

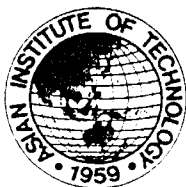
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# MANAGING PROTECTED AREAS UNDER CONDITIONS OF CONFLICT

Selected Case Studies from  
China, Myanmar, Nepal, Philippines and Thailand



*Edited by*

Sanjay K. Nepal  
Karl E. Weber



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Asian Institute of Technology  
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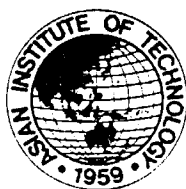
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## PREFACE

The majority of protected areas in the developing countries of Asia are facing various forms and levels of threats. The threats caused by human impacts are of particular concern as poverty and overpopulation have tended to increase human pressure on existing protected areas. While protected areas in many developing countries have become the safest way to ensure biodiversity conservation, local communities living adjacent to the protected areas have often become the victims of protected area establishment who are either displaced from their traditional homes or denied access to resources which previously belonged to them customarily. The result has been the conflict between protected area authority and local communities. The latter are often antagonistic to any conservation related activities as they hardly derive any benefits from such activities. On one hand, there is an urgent necessity to protect natural areas, on the other, the livelihood needs of local communities have to be duly considered without which any efforts towards protected area conservation is bound to fail in the face of poverty stricken conditions of local communities.

As the majority of protected areas in Asia receive low level of commitment from the national governments, they are inadequately funded and lack manpower and necessary skill. Often the legal basis of protected area conservation is not clear. Owing to the varied nature of problems, the resolution of conflict encompasses broader disciplines which reach beyond the confines of conventional protected area conservation and management. Recent approaches have emerged in which efforts are geared towards linking protected area conservation with fulfilling subsistence needs of local communities. The local communities are seen as partners in managing protected areas whose support is indispensable for the long-term viability of protected areas.

This research explores the overall conditions of protected area management with particular reference to the livelihood needs of local communities. It attempts to examine the social and economic conditions of local communities who are, so far, marginalized in the overall development process. Eight case studies from five countries, namely, China, Myanmar, Nepal, the Philippines and Thailand have been covered under this study. The case studies signal the need for coherent and systematic efforts to protected area conservation with particular emphasis on the involvement of local communities. The inherent issues in conflict resolution are discussed and remedial measures are suggested. While strong commitment from the central authority is necessary, attention must be paid to enlisting local communities, non-governmental organizations and private land owners in the planning and management aspects. A solid baseline information is needed in many biological and human-ecological aspects of conservation. Similarly, effective communication mechanism between protected area authority and local communities should be established. Without prompt actions, protected areas will barely remain intact in the future.

Sanjay K. Nepal  
Karl E. Weber

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## ABBREVIATIONS

ACAP	:	Annapurna Conservation Area Project
ACD	:	Agricultural Cooperative Division, CPD
ADB	:	Asian Development Bank
ADB/N	:	Agricultural Development Bank, Nepal
AIT	:	Asian Institute of Technology
AKNP	:	Alaungdaw Kathapa National Park
ALRO	:	Agricultural land Reform Office
APROSC	:	Agriculture Projects and Services Center
ASEAN	:	Association of Southeast Asian Nations
BAAC	:	Bank for Agriculture and Agricultural Cooperatives
BNP	:	Bicol National Park
BNPFI	:	Bicol National Park Foundation Inc.
BZMC	:	Buffer Zone Management Committee
CAS	:	Chinese Academy of Sciences
CBS	:	Central Bureau of Statistics
CENRO	:	Community Environment and Natural Resources Office
CF	:	Close to Forest
CISNAR	:	Commission of Integrated Survey of Natural Resources, CAS
CITES	:	Convention on International Trade in Endangered Species
CNPPA	:	Commission on National Parks and Protected Areas
CP	:	Close to Park
CPD	:	Cooperative Promotion Department
DAEO	:	District Agricultural Extension Office
DALRO	:	District Agricultural Land Reform Office
DAR	:	Department of Agrarian Reform
DCDO	:	District Community Development Office
DEM	:	Digital Elevation Model
DENR	:	Department of Environment and Natural Resources
DLG	:	Department of Local Government
DLO	:	District Land Office
DFO	:	District Forest Office
DNPWC	:	Department of National Parks and Wildlife Conservation
DOH	:	Department of Health
DSWD	:	Department of Social Welfare and Development
EPS	:	Environmental Protection Society
FAO	:	Food and Agriculture Organization
FF	:	Far from Forest
FLMD	:	Forest Land Management Department, RFD
FMB	:	Forest Management Bureau
FMD	:	Forest Management Division, RFD
FPPI	:	Foster Parents Plan International

GEF	:	Global Environment Facility
GIS	:	Geographic Information Systems
ha.	:	hectare
HMG	:	His Majesty's Government, Nepal
IIED	:	International Institute for Environment and Development
IPAS	:	Integrated Protected Area System
IUZ	:	Intensive Use Zone
ICDP	:	Integrated Conservation and Development Projects
IUCN	:	The World Conservation Union
kg.	:	kilogram
kms.	:	kilometers
KMTNC	:	King Mahendra Trust for Nature Conservation
KTWR	:	Koshi Tappu Wildlife Reserve
KYNP	:	Khao Yai National Park
LAD	:	Legal Affairs Division, RFD
LDD	:	Land Development Department
LRMP	:	Land Resources Mapping Project
LSU	:	Livestock Unit
MAB	:	Man and the Biosphere Programme
MTE	:	Myanmar Timber Enterprise
MPD	:	Mapping and Printing Division, LDD
NCNPP	:	Nature Conservation and National Parks Project
NGP	:	Non-governmental Organization
NPD	:	National Parks Division
NRF	:	National Reserve Forest
OAE	:	Office of Agricultural Economics
OEPP	:	Office of Environment Policy and Planning
ORZ	:	Outdoor Recreation Zone
PAEO	:	Provincial Agricultural Extension Office
PALRO	:	Provincial Agricultural Land Reform Office
PAWB	:	Protected Area and Wildlife Bureau
PCDO	:	Provincial Community Development Office
PENRO	:	Provincial Environment and Natural Resources Office
PFO	:	Provincial Forest Office
PNEO	:	Provincial Non-formal Education Office
PPHO	:	Provincial Public Health Office
PRNP	:	Phu Rua National Park
PSB	:	People Settlement Board
PZ	:	Primitive Zone
RCNP	:	Royal Chitwan National Park
RFD	:	Royal Forest Department
RNA	:	Royal Nepal Army
RZ	:	Recovery Zone
SIA	:	Social Impact Assessment
SNRZ	:	Strict Nature Reserve Zone

SWWR	:	Shivapuri Watershed and Wildlife Reserve
TAT	:	Tourism Authority of Thailand
TCC	:	Tambon Community Council
TDN	:	Total Digestive Nutrients
TDRI	:	Thailand Development Research Institute
TEAM	:	Environmental Awareness and Development Mobilization Project
TM	:	Thematic Mapping
UNDP	:	United Nations Development Programme
UNEP	:	United Nations Environment Programme
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
VDC	:	Village Development Committee
WCD	:	Wildlife Conservation Division
WCED	:	World Commission on Environment and Development
WCMC	:	World Conservation Monitoring Centre
WFT	:	Wildlife Fund Thailand
WMD	:	Watershed Management Division
WNR	:	Wuyishan Nature Reserve
WRI	:	World Resources Institute
WWF	:	Worldwide Fund for Nature
WWF-US	:	World Wildlife Fund
XNNR	:	Xishuangbanna National Nature Reserve

# INTRODUCTION

## I. BACKGROUND

---

There has been tremendous stress on environmental resources as a result of technological advancement, human population growth, desire for higher standard of living and global interdependence. The stress is ever more apparent by the gradual loss of critical natural ecosystems worldwide which has been the major factor in the alarming rate of biodiversity loss. Biological diversity, or biodiversity encompasses the variety and abundance of plants, animals and microorganisms as well as the ecosystems and ecological processes to which they belong (WCMC, 1992). There is a growing consensus among the scientific community that species of plants and animals are disappearing at an unprecedented rate. The primary habitats of several plant and animal species has variously fragmented, damaged and eventually lost. Human use, abuse and misuse of biological resources has grown tremendously over the past decades which has been the major threat to the relatively undisturbed ecosystem (WCED, 1987). The conservation professionals generally held the belief that there is an inverse relationship between human actions and the well being of the environment. Yet, much of the healthy natural environment that we see today have been the product of past human actions which have modified the natural ecosystem in many ways.

One of the approaches for the conservation of biological diversity is the conservation of natural resources in the protected areas to their perpetuity. This ensures the biodiversity that is crucial for life support systems in the biosphere (WRI/IUCN/UNEP, 1992). Comprehensive and well managed protected area systems is likely to be the most practical way to preserve the greatest amount of the world's biological diversity and the ecological processes that define and mold it (Wells et al., 1992). Since the establishment of the first national park in 1872, the Yellow Stone National Park in the United States of America, there has been steady growth in the world coverage of protected areas (Fig. 1). This growth has accelerated since the 1950s when many of the developing countries in Asia started establishing protected area networks. Today, 169 countries have recognized protected area networks with a total of 9,832 protected areas covering 926,349,646 ha of the world's land area (IUCN, 1994). While the current protected area network is adequate or not, is debatable, the existing protected areas particularly in the developing countries are under serious threat caused by multitude of factors. The majority of the developing countries lack large protected area system. Owing to rapid population growth and declining land resources, the developing countries may not be in a position to afford more establishment of protected areas. Although, protected areas in some countries constitute a large portion of the national territory, often they are "paper parks" which are lacking in manpower, budget and national commitment to protect it. Frequently, they comprise lands that are 'legislatively mandated' to multiple agencies with conflicting objectives (Ham and Meganck, 1993). The majority of the protected areas are experiencing serious and

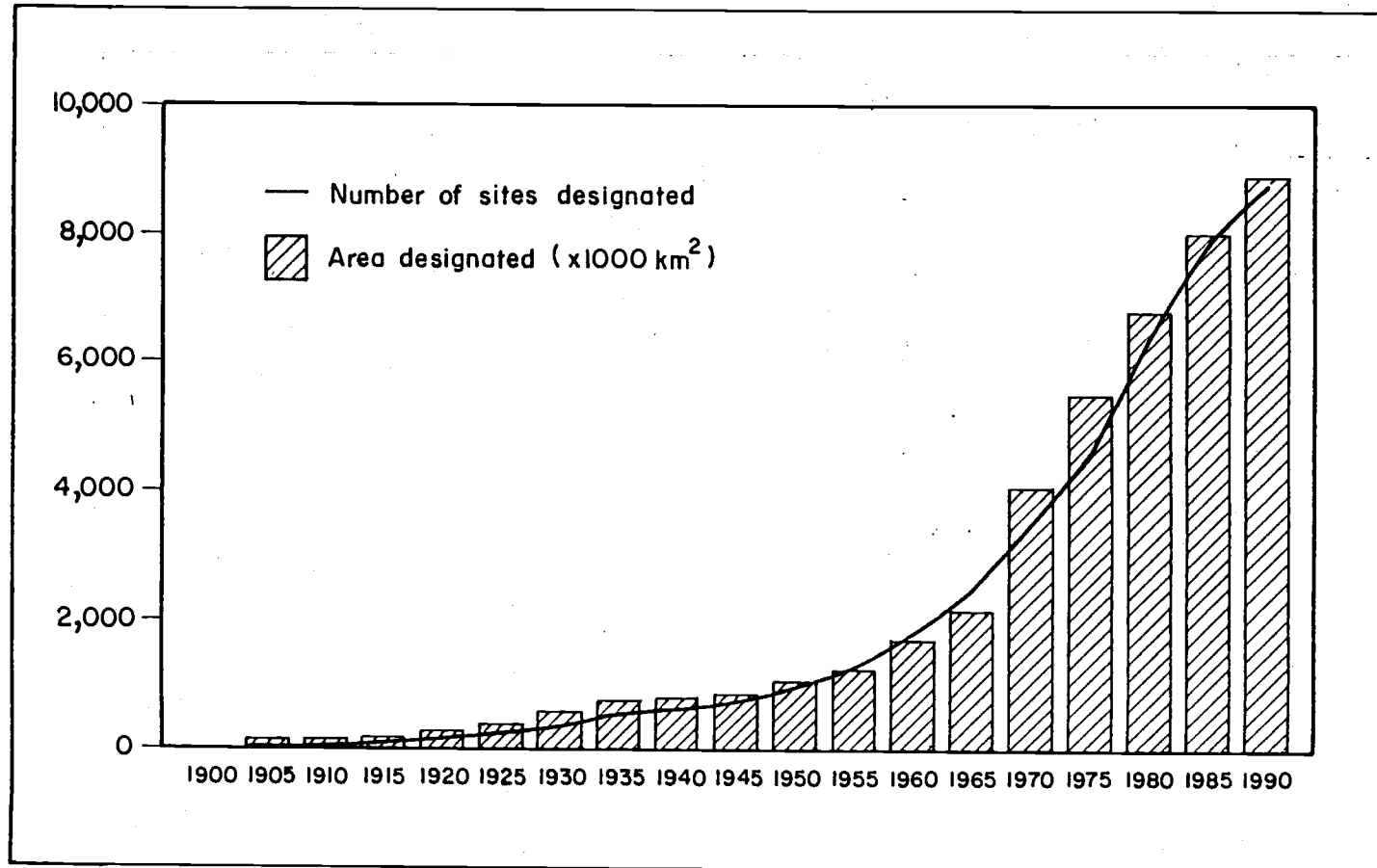


Fig. 1: Growth of the World Coverage of Protected Areas

Source: IUCN, 1994

increasing degradation as a result of large-scale development projects, expanding agricultural frontiers, illegal hunting and logging, fodder and fuelwood collection, and uncontrolled burning (Brandon, 1995). The problem of protected area is further complicated by the local people who inhabit and whose family may have traditionally inhabited, land adjacent to, or even within the protected area boundary. Often the boundaries of protected areas were drawn around the existing populations, instantly, converting what were once traditional lifestyles into "illegal activities". In developing countries, human settlements within or adjacent to protected area can, and inevitably constitute part of what is being managed and preserved (Arboleda et al., 1989 as cited in Ham and Meganck, 1993). The irony is that while protected areas are viewed as one of the precious resources of a modern society, those living in or adjacent to a protected area, who once controlled the resources within it, today, belong to one of the poorest sections of the society.

