local community respondents though there is a big gap between their satisfaction and expectation in this issue. The goal of the NSP was also biodiversity conservation of LNP. Ecotourism was preferred as an alternative tool to attain the goal of the project. The result of the study indicates the performance, effectiveness, acceptability by the local community and potentiality of ecotourism to educate and aware the locals and the guests 59 (visitors/tourists) to conserve the biodiversity of LNP. This status of the outcome also expresses the inevitability of formulating proper policy plan and guidelines to emphasis ecotourism development, promotion and management to facilitate the biodiversity conservation of LNP and its surrounding area/forests. The local respondents opine, the visitors are being motivated by the influence of the local eco-guides, different publicities on biodiversity conservation, environmental amelioration, pollution control, etc. They also inform, these publicities and roles of eco-guides also motivate and educate many locals about the conservation of flora and fauna, the environment of LNP and its protection, etc.

5.1.1.2 Human resource development:

'Human resource development' through ecotourism has been facilitated through different trainings related to tourism through the NSP. Eco-guide, certification of eco-guides, eco-cottage development and maintenance, handicrafts manufacturing, cultural group development, etc. trainings have contributed to develop the local human resources. The local community people claimed that the 'Alternative Income Generation' (AIG) trainings which were provided by the NSP were not properly looked after and monitored by the project officials and as a result the knowledge of the learning was not applied effectively by them which also hindered the AIG strategies of the NSP. There were lack of flow of raw materials, financial capital, marketing channels, technical barriers, etc. which encumbered the triumph of these AIG trainings. Moreover, the local ethnic communities were given some training based on their interests, well-being and culture. But except the training at Tipra village on handicrafts, the trainings at other ethnic villages were not well-designed and useful afterwards because of the aforementioned causes. Hence, the local community respondents treated the human resource development program not so much successful as it was supposed to be under ecotourism component of the NSP. Nevertheless they were to some extent satisfied with the human resource development activities as before the NSP there was not such initiative to develop the local communities through tourism or ecotourism.

5.1.1.3 Improvement of living standards of local communities:

This ecotourism outcome is directly connected with the previous outcome i.e., 'socio-economic benefits to local people through forward and backward linkages'. Improvement of living standard of a community is the ultimate goal or target of the local people through tourism which depends on various factors. However the respondents opine that their living standard has been improved to some extent due to the influence of tourism activities at LNP and its surrounding areas by creating employment opportunities for the young guys and ladies (though very few families), sharing knowledge and experience with visitors, different officials, families and friends, communication with different outsider actors, etc. The direct and indirect attachment of the local communities in tourism or related activities facilitates them to realize to lead a better and comfortable life. It aids and encourages them to perform something better than their previous performances. By this way, the local communities have

been developed since last 3-4 years i.e., after the advent of the NSP and contributing the local communities to improve their living standard to some extent.

5.1.1.4 Empowerment of local communities:

The respondents are also satisfied due to being the local community empowered through tourism by creating alternative source of income, having good interactions with different types of visitors and officials, providing tourism related trainings, motivating and building awareness about different socio-economic issues, etc. Through involving tourism activities one eco-cottage owner has become a respected Member of Co-management Committee and Co-management Council of LNP. He is representing tourism entrepreneurship of that area. Some women become also empowered by earning money through tourism activities focusing LNP. This empowerment also influences the family and personal life of these women.

5.1.2 Long term recommendations

5.1.2.1 Motivation and public awareness campaign

People living in and around LNP forests are not aware of the importance of the Wildlife and its contribution to the maintenance of an environmental balance. An awareness program on Wildlife conservation should be undertaken on a massive scale. Lectures, exhibitions and film shows are all part of these exercises to introduce the protection measures taken for the wildlife by the government. Public Awareness programmes for local opinion makers, teachers, students, NGO, are necessary.

5.1.2.2 Infrastructure development:

A number of infrastructures have been established to develop ecotourism at LNP and its surrounding villages under the NSP. Of these developments there are: wooden trails for visitors, establishment of a number of signboards, bill boards, information centre, 1 tourists' shop, 2 eco-cottages, 2 picnic spots, 2 entry gates at two ethnic villages inside the Park, 4 foot trails, car parking area, some internal communication route development which are noticeable infrastructures developed due to ecotourism development at LNP and its surrounding villages. But the respondents opine, these are not adequate quantitatively and qualitatively to develop and promote ecotourism at LNP. They also note, there is no entry gate of the park; no good toilet, changing and washing facility for the visitors; no Park boundary; no visitor

interpretation centre; no good sitting, resting and food facility; no good picnic facility; etc. Due to such inadequacy, the respondents are not much satisfied with this outcome.

5.1.2.3 Alternative Income Generation opportunities:

This outcome is related to economic dimension of tourism impacts which has gained less relative satisfaction (see Table 4.1 and 4.2). But this dimension has been perceived as the most important by the local people. The reason of selecting this outcome as better satisfied ecotourism outcome by the respondents is due to the motivation of contribution of ecotourism to generate source of income through different alternative employment opportunities such as eco-guides, eco-cottage owners, local business owners, handicrafts manufacturing and selling, etc. The local people really expressed their satisfaction while the discussion on local eco-guide and their income generation was carried out during the interview. Though these economic benefits are less distributed among the local people but they are satisfied with the contribution and potentiality of ecotourism to generate income for the local people. They believe that this is just starting of the journey of tourism at their area where it has immense opportunities to provide new jobs to the local people in future.

5.2 Conclusion:

Lawachara National Park has already come a very long way to maintain the links between rural communities and wildlife. A ban on the trade in wildlife aims to keep wildlife in the rural areas and increase the sustainability of subsistence hunting there. New laws provide for the involvement of local communities in decision making for protected areas, and for them to receive the direct benefits from tourism and other activities in their areas. This provides a platform for moving towards co-management of the protected areas with local communities. The final steps to consolidate this and make it work are to put those special committees into effect, and make the system of revenue sharing work, possibly linking it with agreements to reduce hunting. And the area of forest which is protected must be increased to allow the balance between conservation and rural needs to be maintained. With all of these steps, LNP will be leading the way to maintain the intricate links between wildlife and local cultures, to the long-term benefit of both.

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