The protected area management philosophy in the past was mainly aimed at protecting spectacular scenery and providing recreational facilities, whereas in recent years, the concept has evolved to encompass habitats of endangered species and ecosystems rich in biodiversity (WCMC, 1992). Despite the theoretical appeal, protected areas have been hardly a model of success for achieving long-term conservation goals. One major issue is the over-emphasis on biological basis and legal status of protected areas as a means to conserve biodiversity, ignoring the needs and aspirations of resource users living in and around these areas. There is reason to believe that unless multitude of human activities, values and institutional arrangements that influence biodiversity conservation in protected areas are taken more thoroughly into account, conservation efforts will hardly be successful (Nelson and Serafin, 1992). Current approaches of protected area management recognize that efficient conservation and management must incorporate a broader perspective at local, regional, national and global levels. Increasing attention has been paid to the relationship between local people and protected areas and establishing linkage with rural regional development activities. It is realized that protected areas cannot be "locked away" from the surrounding human population. Without the support from the local community the efforts in protected area conservation are bound to fail. The separation of rural communities from areas they have traditionally managed could, in fact, reduce the conservation value of areas which the conservationists are seeking to protect. The 1980 World Conservation Strategy emphasized the importance of linking protected area management with the economic activities of local communities which was well addressed and adopted in the 1982 World Congress held in Bali, Indonesia. The conservationists and protected area managers gathered on that occasion called for increased support for communities living in or adjacent to protected areas through concerted efforts on education, benefit sharing, local participation in protected area planning and management, community development schemes and limited access to resources where compatible with the protected area objectives. More recently, a people-oriented approach to protected area management which attempts to balance conservation and development is envisaged (Wells and Brandon, 1992).

Many agricultural and forest people value and utilize wild resources. There is ample evidence from many different environments for effective sustainable management of natural resources by local people (Scoones et al., 1992; Gomez-Pompa and Kaus, 1992;



Nabhan et al., 1982 as cited in Pretty and Pimbert, 1995). The establishment of protected area has marginalized local communities and their livelihood needs are at risk. The lack of security ultimately undermines conservation objectives as poverty and rates of environmental degradation intensify in areas surrounding protected areas. Large sums of money have been invested in protected area conservation, encouraging and coercing local community to accept protected area management schemes. The result has been widespread disapproval of such schemes by the local community. Any attempts geared towards the conservation of wildlife and protected areas have run up against the harsh reality of an ever more rapidly growing human population, largely living in poverty and need of using natural resources to an ever greater extent. In situations where wildlife conservation is at odds with the livelihood of local communities, the former is always at the losing end owing to the fact that if it comes to setting priorities, members of local communities bitterly complain that their interests and values are pushed aside giving virtually exclusive preference to wildlife protection instead. This perception has resulted in hostile attitudes towards wildlife and the park staff which have faced open and intense conflicts between local communities and protected area authorities. In a sample of 100 parks from 49 countries, Machlis and Tichnell (1985) identified 1,611 specific threats to national parks (McNeely, 1989). The conflicts indicate reciprocal relationships between park authority and local people. The fundamental issues of these conflicts is local people's customary right of use of park resources, which has raised basic questions of humanity and survival. These have caused severe damage to park resources and jeopardized the accomplishment of set objectives to be met by park administration and management. Reality renders evidence that protected area conservation cannot be considered in isolation, without taking into account local people's needs and their often time-honored practices of natural resources utilization and making them beneficiaries as well of any such conservation activities. While there are conditions where wildlife can barely coexist with dense human settlements, there is also some potential in that wildlife can be an asset for the development of local communities. Recent experience in protected area conservation amply demonstrated that, if properly managed, wildlife can bring considerable economic benefits (Fitter, 1986; McNeely et al., 1990; Balakrishna and Ndhlovu, 1992). This has prompted several government and local conservation agencies to devise innovative ways and means to protect wildlife "that put economic forces to work in regional and national economies and seek to meet the needs of humans at local levels" so that the latter's attitude might be expected to change to become positive (WRI and IIED, 1987).

It is with this background that this study has been undertaken to explore the socio-economic conditions of local people living in or adjacent to selected protected areas in Asia and the underlying causes of success or failure of conservation efforts. The research is based on the premise that unless the livelihood needs of local people living adjacent to protected areas are adequately addressed and alternative strategies are implemented to make their views, perceptions and activities favorable to conservation, any government or international agency sponsored conservation activities, no matter how well they are designed will have to face extreme difficulty in ensuring adequate protection of parks and nature reserves.

## II. RESEARCH OBJECTIVES AND SCOPE

---

This research analyses the current situation of protected areas in five Asian countries, namely, China, Myanmar, Nepal, the Philippines and Thailand. A total of eight parks and protected areas are comparatively analyzed, two each in China, Nepal and Thailand, and one each in Myanmar and the Philippines (Fig. 2). Some of the protected areas covered in the research project, such as the Alaungdaw Kathapa National Park in Myanmar, Wuyishan Nature Reserve in China, Bicol National Park in the Philippines and Phu Rua National Park in Thailand are little discussed in the international protected areas literature, while issues related to Royal Chitwan National Park and Koshi Tappu Wildlife Reserve in Nepal, Khao Yai National Park in Thailand, and Xishuangbanna National Nature Reserve in China have been adequately exposed. Thus, a comparative analyses of these protected areas within the framework of global biodiversity conservation issues and specific examples of conflict resolution strategies discussed in a proper context is meaningful and interesting.

The case study on Wuyishan Nature Reserve by Li Zifeng (Chapter Two) explores the socio-economic conditions of the resident population inside the reserve, various positive and negative linkages between resident people and the reserve, local people's perceptions and attitude towards the reserve authority, and strategies that enhance the positive relationships while safeguarding the integrity of the park and serving the interests of the resident community. The second case study from China by Yu Xiao Gang examines the traditional natural resources utilization by the Dai and Jino communities living inside the Xishuangbanna National Nature Reserve (Chapter Three). The elements of natural resources conservation is examined in a religious and cultural context. Exploring the general attitude of the reserve officials towards the indigenous community and their traditional practices of natural resource utilization, the paper recommends strategies with a view to strengthen management capability. Briefly addressed in the paper is the issue of resettlement of some villages from the Xishuangbanna prefecture.

The case study from Myanmar, the Alaungdaw Kathapa National Park by Thauang Tint Lwin considers the overall management situation in that park (Chapter Four). Major issues discussed are the administrative capabilities of the park, local people and park relationship and visitor impact management. The emphasis is laid on management guidelines for strengthening the capacity to conserve biodiversity of the park.

The two protected areas from Nepal covered under this study examine the relationship between a protected area and local community in two different ecological settings. The case study from the Royal Chitwan National Park by Sanjay K. Nepal and Karl E. Weber centers around the theme of struggle for existence between wildlife and local people and the challenge of striking a balance between conservation and livelihood needs of local people (Chapter Five). The main issues taken into consideration are the relationship between park and local people, local people's dependency on park resources, possibilities of establishing a buffer zone, conservation attitudes and potential among local people, and alternative strategies for conflict resolution. The case study of Koshi Tappu Wildlife Reserve by Ram K. Shrestha and Karl E. Weber typifies the complex situation where livestock and wildlife compete for grazing grounds on an ever shrinking resource base as a result of man induced and natural problems (Chapter Six). Specifically, it examines the

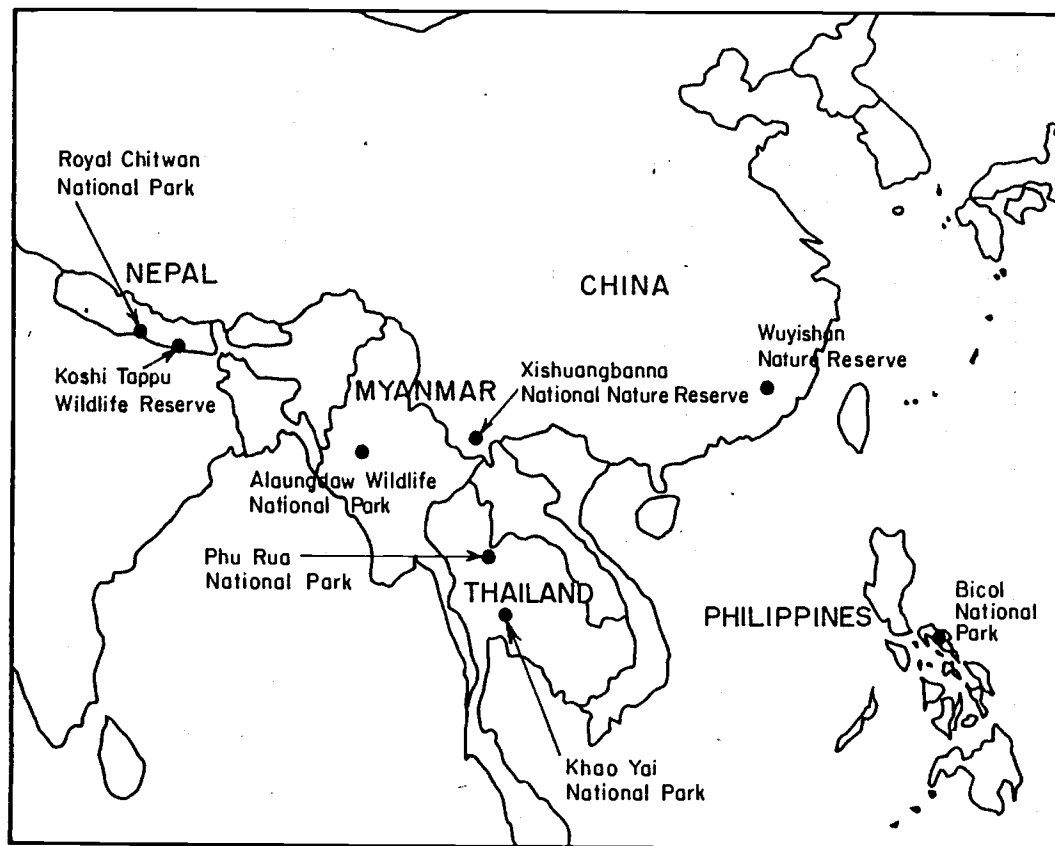


Fig. 2: Map showing protected areas under study

significance of livestock rearing in the households communities living adjacent to the reserve, livestock population characteristics and its management practices, the extent of impact on the wetland ecosystem, and socio-economic alternatives for the conservation and management of the wildlife reserve.

The Bicol National Park is taken as a case study from the Philippines by Christina A. Lantican (Chapter Seven). It examines the overall socio-economic situation of villagers living adjacent to the park and evaluates various actions and policies for the management of national parks and their implications on the Bicol National Park. Assessing the socio-economic impacts of the eviction of former occupants in the park, this paper identifies various roles of local and national agencies, units and institutions involved in the management of the park. Finally, certain management issues are discussed in detail with a view to recommend some corrective measures to strengthen the capability of the park.

The socio-economic issues in and around the Khao Yai National Park of Thailand, in the past, were never considered important aspects to be studied by the park management. It was only in 1987 that these issues were addressed in the management plan. Yet, not much has been accomplished mainly because of inadequate understanding of the human ecological issues related to the park. Realizing that clear understanding of the issues involved in strained park-people relationship is mandatory before searching for alternative courses of action, Tippawan Chatchaiwiwatana examines the socio-economic situations of the local communities living adjacent to the park, their dependency on park resources and attitude towards conservation (Chapter Eight). Furthermore, alternative strategies are explored and a plan of action is prepared. The second case study from Thailand is of the Phu Rua National Park in northern part of the country by Youngyut Trisurat (Chapter Nine). The overall objective of this study is to demonstrate the use of geographic information systems (GIS) and remote sensing as tools for identifying suitable zones in a protected area. It discusses the procedural requirements for applying GIS in delineating management zones. Certain management programs are suggested to resolve existing and potential land use conflicts.

Following the eight case studies, this research briefly discusses the paradigm of national park establishment and its impact on local livelihood (Chapter Ten). It then highlights major sources of conflict which have occurred in national parks in developing countries. Some theoretical approaches to conflict resolution as relevant to parks and protected areas are summarized, and several strategies, as employed in particular situations, are discussed. It is concluded that an in-depth understanding of the human ecology beyond the boundaries of protected areas and the conceptualization of strategies to resolve the innate problems are imperative. The integration of several strategies is deemed essential so as to address issues comprehensively and on a larger scale.

With detailed discussion of several case studies as well as review of overall protected area management situation, the major findings of the study are summarized (Chapter Eleven). This chapter also discusses the information needs of the local people vis-a-vis park authority. What local people need to know about the park is as much important as the need for the park authority to get reliable information on surrounding human populations and their socio-economic systems including resource use patterns. Finally, some research needs are identified and the usefulness of GIS highlighted. The identification of buffer

zones through the application of GIS is considered an important research agenda for the parks and nature reserves discussed in this study.

### **III. METHODOLOGY**

---

The specific case studies in the above mentioned five countries are based largely on Master's theses completed at the Asian Institute of Technology (AIT) during 1990-1994. The selection of case studies was made flexible, however, caution was taken so that they would reflect the overall theme of *protected area management under conditions of conflict*. The Phu Rua and Alaungdaw Kathapa parks differ somewhat from the other studies in that they reflect the management concerns as viewed by the protected area authority. The other case studies have adequately incorporated the local perspective on the management aspects.

The theses research were based on field visits supplemented by sources that included project proposals, progress reports and evaluations. Owing to the various methods of data collection which include structured questionnaire interviews, rapid rural appraisal techniques, group discussions with villagers, and the level of detail considered for each parameters, it is difficult to put them together in a comparative perspective. Thus, the quantitative data had to be converted to qualitative information. Rigorous review of many past and recent literature has provided proper context for the issues addressed. This has adequately put the specific case studies in a national, regional and global perspectives.

## Chapter One

# MANAGING PROTECTED AREAS IN ASIA: SELECTED CASE STUDIES

## I. INTRODUCTION

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Asia is one of the most densely populated area on earth, supporting nearly a third of the world human population in just six percent of its land surface. It is represented by some of the most spectacular natural scenery on earth, ranging from the highest peaks in Nepal to the coral gardens of the Philippines. In Asia, the interface between nature and humanity is often indistinguishable as it is difficult to determine where nature ends and human influence begins. The land coverage under protected areas in Asia has substantially increased over the past three decades. These represent the major centers of biodiversity, endemism, and *Pleistocene* refugia, however, certain habitat types are still under-represented (MacKinnon and MacKinnon, 1986).

The biogeographic range, geographic isolation, climate and attitude variation, and large number of diverse and isolated islands account for Asia's tremendous species richness (the number of species in an area) and high levels of endemism (the occurrence of a species in a certain locality or region only). Among the Asian countries, China and Indonesia are the most biologically diverse. Along with India and Malaysia, they are among the twelve so-called "megadiversity" countries which together account for 60 percent of the world's species (Mittermeier and Werner 1990 as cited in Braatz et al., 1992). In the Indo-Malayan realm, the greatest biological richness is found in the tropical rainforests of Indochina (Vietnam, Lao P.D.R., and Cambodia), South China, Indonesia, Malaysia, Papua New Guinea and the Philippines. In South Asia, the richest areas in terms of number of species and endemism are in India (the Western Ghats as well as Assam and other northeastern states), the eastern Himalayas (including eastern Nepal and Bhutan, and the lowland rainforests of southwestern Sri Lanka (Braatz et al., 1992).

The biological wealth of Asia is fast diminishing. Overall habitat losses have been most acute in the Indian subcontinent and China. The major ecosystems in the Indo-Malayan realm are estimated to have lost almost 70 percent of their original vegetation. Bangladesh, India, southwest Sri Lanka, Vietnam, coastal Myanmar, south and central Pakistan, Thailand, the island of Java in Indonesia, and the central islands of the Philippines have experienced extensive conversion of their natural habitats. One of the major cause for the decline in biodiversity in Asia is the loss of forest cover as a result of deforestation. Deforestation is a serious problem in most parts of the Indo-Malayan region. Nearly all of Southeast Asia was forested a century ago, but now it is estimated that only one-third is still under forest cover. While Bhutan and Malaysia have retained large portions of their natural forests, many of these areas are now under threat of logging and agricultural encroachment. In addition, excessive poaching, hunting and non-timber forest

product collection, as well as introduction of exotic species and increasing pollution, all pose major threat to specific species and habitats in the region (Raven, 1988 as cited in Braatz et al., 1992). In 1988, FAO reported extremely high deforestation rates (over 1.5 percent annually) in China, Nepal, Sri Lanka, and Thailand, while the WRI statistics suggests the same rate for India, Myanmar, the Philippines and Vietnam. Overgrazing by livestock and conversion to cropland are the principal threats to the grassland ecosystem of Asia. Large areas of China's grasslands have already been converted to agriculture and an estimated 30 percent of those that remain are degraded (Chinese Academy of Sciences 1990). Mangroves, marshes and inland bodies of fresh, brackish and salt water support large numbers of aquatic and terrestrial organisms as well as waterfowl and shorebirds. More than half of Asia's wetlands are in seven countries: Bangladesh, China, India, Indonesia, Myanmar, Papua New Guinea and Vietnam, however, most of them are under threat of one or the other kind. Similarly, the marine areas are also under significant threat from the effects of urbanization, industrialization, off-shore mining, agricultural growth, overfishing and oil pollution. More than half the coral reefs in the Philippines and Indonesia are in advanced states of destruction, and conditions in Thailand and Malaysia are probably similar (White, 1988 as cited in Braatz et al., 1992).

The coexistence of people and nature in Asia is the result of a long history. Humans have always played an important role in forming the ecosystems that are today considered "natural" (Mishra, 1991). The concept of protected areas dates back to the 4th century BC in India, with the establishment of *Abhayaranyas* or forest reserves, advocated in the *Arthasashtra*, the well-known manual of state-craft (Singh, 1985 as cited in Collins et al., 1991). Though, protected areas have a long history in Asia, over the centuries, natural resources have come under increasing pressure. Human dependency on natural resources have never been so high in the past as it is now. Today, the region is experiencing rapid economic growth, albeit, with heavy environmental costs, such as reduction of biodiversity and loss of local autonomy over natural resources. As the exploitation of natural ecosystems has accelerated, the governments of Asia have realized that conservation of samples of relatively intact natural ecosystem is a fundamental part of sustainable land use. National parks and other forms of protected areas have been one of the most universally adopted mechanisms for nature conservation, however, many of the protected areas are under some degree of threat from encroachment or poaching, resulting from a conflict between the conservation of nationally or internationally important sites and the needs of the local communities traditionally dependent on the resources of such areas.

The modern concept of parks and protected areas in Asia started in the second quarter of this century. Many protected areas were originally forest reserves established over the past hundred years or so to safeguard timber, soil and water resources and were subsequently designated as national parks or sanctuaries. Many of the existing protected areas of India, Indonesia, Thailand, Myanmar, and Malaysia, for example, have evolved from forestry traditions. While the primary role of forest reserves has usually been to provide for controlled commercial exploitation, their conservation importance is increasingly being recognized. Thailand, for example, has 1218 forest reserves covering 45 percent of its total land area in 1989. Though some of them actually have few trees, they

are classified as production or conservation forests; the latter category includes watershed areas, as well as national parks, wildlife sanctuaries, non-hunting areas and forest parks.

The earlier establishments of protected were largely derived from the North American model which envisioned parks as representatives of *the vignette of primitive America*, laying emphasis on "setting aside" certain "special" places to protect them from the ravages of ordinary use (Hales, 1989). This concept is ill suited to the needs of the developing countries in Asia, where the socio-economic and political conditions are much different. The majority of the parks and protected areas are surrounded by agricultural lands with dense human population, mostly dependent on a subsistence economy. The local people had been accustomed to the free collection of various forest products in areas, which later were designated as national parks or reserves. The establishment of a national park and imposition of various rules and regulations restricted utilization of natural resources resulting in serious conflicts between local people and the park authority. Conflicts have arisen between modern and traditional forms of resource use. The quest for more land, firewood and fodder has resulted in clearing of the pristine forests and grasslands thereby threatening the existence of protected areas. While some protected areas such as in the Philippines and Thailand have become refuge for illegal settlers, in others, they have been logged, burned or are facing threats due to development activities immediately outside their boundaries. The use of explosives in many marine parks have destroyed coral reefs such as in the Tubbataha National Marine Park in the Philippines (Mishra, 1991).

Protected areas were often established on an *ad hoc* basis, with little regard to ecological or other criteria. However, more systematic approaches have now been adopted in countries like Thailand, Indonesia, India, Nepal, Philippines and Malaysia. The traditional approach of protected areas being "locked away" from surrounding areas are increasingly unpopular owing to intensified human pressures. They are being replaced by concepts based on management of natural areas to support sustainable development (McNeely and Miller, 1984; McNeely et al., 1989). The need for a more strategic approach to conservation that anticipates and prevents the more destructive impacts of development policies is clearly identified in the final report of the World Commission on Environment and Development (WCED, 1987). A useful tool in promoting such an approach is the preparation and implementation of national conservation strategies whereby the processes of conservation and development are integrated. These are already completed or underway in Bangladesh, India, Sri Lanka, Thailand, Vietnam, Nepal, Malaysia and the Philippines.

At the local level, protected areas need to be linked with rural development projects, rather than becoming isolated from surrounding land usage. The majority of protected areas in Asia tend to have uneasy relations with the people living around them. This has been mainly because the local people pay the costs of conservation though not being able to harvest resources as they might wish, while the bulk of the benefits go to the nation at large or even to the international community.



## **II. FACTORS AFFECTING PROTECTED AREA MANAGEMENT IN ASIA**

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The majority of protected areas in Asia are facing several external and internal threats. It is rather challenging to balance conservation goals with the needs of local people by adopting a suitable protected area management strategy (Fig. 3). The problems of protected areas are also complicated by the involvement of a large number of stakeholders who usually have conflicting objectives (Fig. 4). The local people are often the worst victims of protected area establishment in Asia. The management suffers from inadequate legal provisions, institutional weaknesses, inadequate funding and manpower, and limited opportunities for public and NGO involvement (Braatz et al., 1992). Moreover, lack of political commitment for protected areas by the national governments is crucial.

Most Asian countries have basic conservation legislation related to wildlife protection and the establishment of protected areas, although many of the laws are weak and aimed at conserving species rather than habitats. Legislation is most comprehensive in China, while in the Philippines, it is being enacted. The government agencies responsible for protected area management have extremely limited operational capabilities and political influence. Most agencies such as in Nepal, Philippines and Thailand are overcentralized and many have hostile relationships with local communities. Responsibility for wildlife conservation usually lies with Forestry Ministries or Departments. The local governments also differ widely in terms of commitment, capacity and financial resources for protected area management. The existing level of government expenditures is inadequate to assure the long-term survival of protected areas. While Thailand has set aside almost 0.2 percent of its national budget for conservation, countries such as Nepal, Myanmar and the Philippines have very little portion of the national budget on conservation programs. Most of the budget is spent on outlays for acquisition of the lands to be protected, preparation of management plans and capital expenditures for building roads and facilities and for operation of the protected area (Dixon and Sherman, 1990 as cited in Braatz et al., 1992). Much less is spent on research and monitoring programs which is one of the main weakness of protected area in Asia.

The shortage of manpower is another issue in the Asian protected areas. Even where adequate manpower exists, they are inadequately trained and lack basic knowledge in protected areas. Most of the mid or senior level staff are either foresters or biologists who have a traditional view of protected area management and fail to understand why protected areas need to support activities beyond its boundaries. Human and sociological issues are of less interest to them. This limits a country's ability to plan and manage effective conservation programs and conduct research, and monitoring. In addition to the shortage of trained staff, most countries do not have enough trainers and educators for the planning and management of protected areas. They lack institutions, programs and materials for training, as well as facilities to provide students with practical field experience. There is a critical need to develop conservation training programs for lower, mid and upper-level staff.

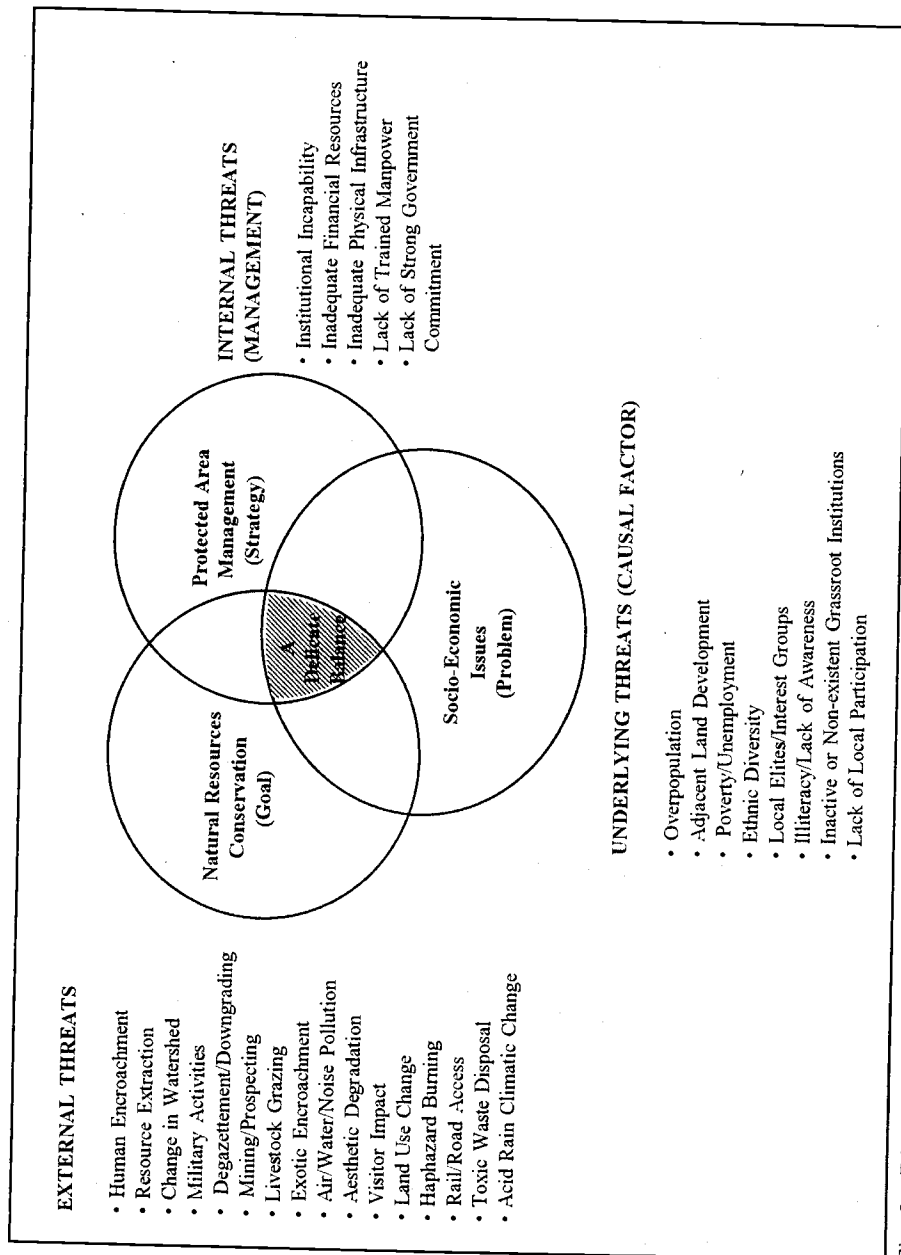


Fig. 3: Dimension of Protected Area Conflicts

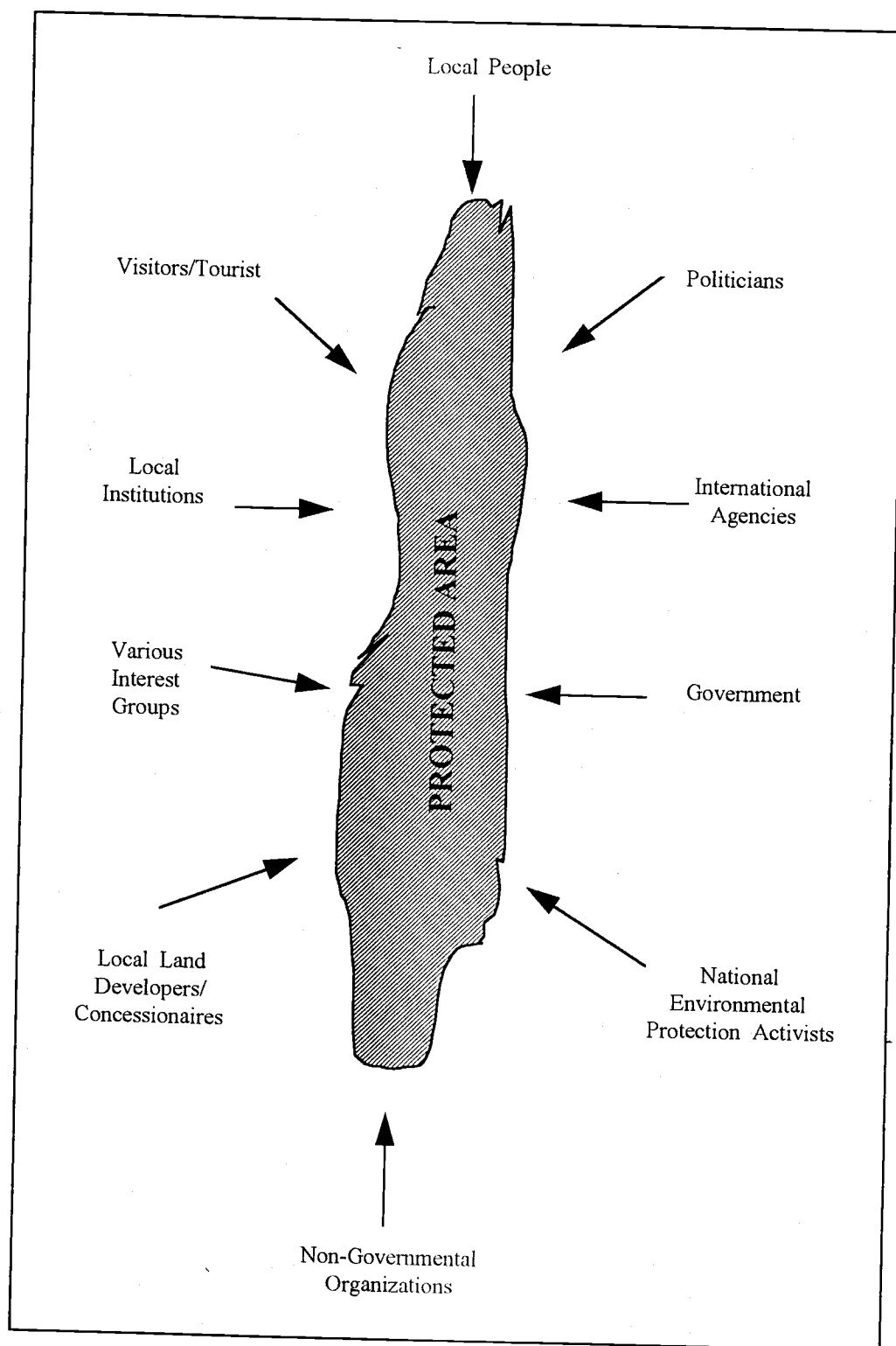


Fig. 4: Major Stakeholders Involved in Protected Area Conflicts

The national commitment to biodiversity program tends to be strongest in countries with strong NGOs that play an advocacy role vis-a-vis governments such as in Nepal, the Philippines and Thailand where there are relatively strong and active environmental movements. The presence of NGOs capable of implementing conservation initiatives at the local level can expand a country's absorptive capacity for international funds and increase the effectiveness with which these funds are used. Those directly involved in protected area management include the King Mahendra Trust for Nature Conservation in Nepal, the Haribon Foundation for the Conservation of Natural Resources in the Philippines, and Wildlife Fund Thailand. For political reasons, the development of local NGOs are limited in Myanmar and China. Most of the governments in Asia have yet to institute policies or devise land management systems that will secure the conservation of protected areas in the future. Government commitment to conservation looks good, however, when it comes to implementation of laws, policy or regulations, they are less effective.

### **III. PROTECTED AREAS IN SELECTED ASIAN COUNTRIES**

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This section briefly gives the overall situation of protected area management in China, Myanmar, Nepal, Thailand, and the Philippines with particular focus on conservation issues, legal status, administrative strength, national and international support for conservation, and relationship with local people. All the above countries have experienced extensive conversion of their natural habitats, owing to intensified human pressures. The protected area system in these countries are diverse in many ways, yet they have striking similarities, particularly the local community's need and dependency on natural resources within protected areas. While countries such as China and Thailand are now experiencing slow population growth, Myanmar, Nepal, and Philippines are characterized by high population growth. However, the rate of degradation of natural habitats are very similar, with all the countries experiencing deforestation over one percent per year. Except for Myanmar, all the other countries have fairly well protected area systems. Though Myanmar has 16 wildlife sanctuaries and five parks, only two of them are officially recognized as having adequate protection and relatively well-managed. In terms of land coverage, the highest percentage of land gazetted for protected areas are Thailand (12.6 percent) and Nepal (almost 8 percent, however, if conservation areas are included, it is almost 14 percent). While China has gazetted 3.2 percent of its land area as protected areas, Philippines has only 1.9 percent and Myanmar 0.3 percent (Table 1). In all of these countries, the legal system are still inadequate to address many conservation issues, including the relationship with local community, while amendments are needed to incorporate the changing policy thinking in managing parks and protected areas.

The protected areas in these countries vary significantly in terms of their value for biodiversity conservation. Some have been established primarily for recreation and tourism and have limited biodiversity value; others are either too small or too degraded to contribute effectively to conservation. An alarming number are "paper parks", areas that despite their designation receive little or no effective protection or management and derive no benefits from their special status. Frequently, boundaries are not marked and are unclear to local people, infrastructure is nonexistent, staffing and budget are insufficient,

inventories of fauna and flora have not been conducted. There is no conservation management plan and where exists are outdated and are not followed. Human activities incompatible to conservation are widespread with no significant effort to check such activities. In the Philippines, for example, many of the protected areas are so seriously degraded that they make little or no significant contribution to the conservation of biological diversity. Illegal wildlife hunting, logging and agricultural encroachment are prevalent throughout much of Asia's protected areas.

Table 1: Status of Forest and Protected Areas in Selected Asian Countries

Country	Land Area (000 km <sup>2</sup> )	National Forest Area (000 km <sup>2</sup> )		Annual Deforestation (000 km <sup>2</sup> )	% Deforested of total area (1981-90)	Nationally Protected Areas (1993)		
		1980	1990			(000 km <sup>2</sup> )	Nos.	% total area
China	9326.41	1150	NA	NA	NA	434	3.2	NA
Myanmar	657.74	329	289	4.0	1.2	2	0.3	1389.6
Nepal	141.78	56	50	0.5	1.0	12	7.9	473.3
Philippines	298.17	110	78	3.2	2.9	27	1.9	816.2
Thailand	511.77	179	127	5.2	2.9	106	12.6	15097.3

Source: World Development Report 1994

Note: NA - data not available

## China

China consists an extensive range of natural ecosystems with rich and varied natural habitats. With an exception of equatorial rain forests, every type of natural ecosystems of the Northern Hemisphere is represented in China. The majority of China's reserves protecting comprehensive natural ecosystems are located in cold-temperate coniferous forest regions, temperate coniferous and broadleaf mixed-forest regions, subtropical broadleaf evergreen forest regions, tropical monsoon rain forest and tropical rain forest regions. Few of them are in temperate grassland areas and temperate desert areas of the Qinghi-Tibet plateau. The nature reserves are mainly concerned with the preservation of primeval natural ecosystems. The value of China's nature reserves goes far beyond aesthetics. They are of immense importance to scientific research, environmental protection, education, and tourism.

China possesses 27,150 species of higher plants, which fall into 353 families and 3,184 genera, of which 190 are peculiar to China. There are many economically valuable plants which are used in herbal medicine, nutrients and for the purpose of scientific research. There are approximately 414 species of animals, 1,175 species of birds, 196 species of amphibians, 315 species of reptiles and over 2,000 species of fish which accounts about 10 percent of the species found all over the world. This mine of precious species includes a number of rare and endemic animals as well. There are 68 animal species at the first level of national protection and almost 100 species of birds and animals at the secondary and tertiary level of protection (Wenhua and Xianying, 1989). There is a wealth of aquatic resources including over 800 species of fish, the greater proportion of which are endemic.

The first nature reserve, Dinghu Mountain Nature Reserve was established in 1956 for the conservation of southern subtropical monsoon rain forest in Zhaoqing City, Guangdong Province. After ten years of the first establishment, only 19 reserves had been set up. During 1966 to 1976 China was rocked by the political and social upheaval unleashed by the Cultural Revolution. During this decade of chaos, many nature reserves were severely damaged, for example, in Yunnan Province between 1949 and 1988, forest cover decreased from 50 to 21 percent (China Conservation Strategy, 1990). Some of the nature reserves lost their original protective values while expansion of new reserves was completely suspended (Wenhua and Xianying, 1989). Since 1979 the management of nature reserve has steadily improved - from 45 nature reserves to 434 different categories of protected areas. Among these, four natural sites have been included in the World Heritage List while there are seven Unesco Man and Biosphere Reserves.

The Forestry Law of 1979 provides for the establishment of forest reserves, the management and administration of forests and prevention of hunting in forests (Richardson, 1990 as cited in IUCN, 1993). Except for the 31 national nature reserves directly administered by the central government, other nature reserves are under the provincial jurisdiction. In 1980, China joined the IUCN, became a party to Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and formulated a new Wildlife Policy Act, stressing the rational use of conservation of wildlife (IUCN, 1993). The Ministry of Forestry retains responsibility for coordinating protection of all protected areas on forest lands.

The present human population and economic and technological advancement have taken a heavy toll on the country's natural resources. Any attempt made by the government for the protection of parks is seen with suspicion. Local people are antagonistic to park related conservation activities while the attitude towards the park authority is unfavorable. The center-based government institutions have ignored the traditional practices of the local community and no systematic efforts have been made to tap the potential of the indigenous people's knowledge, use and management of natural resources. The majority of the protected areas have neighboring human settlements. The major conservation problems in and around the protected areas in China are caused by illegal wildlife poaching of species such as giant panda, snow leopard, musk deer, lynx, brown bear; grazing by domestic stock; illegal logging resulting in habitat destruction; overfishing; exotic species encroachment; damage to crops by wildlife such as wild pig, black bear, monkey, pheasant; and killing of domestic livestock by snow leopard, wolves. Other problems include unsustainable land use practices in surrounding areas, insufficient patrolling resulting in increasing cases of poaching and logging, local people vandalizing park properties such as removal of sign posts and fence etc.

## ***Myanmar***

Situated between the Indian subcontinent and the Southeast Asian peninsula, Myanmar has an ecological spectrum of almost unique variety, ranging from tropical rain forests and coral reefs in the south to temperate forests of conifers, oaks and rhododendrons in the far north. The climax vegetation in coastal areas is lowland rain forest, with mangroves and

freshwater swamp forest in the Ayeyarwady Delta and flood plain. The Forest Department recognises 11 Burma standard forest types: closed broad-leaf forests comprising tidal mangroves, beach and dune, swamp, evergreen, mixed deciduous, deciduous dipterocarp, and hill formations; closed coniferous pine forest; bamboo forest, and scrub formations comprising dry scrub and deciduous woodland scrub (IUCN 1993). These forests are the habitat of nearly 300 known mammal species, 360 reptiles, about 1000 bird species and 7000 plants (FAO, 1985 cited in Lwin et al., 1990).

The legal protection of natural resources rests on two acts dating back to the pre World War II colonial period - the 1902 Burma Forest Act and the 1936 Burma Wildlife Protection Act. Although, these two acts theoretically provide protection for wildlife in both reserve forests and in wildlife sanctuaries, neither act includes specific measures for protecting habitat (IUCN 1993). The responsibility for managing the forest resources, protecting wildlife and managing game sanctuaries rests with the Forest Department which is one of the oldest in Asia. Its power is limited, however, because the Myanmar Timber Enterprise responsible for timber extraction, processing and sale is politically more influential (Collins et al., 1991).

There are five parks and 15 game sanctuaries, however, IUCN has recognized only two of them which represent only 0.3 percent of the country's land territory as the other protected areas were badly neglected over the past 30 years and, thus, remain as "paper parks". Between 1981 and 1984, UNDP and FAO carried out a Nature Conservation and National Parks Project to identify areas suitable for national parks and nature reserves. Surveys and feasibility studies were conducted over 24 areas, and several critical sites were identified in the rainforests, namely, Nam Lang Valley, Packchan, Alaungdaw Kathapa, Lampi, Kyankpandaung and the Moscos Islands (Salter, 1994). A proposal to follow up the work has not been pursued owing to political uncertainties. In 1985, the country established its first national park - the Alaungdaw Kathapa. The legislative basis for this national park is not clearly defined. The current protected area system is largely inadequate and if all proposed sites were to be gazetted, approximately, four percent of land would be protected. However, these would not provide adequate coverage of all major ecosystems, nor ensure the survival of even such significant species as elephant.

There are hardly any cooperative projects between the Myanmar Government and international bodies as the Government has pursued an isolationist foreign policy. The efforts in nature conservation are largely restricted to the only national park. The management of other game sanctuaries tends to be on *ad hoc* basis, usually limited to infrequent patrolling and is hampered by inadequate staff, resources, support and relevant infrastructure in the Forest Department. The protected areas of Myanmar are directly threatened by their inadequate size, and representation of important biota and by weak and poorly-enforced legislation (Blower, 1982 as cited in IUCN, 1993). Indeterminate amount of poaching occurs inside the protected areas. Effective law enforcement and the prevention of poaching in reserved forests and game sanctuaries is difficult due to inadequate field staff and heavily armed poachers and insurgents. There is extensive encroachment in many of the existing forest reserves. Although, some of the game sanctuaries have provided the local community legal rights to collect minor forest

products, timber house-posts, fuelwood, and thatch grass, the relationship with the local community is not favourable. Thus, many protected areas are seriously damaged and have little conservation value.

## *Nepal*

The physiography of Nepal represents some of the most spectacular landscapes in the world. Situated at the junction of the Indomalayan and Palaearctic biogeographic realms, within a distance of less than 150 km, there is exceptional diversity of habitats and varieties of wildlife species. Including many endangered mammals and reptiles, the kingdom records about 175 species of mammals, over 850 species of birds, 180 species of fish, some 640 species of butterflies, and more than 6,500 species of flowering plants (HMG/UNDP, 1994).

The protected area network in Nepal covers almost 8 percent of the total land area. If the two conservation areas, namely the Annapurna Conservation Area Project (ACAP) and the Makalu Barun Conservation Area are included, the total coverage increases to almost 14 percent (Gurung, 1994). The first protected area, the Royal Chitwan National Park was established in 1973. Two of the national parks, namely, Sagarmatha and Royal Chitwan, have been included in the UNESCO World Heritage in 1979 and 1984, respectively. The Koshi Tappu Wildlife Reserve has been designated as a wetland of International Importance in 1987 under the Ramsar Wetland Convention. Nepal is a state signatory and member of several international conventions and organizations relating to wildlife and environmental conservation.

Conservation practices dates back many centuries in the Nepalese society. Historically, various traditional systems of resources management had evolved during the 19<sup>th</sup> century which were abolished in 1957 by the Forest Nationalization Act. The new Constitution of the kingdom of Nepal 2047 (1991) has formally recognized the need to preserve the environment and use natural resources wisely (IUCN, 1993). A national conservation strategy for Nepal was completed in 1987 and endorsed as a national policy in 1988 (HMG/IUCN, 1988 and 1991). The modern conservation era in Nepal began in the 1950s, with the publication of first wildlife law of Nepal in 1957 (HMG, 1977 as cited in Heinen and Kattel, 1992b). This law ensures the legal protection of rhinos and their habitat. The National Park and Wildlife Conservation Project in 1973 is probably the major effort in implementing the National Park and Wildlife Conservation Act 2029 (1973). This act supersedes the Wildlife Conservation Act 2015 (1958) and the Hunting Rules of 1967, under which six royal hunting reserves were established in July 1969 (Heinen and Kattel, 1992). This is the comprehensive legislation which enables the Government to establish areas as a national park or reserve. The concept of conservation area has been recognized with the subsequent amendment in 1989. Various regulations were introduced under this Act with subsequent amendments in due course of time. The fourth amendment of the National Park and Wildlife Conservation Act in 1993 recognizes the necessity to establish buffer zones near parks and protected areas. It also accommodates the involvement of local people in the conservation and management of protected areas. An amount ranging from 30 to 50 percent of the revenue earned by the



parks and protected areas may be used for community development in the buffer zones (UNDP/HMG, 1994).

Except for the ACAP and Shivapuri Watershed and Wildlife Reserve (SWWR), all protected areas are managed by the Department of National Parks and Wildlife Conservation (DNPWC). The ACAP is managed by the King Mahendra Trust for Nature Conservation (KMTNC), and the SWWR by a Department Board under the Ministry of Forest and Soil Conservation. The Makalu-Barun National Park and Conservation Area Project is managed by the DNPWC in collaboration with The Mountain Institute of United States. The Warden is responsible for overall managing and protecting parks and reserves and is directly accountable to the Director General of the DNPWC. However, the regular protection and security activities are carried out by the Royal Nepal Army (RNA). The system of army protection force was introduced by replacing armed park guards in Chitwan in 1974. The army units are not accountable to the Wardens for any of their activities and receive no specific training on conservation and management. The protection force shares about 70 percent of the total budget of the DNPWC (Heinen and Kattel, 1992). This dual nature of organizational structure of parks and reserves of Nepal distorts the line of command and creates several inconsistencies in protected area management.

The major challenge to the management and conservation of park and protected areas has emerged from surrounding communities who depend on subsistence agriculture. Owing to the poverty stricken condition of people living in the vicinity of protected areas, local people have relied on the parks for most of their necessities such as firewood, fodder, timber, roots and tubers, herbal plants and game meat. The imposition of the park establishment has caused resentment among local community resulting in hostile attitude towards wildlife conservation and negative feelings for the park staff. As livestock is an integral component of the farming systems in Nepal, the ever increasing livestock population in the periphery of protected areas, particularly in the southern Terai belt, continue to jeopardize their existence owing to the competition between domestic stock and wild animals for foraging grounds. As an extreme case, the Koshi Tappu Wildlife Reserve even has livestock population permanently residing inside it, resulting in mixed herds of wild and domestic water buffalo. The UNDP funded Park- People Project addressing this issue is recently being implemented in the adjacent communities of five parks and reserves in the Terai region (HMG/UNDP, 1994).

The local people living around in some parks and are allowed to collect thatch grass for a two-weeks period. There are several other provisions of providing benefits to the local people such as fishing, hunting, grazing, tourism, and collecting other important resources depending upon the category of protected areas. A conservation area concept has been introduced in ACAP which accommodates local people inside the protected areas and their progressive involvement in the resource conservation and management. Similar concept has been replicated in Makalu Barun Conservation Area. Protected areas play a very important role in the tourism industry which generates 48.5 percent of gross foreign exchange earnings (IUCN, 1993). In 1989, protected areas received a total of 84,840 visitors; Annapurna Conservation Area and Royal Chitwan National Park being the most popular destinations.

It appears that there is a major gap in the protected area coverage in the altitudinal belt of 500 meters to 2000 meters. This omission is significant because the middle hills contain 61.1 percent of the total forests, including many forest ecosystems not represented in other protected areas. Most of the protected areas are located on high Himalayas or high mountain habitats (three-fourth of all conservation areas comprise habitats of the Himalayas region). The middle mountain and Siwalik zones are poorly represented with only 1.4 percent in the case of the high Himalayas whilst from a biodiversity point of view the middle mountain zone encompasses exceedingly rich areas.

### ***The Philippines***

The Philippine archipelago, consisting of more than 7,100 islands and islets, is endowed with rich terrestrial, wetland and marine resources. The water cover of the country runs about 1,666,300 km<sup>2</sup>, almost five times greater than the total land area. There are 62 National Parks, 7 Game Refuge and Bird Sanctuaries, 10 Wilderness areas, 36 Municipal Forest Parks and 64 Barangay Forest Parks encompassing about 1,443,994 ha of land area (DENR, 1992a). However, a number of parks and protected areas only exist on paper and almost all of them have been encroached upon. About 90 percent of lowland forests in the Philippines have disappeared in the past thirty years, causing massive losses in biodiversity. Today, only five percent of the land remains under mature natural forest. The first national park in the Philippines, the Rizal Dapitan National Park, was established during the United States administration through the enactment of Executive order in 1910. However, the formal protected area legislation for the establishment of national park and protected areas was promulgated on February 1, 1932. The IUCN has recognized a total of 605,927 ha of protected area which is roughly 2.02 percent of the national territory.

There are three major habitat zones with rich flora and fauna. Several corals, algae, protozoan, seagrasses and fishes make their home in the marine habitats. Wetland habitats consist of mangroves and fresh water swamp forests. Terrestrial habitats include alluvial, molave, dipterocarp, pine and mossy forests suitable for several plant and animal species. Wildlife in the Philippines are mainly represented by Philippine macaque (*Macaca fascicularis*), wild pig (*Sus sp.*), deer (*Cervus sp.*), Philippine squirrels (*Petinomys sp.*, and *Hylopetes sp.*), several birds species including the rare and endangered Philippine eagle (*Phithecophaga jefferyi*), Philippine Hawk (*Spizaetus philippinensis*), the black-winged Kite (*Elanus hypoleucus*), and different species of owls, doves, and fowl in dipterocarp forests. There are varieties of amphibians and reptiles. The birds species occurring in the pine forest habitats include avian species such as *Zosterops*, *Dicaeum*, *Nectarinia*, *Pyrshula*, *Loxia* and *Erythrura*. The Philippine deer (*Cerbus sp.*), wild pig (*Sus celebensis*), tree shrews (*Tupaia sp.*, and *Urogale sp.*), and ground shrews (*Suncus sp.* and *Crocidura sp.*) are common in the mossy forests.

The 1987 Constitution of the Philippines mandates the state ownership of all natural resources, which includes fisheries, forests, wildlife, and other natural resources (DENR, 1992a). It has declared that the boundaries of forest and national parks must be marked clearly on the ground and thereafter they shall be conserved and will not be increased or

decreased except by act of congress. The law on protected areas could be traced from 1932 with the enactment of Act no. 3915, providing mandate for the establishment of national parks, declaring such parks as game refuges and for other purposes. This Act also prescribed the management system, protection and development of protected areas. The law was in effect until the proclamation of PD 705, the Revised Forestry Reform Code of the Philippines. The efficiency of legal documents are now the subject of review in light of the existing population and land uses and the mission of the Integrated Protected Area System (IPAS) program. The major issues being addressed are on categories of protected areas, agreeable and allowable uses, buffer zones management, involvement of NGOs and community participation.

The management and conservation of the national park and protected areas rests upon the Department of Environment and Natural Resources (DENR). Prior to the Constitution, the national park management was under the Bureau of Forestry Development from 1972 to 1986. Between 1952 and 1972, the management of national parks was carried out by separate and distinct office, the Parks and Wildlife Office, administered under the Bureau of Forestry. The Protected Area and Wildlife Bureau (PAWB) is one of the six staff bureaus of the DENR primarily concerned with the establishment and management of protected areas, wildlife resources conservation, habitat management and nature conservation education. The PAWB operates with the regional offices of DENR providing technical assistance, briefing on wildlife policy, conducting resources inventory, education programs, and field operations. The Provincial Environment and Natural Resources (PENR) offices and Community Environment and Natural Resources (CENR) offices of the DENR implement the policies and programs such as protection, patrolling, habitat restoration, maintenance and interpretation for visitors.

The PAWB initiated its IPAS program with the technical assistance received from the World Bank. The IPAS is the recent concept integrating conservation and development which was studied and reviewed by the World Bank and Asian Development Bank. The program considers the assessment of parks and protected areas on the basis of flora, fauna, soil, land use and other socio-economic parameters. The debt-for-swap program of World Wildlife Fund is assisting the St. Paul Subterranean National Park, and El Nido Marine Reserve through the Haribon Foundation, a local NGO.

Other special projects related to resources conservation include Ninoy Aquino and Wildlife Nature Center, Pawikan Conservation Project, Tamaraw Conservation Project, Philippine Eagle Conservation Project, Philippine Flying Lemur (*Cynocephalus volans*) Project, Philippine Tarsier Conservation Program, Bird Banding, Crocodile Farming Institute, Integrated Protected Area System and Debt-for-Nature Swap. The Philippines is a member of ASEAN Nature Conservancy Group, IUCN, CITES, and Heritage Sites.

Most of the present protected areas are not representative of the range of biounits, ecosystem types and habitats of the Philippines. Even the sizes are too small (less than 100 ha) to provide habitat and protection of biodiversity. Some national parks are actually historical shrines and recreational areas. Protected area administration has historically been weak due to many institutional reorganizations. Inadequate staff, fund, training and

administrative support are common problems. There are no formal provisions for involvement of NGOs and local people's participation. However, the involvement of the private foundations such as the Bicol National Park Foundation and the Tubbataha Marine Park Foundation to assist the Government in protection and restoration is entirely a new approach. Three other foundations are now handling separate wildlife projects. The development of recreational facilities in four national parks are being financially assisted by the Department of Tourism. There are some national parks which are under the administrative control of the Department of Tourism, National Power Corporation and the Philippine National Oil Corporation.

Except for seven protected areas, all other sites have been encroached upon by upland migrants, swidden farmers and local communities. Population growth is inflicting further damage to the integrity of the protected areas. In 1975, it was reported that approximately 72,000 people were permanently settled inside the parks and about 54,000 ha of the protected areas were under some form of cultivation (DAP, 1975 as cited in DENR, 1993). Further, about 4,000 ha land area were being logged by timber companies. It is likely that these figures would grossly underestimate the current situation. Park boundaries are frequently not demarcated, law enforcement is lacking and current staffing and financial provisions of the DENR is fairly minimum (DENR, 1993). Park managers must now face these problems and find out how to integrate some of the land uses in protected area planning and management through the concept of buffer zones and community participation.

### ***Thailand***

Thailand covers a large part of the Indochinese and Sundaic biogeographical subregion with at least 15 terrestrial and aquatic habitats. The protected area system include some of the last great forests of mainland Southeast Asia as well as valuable marine habitats of the Gulf of Thailand and Andaman Sea. The forest resources and wildlife of Thailand are well represented in the impressive and extensive areas of national parks, wildlife sanctuaries and other reserves established over the past three decades. Almost all of the remaining natural forests, along with most of its wildlife, are now located in the protected areas, which cover more than 12 percent of the total land area.

Though, small areas around Buddhist temples have long proved sanctuaries for beleaguered animals and threatened forest tracts in the history, national parks in Thailand are a recent development initiated with the establishment of Khao Yai national park in 1961. Alarmed by the dramatic decline in wild elephants and other important wildlife species, the Wild Elephant Protection Law, enacted in 1900 and later amended, was the first definitive act to conserve wild animals in Thailand. It was not until 1960 when Wild Animals Reserve and Protection Act was enacted. The act also set up wildlife sanctuaries and non-hunting areas throughout the country. The National Park Act was promulgated in 1961. Progress on protected area system were creeping during 1960s. By 1972, only four parks had been gazetted, 11 years after the establishment of Khao Yai. As of May 1993, the Thai government had gazetted 76 national parks, 36 wildlife sanctuaries, and 48 non-hunting areas (IUCN, 1993).

Forest habitats are the great storehouses for wildlife of all kinds in Thailand. About 65 percent of total forests can be categorized as deciduous and the remaining as evergreen forest. There is considerable intersection of the deciduous and evergreen forest and a number of sub-categories of each. More than 500 species of trees and over 1,000 orchid varieties have been recorded. Similarly, 928 birds species have been recorded (Graham, 1991). Of the world's 4,000 mammals species, 282 are found in Thailand. Research in the late 1980s indicated that elephants inhabited at least 16 national parks and 14 wildlife sanctuaries. Habitat loss and poaching for ivory and meat are the main reasons for the declining population of elephant. Wild elephants are believed to be roughly between 2,000 to 3,000 in both protected and non-protected areas. Another 5,000 are reported to be domesticated, as compared to more than 20,000 which thrived in northern Thailand alone at the end of the last century (Graham, 1991).

Protected areas are administered and managed by the Royal Forestry Department (RFD) under the Office of Natural Resources Conservation which includes the Wildlife Conservation Division (WCD), the National Park Division (NPD), and the Watershed Management Division (WMD). The Fishery Department is also involved in managing freshwater and marine resources in non-hunting areas as well as wildlife sanctuaries. The Office of Environmental Policy and Planning (OEPP) has responsibility in the formulating environmental policies and preparation of Thailand Biodiversity Strategy and Action Plan.

Thailand well exemplifies the case of increasing number of illegal settlers within the protected area boundary. The settlements of hill tribes and other minority ethnic communities in and near protected areas is among the most pressing issues. About 12 million people occupy forest lands owned by the state which constitute the upper reaches of the watershed. The National Park Division of Royal Forestry Department and Wildlife Conservation Division reported 66,000 people occupying about 88,960 ha of park lands and 98,000 people occupying about 12,6400 ha of land within wildlife sanctuaries. The construction of dams and roads, encroachment for agriculture land and human settlements in and near protected areas, illegal logging, hunting and fishing, excessive tourists' visits, and political turmoil in neighboring countries are the major forces creating resource conflicts in protected areas. Poor farming practices, resort development in the periphery of the parks and intensified hunting resulting in armed clashes between poachers and guards are common problems. The Khao Yai and the Phu Rua national parks face pressure not only from the settlers inside but considerable amount of pressure, particularly in the case of Khao Yai, comes from the intensified development activities around it and the urban sprawl. At the village level, the problems are caused by local communities who have relied on park resources for a long time. As land is increasingly a scarce commodity, local community always tend to encroach the park. While the problems of law enforcement, management and administration, and jurisdictional clashes are apparent, funding seem to be one major constraint in launching any integrated conservation and development activities.

The ownership of land covered by national parks is another issue, which is not resolved either by law or government policy. Since titles are valid prior to incorporation of

an area into a national park, some park dwellers stand on legal ground. Though, current Enhancement and Conservation of National Environmental Quality Act, 1992 encourages NGOs to participate in natural resources conservation, consensus among agencies is yet to be built up. Some of the local NGOs, however, do not oppose illegal loggers and encroachers but support public demonstrations against government authorities.

Some sanctuaries, like Huai Kha Khaeng, recruit employees from local villages. In the Thale Noi Non-hunting Area, local fishermen are hired to take visitors around the lake on their boats to view the rich bird life. Rangers at Laem Son National Park encourage local fisherman to take visitors to outlying islands rather than over-fish the sea. The Phu Krading National Park employs several hundred locals as porters to carry hiker's gear on the mountain. Some of them have become so protective of their park that they report violations of regulations to the rangers (Graham, 1991). On the peripheries of Khao Yai National Park, an innovative approach of integrating local people in conservation was introduced (Wells et al., 1992).

Thus, virtually all protected areas in Asia are facing threats of one or the kind, which is an irony considering that conservation efforts have a much long history, where it is embedded in the culture, religion and way of living of the local people. The single overriding issue is the quest for a balance between the average desire to live harmoniously with nature and the need to exploit resources to sustain livelihood. The problems facing protected areas are thus intricately related to socio-economic forces such as poverty, land tenure and equity. The legal and administrative mechanisms are yet inadequate to address all of the issues related to protected areas. The majority of the Asian countries are all set for making sincere efforts to conservation and improve the quality of life of the local community who have, so far, paid a heavy price for the establishment of protected area network. Such efforts should include a change in protected area policy, enlisting local people for protected area planning and management, linking conservation with development activities, enabling local NGOs and organizations at the grassroots level to contribute to protected area conservation and building local capability to finance conservation activities.

## Chapter Two

# LOCAL PEOPLE AND PROTECTED AREAS: THE CASE OF WUYISHAN NATURE RESERVE, CHINA

by

Li Zifeng\*

## I. INTRODUCTION

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Since the formulation of the Bali Action Plan during the Third World Congress on National Parks and Protected Areas held in Bali, Indonesia in 1982, the publication of the Second World Conservation Strategy "Caring for the Earth: A Strategy for Sustainable Living" in 1993 and, more recently, the "Caring for the Earth: A Strategy for Survival", the need for improving relationship between the resident people and protected areas have been repeatedly emphasized (MacKinnon et al., 1986; IUCN 1993a and 1993b). The need to recognize the territorial rights and customary laws of the resident people when planning a protected area establishment is addressed in many conservation literature. Similarly, new approaches have been considered in which local people's traditional life and mode of production are well integrated into the overall management of protected areas. The concept of integrating protected area with community development activities is becoming ever more popular in many third world countries. Yet, relationship between the protected area authority and local community have not improved. There are very few successful examples of protected area management where the park - people relationship have become positive and local people have supported conservation activities. The so called "success stories" are few and appear as "islands of hope" amidst "vast depressions". When one visits such successful protected areas which are widely publicized by the international literature and network of protected area professionals, it is rather disappointing to see that the benefits actually reach to a small group of people only, while a large mass is not affected in any way.

In China, the protected area network has expanded rapidly since the 1970s. However, the proportion of the land under protected areas is very low compared to many other Asian countries. The majority of the protected areas in China represent forest ecosystem only. The law enforcement and management capability in many protected areas is weak owing to lack of trained manpower and adequate funding. As most of the protected areas in China are in remote locations, qualified persons are reluctant to work in such places. About 2 percent of the protected areas in China do not even have an administrative office building. A major problem is that protected areas are seen as hostile interventions by the resident community who are hardly consulted or involved in planning and management of such areas. Conflicts between the

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Mohammed Z. Hussain. The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.

protected area authority and the local community is common in the majority of protected areas in China. Such conflicts have arisen because of the new rules and regulations which limit traditional resources utilization. Quite too often, the farming practices are not compatible with conservation objectives. Owing to the low level of economic development in the periphery of protected areas, local people often find it difficult to refrain from their age-old tradition of collecting resources from within the protected area boundary.

The Wuyishan Nature Reserve (WNR) well exemplifies the above situation. Before it was established in 1979, the resident people had been heavily dependent on bamboo harvesting, tea plantation and collection of fuelwood and other minor forest products. The area was unsuitable for agriculture. The bamboo and tea plantation in the reserve area had physically linked the local community with the reserve. Considering the heavy dependency on the reserve, certain amount of land was allocated to the local community even after the declaration of the nature reserve. Some of the recent regulations on bamboo harvesting, and land tenure has restricted local people's access to the reserve. Although, the reserve authority has relaxed some regulations to build a positive relationship with the local community, disputes have not been settled. This exploratory research examines the socio economic conditions of the resident population, the positive and negative relationship between the reserve authority and resident people, and the attitude and perceptions of the resident people towards the reserve authority. Based on the findings of the study, certain strategies are suggested for improving the relationship. The study is based on a two-month field survey conducted in three villages, namely, Autou, Dapo and Tongmu in early 1993. The discussion in this paper is qualitative, drawn from a larger study in which primary as well as secondary data were used (Zifeng, 1993).

## II. THE WUYISHAN NATURE RESERVE

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The Wuyishan Nature Reserve (WNR) is situated in the highest section of the Wuyi Mountain range with diversified natural ecosystems well representing the central subtropical zone of China (Fig. 5). The reserve covers approximately 56,527 hectares of land area divided into core area (34,771 ha) for preservation, the experimental area (20,845 ha) as a buffer zone, and a scientific and educational area of 911 ha (Wenhua and Xianying, 1989). Forest land covers almost 51,367 ha of which 7,938 ha is under bamboo plantation. It was designated as the UNESCO's Man and the Biosphere reserve in September 1987. The altitude of the reserve ranges from 1,100 to 2,158 meters above mean sea level. The average annual precipitation is recorded approximately between 2,000 mm and 3,376 mm, while the average temperature ranges between 12 °C to 18 °C. The reserve extends within 27°35' to 27°55' north latitude and 117°27' to 117°51' east longitude, which runs across 52 kms. north-south.

The flora of the WNR represents a mixture of different geographical features consisting 1,800 vascular plants divided into 191 families and 798 genera. Broadleaf evergreen forest is distributed mainly on the lower slopes of the mountain with the altitude ranging up to 1,100 meters above mean sea level. The dominant tree species include evergreen chinquapin (*Castanopsis eyeri*), farges evergreen chinquapin (*Castanopsis fargesii*), faber evergreen chinquapin (*Castanopsis fabri*), hance tanbark oak (*Lithocarpus hancei*) and blue Japanese oak (*Cyclobalanopsis glauca*). The second dominant species include red nanmu (*Machilus*



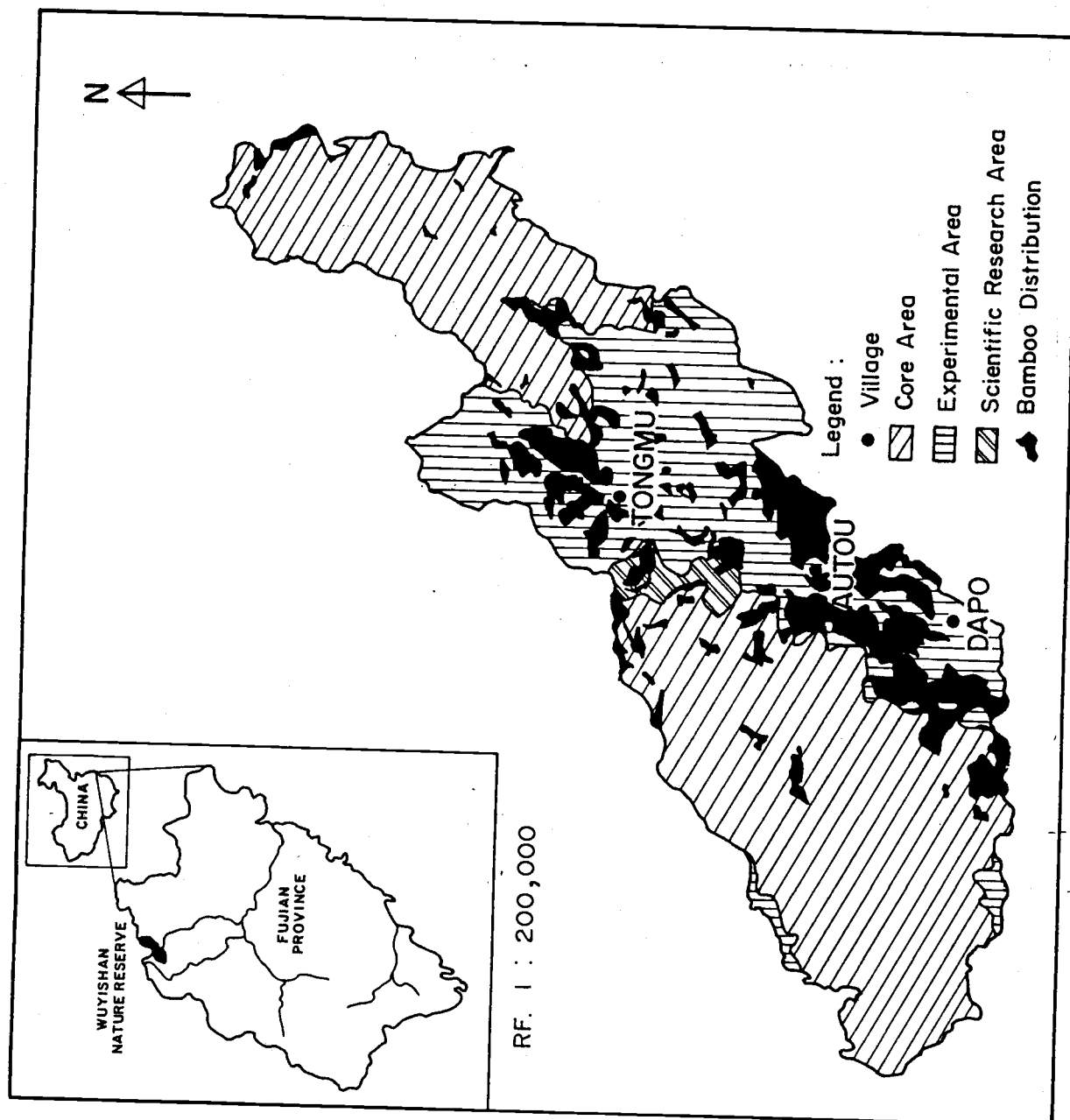


Fig. 5: The Wuyishan Nature Reserve, China

Source: CISNAR, CAS, 1992

*thunbergii*), great spice bush (*Lindera megaphylla*), and common new litse (*Neolitsea aurata*). Several species of tea and magnolia are the prominent lower layer vegetation. Major deciduous broadleaf forest with a few coniferous trees represent the middle mountain zone (1,100 to 1,700 meters) which consists of sweet gum (*Liquidambar*), shining-leaf birch (*Betula luminifera*), silverbell (*Halesia*), David maple (*Acer davidi*), Chinabells (*Alniphyllum*), China fir (*Cunninghamia lanceolata*), Chinese cedar (*Oryptomeria fortunei*) and masson pine (*Pinus massoniana*). The narrow zone extending between 1,700 and 1,900 meters is covered by coniferous forests of Taiwan pine, (, Chinese cedar and Taiwan hemlock (*Tsuga formosana*) with patches of Cavalerie clethra (*Clethra cavaleriei*), and little-leaf box (*Buxus sinica* var. *parvifolia*). There are apparent changes in the natural vegetation above 1,900 meters where several grass species such as Chinese silver grass (*Miscanthus sinensis*), common small reed (*Deyenxia arundinacea*) and *Arundinella* are found (Wenhua and Xianying, 1989).

More than 100 species of mammal and some 400 species of birds have been recorded in the WNR. The common wildlife include South China tiger, Elliot's pheasant (*Syrmaticus ellioti*), golden cat (*Felis temmincki*), rhesus monkey (*Macaca mulatta*), small Indian civet (*Viverricula indica*), tufted deer (*Elaphodus cephalophus*), clouded leopard (*Neofelis nebulosa*), large Indian civet (*Viverra-zibetha*), Fukien tragopan (*Tragopan caboti*), and pangolin and serow (*Capricornis sumatraensis*). The Guadun region is the most important habitat for birds with the concentration of one fourth of bird species found in the reserve. The major bird species are silver pheasant (*Lophura nycthemera*), spotted scops owl (*Otus spiclocephalus*), pale-headed woodpecker (*Gecinulus grantia*), short tailed parrotbill (*Paradoxornis davidisnus*), Rickett's hill partridge (*Arborophila gingica*) and major endemic species such as green shrike babbler (*Pteruthius xanthochlorus*), white-backed woodpecker (*Dendrocopos leucotos*), orange crowtit (*Paradoxornis nipalensis*) and red-tailed laughingthrush (*Garrulax milnei*). There are hundreds of amphibians, reptiles and insects recorded in the WNR.

The reserve is under the jurisdiction of the Provincial Forestry Department of the Fujian Province. A total of 94 personnel including 7 administrative, 19 security police, 39 researchers and technicians, and 29 workers constitutes the management staff. The human settlements are located in the experimental area, the buffer zone of the reserve which consists of three administrative villages, namely, Tongmu, Autou and Dapo village. There are 2,505 people in 462 households. Under each administrative villages there are several natural villages - 12 in Tongmu, two in Autou and three in Dapo. Each natural village consists of villagers' group, the leader of which is elected every two years by the villagers. The leader often plays the rôle of mediator in settling disputes with the reserve authority. He/she also has the opportunity to attend the meetings concerning the management of the reserve. Similarly, the representative of the administrative village is elected every three years by the villagers. All too often, they are the preferred candidates of the local government as well. They are responsible for implementing the policies and decisions made by the local government.

### III. THE LOCAL SOCIO-ECONOMIC CONDITIONS

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The Autou Administrative Village has a total population of 355 living in 77 households. In terms of education, the majority are at the primary level while only six persons had been to the

high school. Bamboo harvesting and processing is the main economic activity. The bamboo and tea plantation were allocated to local people in 1984 under the contract system, resulting in rapid economic growth. Today, the majority of the households are living in newly built houses and have television sets. A television receiving station had been built recently. The total population in the Dapo Administrative Village is 375 living in 80 households. There is one six-grade and two three-grade primary schools. There is virtually no transportation system. The bamboo plantation is under the commune system. Some rice fields had been allocated to the individual households. In Tongmu Administrative Village, the total population is 1,469 living in 305 households. It has one six-grade and nine two-grade primary schools. Compared to the other two areas, many people were educated at the lower secondary and secondary level. Some settlements were located along the bus route. Bamboo and tea plantation are the main economic activities.

In the WNR, bamboo (*Phyllostachys pubescens*) is cultivated along gentle slopes and valleys less than 1,200 meters above sea level. The total area under bamboo plantation is 7,938 ha out of which 20 percent is in the core area and the remaining in the experimental area. The local people have a long history of bamboo harvest. It is mono-cultured with occasional stands of few other tree species, which has resulted in high productivity but less biological diversity. The height of a bamboo stand ranges between 10 to 20 meters with a breast-height diameter of 0.10 to 0.12 meter. A bamboo stand could be cut in seven years while the shoots could be harvested throughout the year, except the period between May to July. On average, 2,500 stands of bamboo could be grown in one hectare of which about 150 - 200 bamboo poles could be annually harvested. After bamboo is harvested, either it is sold directly to the market through the reserve management or is processed by the individual household. However, the number of households who can process bamboo is regulated by the reserve management. The main bamboo products were chop stick, mat and spike.

There was 332 ha of tea plantation of which 312 ha was located in Tongmu. Due to improper soil and land management, its yield was 450 kg/ha only. Out of 109 ha of rice fields, 79 ha was in Dapo and the remaining in Autou. Rice was planted once in a year with an average yield between 4.5 - 6.0 ton per hectare. In Dapo, the rice production fulfilled 70 percent of the household needs while in Autou and Tongmu, it had to be imported from outside.

The household on-farm earning sources were from bamboo, tea, livestock and poultry while the off-farm sources were from the sale of bamboo products, services and labor. The average annual household income was the highest in Autou with 7,761 Yuan, followed by Tongmu with 5,089 Yuan and Dapo with 4,785 Yuan. However, there was skewed distribution of income owing to the policy that only a limited number of households had been allowed to process bamboo. The average annual income and expenditure of the households indicate a positive balance in all the three villages. It was highest in Autou followed by Dapo and Tongmu. The majority of the households in these villages own television set, sewing and washing machines. While 66 percent had radio sets and bicycles, almost 59 percent had a motorcycle. Similarly, a little less than 20 percent had refrigerator, tractor and other farming machinery. Only in Dapo where the land was under commune system, farm machinery and tractors were collectively owned.

Various services were provided to the resident population by the local government and the WNR authority. These include education, health, drinking water, and electricity supply. Overall, the respondents were satisfied with the public service facilities provided. While all the villages had electricity and water pump stations, except for Autou, the other two villages did not have any road link and were connected through dirt road and trails leading to the main bus route. Owing to the absence of a higher-grade school, the majority of the children stayed at home and worked in the farm after completing primary school.

#### **IV. RESIDENT PEOPLE AND THE RESERVE: POSITIVE ASPECTS**

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The subsequent imposition of various rules and regulations after the establishment of the reserve resulted in an strained relationship between the reserve staff and the resident community. The resident population claimed that their traditional way of collecting natural resources had been disrupted by the establishment of the reserve. Following series of complaints by the resident people, with approval from the provincial office of the Department of Forestry, the reserve authority allowed local people to collect logs and dead wood left by the logging company. Before 1989, the quantity of bamboo to be harvested from the reserve by individual household was determined by the reserve authority who had allocated specified plot of bamboo fields to the households. It was observed that those households who held less bamboo field but had many adult members in their family than they had in 1984 when the allocation was made, usually harvested more than the specified quantity. This accelerated depletion of bamboo stands in the reserve. On the other hand, those households who had proportionately higher allocations compared to their present number of adult members harvested less bamboo. The villagers made the suggestion that instead of harvesting the specified quantity allocated to each individual household, they would first determine the number of poles that could be cut in a sustainable way irrespective of the individual quota, then adjust the quota among themselves. This suggestion was readily accepted by the reserve authority as it ensured more sustainable harvesting.

The resident community was also involved in resource protection in the reserve as indicated by their frequent voluntary participation during times of forest fire. During the conduct of the field survey, the author witnessed an outbreak of a forest fire in Tongmu. The fire was extinguished with the combined effort of the villagers and the reserve staff. Every villagers' group had at least one forest protection guard who was in charge of preventing and monitoring forest fire. Each year, the representatives of the administrative villages, the head of the villagers' group, fire protection guard from each group and representatives from the WNR authority convened to discuss the work they had conducted to ensure adequate protection of the reserve.

The majority of the respondents were in favor of protection of the reserve and showed a greater degree of awareness of its conservation values. An overwhelming majority believed that there had been an increase in wildlife population since the establishment of the reserve. All of the respondents had realized that due to the existence of the reserve, they had easy access to fuelwood and water supply. During the initial period of the reserve establishment, the villagers did not believe that the reserve authority would allow them to harvest bamboo from inside the reserve. Almost all the respondents were satisfied with the present bamboo quota as they knew that excessive demand of bamboo poles would result in unsustainable harvest. The majority

expressed that it is also their responsibility to protect the reserve and desired to be involved in its planning and management.

Since the establishment of the reserve, the WNR authority had made efforts to improve their relationship with the local people. The provincial and central governments issued several policies and guidelines such as the "Guidelines for Implementing the State Council Decisions on the WNR", "Policy on Boundary Demarcation and Resource Allocation", "Management Guidelines of the WNR", and "Regulations on Harvesting, Transporting and sale of Bamboo and Timber in the Experimental Area of WNR". The implementation of these policy and regulations resulted in the withdrawal of several logging companies from the reserve. There is a policy statement that the local government and the reserve authority should assist and provide guidance to the local people in their farming activities as well as resource utilization. The logs and deadwood left by the logging companies were allowed to be collected by the villagers for two years (1980-1982) which solved their immediate concern. In 1984, the WNR authority demarcated the reserve which facilitated the change in land tenure from the communal system to the household contract system. The WNR authority also encouraged villagers to sale bamboo products rather than bamboo poles and offered its assistance to ensure a reasonable price. The group discussions in the village also revealed that before implementing the various guidelines and regulations, the WNR authority had discussed them with the local people. The representatives from the three administrative villages had discussed the management guidelines of the WNR while suggestions were made by the local people in the bamboo harvesting regulation. Aside from these, other related issues were discussed in the annual administrative meetings. Every year, two film shows were organized by the WNR authority to increase the awareness among the local people. The majority of the respondents interviewed had attended the film shows.

## **V. RESIDENT PEOPLE AND THE RESERVE: NEGATIVE ASPECTS**

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One of the major constraints in improving relationship between the WNR authority and the resident people is caused by the wildlife damage to bamboo plantation. Almost 65 percent of the respondents reported such damage. Among the three villages, the highest proportion of respondents who reported damage was in Tongmu followed by Dapo and Autou. The main wild animals responsible for the damage were wild pig and monkey whose population had increased since the establishment of the reserve. Wild pig fed on bamboo shoots which is one reason why most of the damage was recorded during the spring season when the bamboo shoots sprout. Unlike wild pig, monkey fed on young bamboo tips. During the period between May to July, packs of monkeys could be observed in the bamboo plantation. A preliminary survey of the monkey population during those periods indicated at least 25 packs, with 10 - 15 heads in each pack. Almost 70 percent of the bamboo stands could be damaged by one pack. As most of the bamboo fields were located far from the village, there was no effective way to protect against the damage. The respondents expressed serious concern over this issue and sought some compensation from the WNR authority while some suggested regular patrolling by the reserve staff in the bamboo fields during certain periods. Some even held the opinion that some of the nuisance animals should be killed in view of the damage incurred, though this suggestion was made by few only.

The local people expressed their desire to collect some medicinal plants and wild fruit from inside the reserve which was prohibited by the reserve authority. They suggested that perhaps a quota system could be established so that these resources would be collected in a sustainable way. While the local people supported the protection and conservation activities by the WNR authority, the majority expressed that the authority should adopt a policy of balancing the conservation needs and the livelihood needs of the local people. Almost half of the respondents held the opinion that the WNR regulations were too strict to be successfully implemented.

As mentioned earlier, the reserve authority allowed bamboo processing to a limited number of households. Obviously, those who were not included were critical of the regulations which constitute almost 65 percent of the total respondents. There were many more in Autou who opposed the regulation and expressed their desire to have the permission. The WNR regulation on the harvesting, transportation and sale of bamboo and timber in the experimental area was the main source of controversy. Its third item in the regulation states that the processing and sale of bamboo must be controlled by the reserve management, while the sixteenth item states that any interested individual could apply for the permit for processing bamboo. The number of permits depends primarily on three factors - the number of bamboo stands in the reserve, the acceptable level of human activity in the reserve, and the number of laborers required for bamboo harvesting and processing. This was done to ensure the sustainable utilization of bamboo. This policy hardly satisfied the resident community as it restricted people's activity inside the reserve while giving access to a few privileged people only. The majority who opposed this regulation were mainly those who did not have the permits to process bamboo. Those who had such permits and earned some cash income were satisfied. There were some villagers who did not have the legal permit but were found to be engaged in bamboo processing (by official definition, it would be considered illegal), demanded for such a permit.

The third item of the regulation states that the sale of all bamboo poles and other products must be carried out through the reserve management. During the initial period, the local people had no opposition, however, as the demand for bamboo products in the local market increased, the local people had disagreement with the WNR authority who had set a relatively lower price than the local market. For example, a bamboo pole in Huangkeng Township could fetch 4 Yuan (US\$ 1 = 5.7 Yuan) while the price set by the WNR management was between 3.1 - 3.4 Yuan depending on the quality of bamboo. It was only in Tongmu where almost half of the respondents were satisfied with the price set by the WNR management while in Dapo and Autou, the majority were discontented with the price. In the latter two villages bamboo processing was the only activity which brought cash to the local economy which may be the main reason why people there were dissatisfied with the price. Some of the local people also expressed that if they had their own way, they would prefer to sell directly to the local market which would probably fetch a better price. Those who had been satisfied with the price set by the reserve said that they would continue to sell through the reserve while the dissatisfied respondents expressed the opinion that unless there is an increase in the price, they would be less willing to sell through the reserve.

The reserve authority held a different opinion on the price of bamboo. Their price was guaranteed irrespective of the fluctuation in the market demand. Only in the spring season, the price would rise, otherwise, the price in the local market always fluctuates. Sometimes, it is

much lower than what they offer to the villagers. The WNR management did not want to let villagers sell directly to the market as they feared that it would encourage more number of villagers to get involved in bamboo processing which would ultimately deplete the bamboo stock.

As mentioned earlier, there was some form of local participation in the reserve management, mainly through the villagers attendance in the meetings held every year. Among the respondents, only about 14 percent had participated in such meetings. Many of the respondents said that they had been never approached by the reserve staff for any consultation, whatsoever. It was only the representative of the villagers' group who had been consulted on few occasions. The reserve authority made claims that most of the regulations of the reserve had been discussed with the resident community. There was, in fact, no local involvement in the management of the reserve in any way. Hardly any locals had been hired by the reserve.

The WNR management and development plan of 1988 had four main objectives which include strict protection of the natural resources and environment, sustainable utilization of the resources in the reserve, conducting scientific research, and local development. While the first and the second objectives were somewhat contrary to each other, the local development was limited to some construction of rural roads, and bamboo harvesting by the local people and its sale through the reserve. Only one-third of the respondents believed that the existence of the reserve had benefitted them. Similarly, only seven percent of the respondents thought that there might be future job prospects in the reserve. One major obstacle in employment in the reserve was the lack of skill and training opportunities in the village while formal education was limited to primary school only. Owing to these reasons, the majority of the respondents expressed that perhaps the WNR authority would not like to employ them. Despite the skepticism in the activities of the WNR management, the respondents believed that the WNR had been capable in supporting them, in a small way though, for example, selling bamboo products and some construction works. They had well recognized the potential and limitations of the WNR management. None of the respondents thought that the WNR management is capable of providing some technical knowledge needed for diversifying their bamboo products and increasing agricultural productivity.

It was the junior rather than the mid-level staff who frequently came into contact with the villagers. The local people held the opinion that usually, the behavior of the reserve staff is good. There was mutual understanding between the junior staff and the villagers. That may be one reason why some of the villagers were involved in bamboo processing even if they did not have a legal permit. When asked if the reserve staff had better options of sustainable utilization of natural resources, the majority said they know better than the reserve staff signalling to the earlier suggestions they had made with regard to quota systems for harvesting bamboo poles.

## VI. SUMMARY AND CONCLUSION

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This research examined the local socio-economic conditions in three villages inside the WNR and identified positive and negative relationships between the local people and the reserve authority based on a two-month field survey. The findings indicate that the local economy was

mainly dependent on bamboo harvesting and sale of bamboo products in the nearby market while some income was derived from the tea plantation. In terms of level of economic development in the three villages, Autou was well off as compared to Tongmu and Dapo. In Autou and Tongmu, individual households had been allocated bamboo and tea plots while in Dapo, land was under the commune system. All three villages are fairly remote and are largely dependent on resources available in the reserve. The reserve had allowed local people to harvest bamboo from the reserve, which was based on a quota system.

The WNR management had taken necessary steps towards improving the relationship with the resident community by allowing villagers to harvest bamboo and sell some bamboo products. The bamboo plantation inside the reserve was allocated to the household under contract system in which individual household becomes the user but not the owner of the land. The original allocation was not acceptable to many villagers as the number of adult members in certain households had increased because of marriage etc. The majority of the households were critical of the permit system for processing bamboo which allowed only few households to get involved in the processing which was a lucrative enterprise in that area. This somehow determined the economic status of the individual households. As a result, there were many households who had been engaged in illegal bamboo processing activities which often was overlooked by the reserve staff. The authority had increased the quota for harvesting bamboo, however, due to increasing demands of bamboo products in the local market, villagers demand have kept increasing which is rather difficult to fulfill because of the limited stock available. Balancing the needs of the local villagers with the conservation goals thus, had become a difficult task for the WNR management. The villagers had become aware of the value of the reserve who held positive opinions about the activities conducted by the WNR management.

Villagers complained of wildlife damaging the bamboo fields and other agricultural crops. As the location of the bamboo fields was far from the village, controlling the damage was difficult. The only way it could be minimized was by increasing regular patrolling in those areas. They also did not like the restrictions imposed on the collection of medicinal plants and wild fruits. The households were required to sell their bamboo products through the reserve which they did not like. They wanted some freedom of choice as to how and where they could sell their products. The policy statements of the reserve states that local people shall be consulted in the planning and decision making of the reserve management, however, there was hardly any consultation except during the annual meetings where the local complains and grievances were discussed. There was not much scope for villagers involvement in the management task. The prospects of employment were limited too. The scale and the impact of environmental education programs were minimal. One major problem was that the WNR management neither had adequate local development plans nor any funding to support the local economy. As there was hardly any tourism, the funding and other assistance had to come from the provincial government, which was limited.

From the above discussion, it can be inferred that the survival of the WNR much depends upon the survival of the resident community. In order to get active support from them, it is necessary that the reserve ensures the benefit of the community. Due to the inherent characteristics of the reserve such as remoteness, and weak and less diversified local economy, and the growing aspirations of the resident community, it is rather difficult to balance the



conservation needs of the reserve with the livelihood needs of the community. However, much could be accomplished though, if sincere efforts are made to uplift the level of development in sectors such as health, education and transportation. The fact that the majority of the resident community have television in their house signals the potential of launching effective audio-visual conservation programs. In order to get adequate funding support, the WNR management should establish strong contacts with the township and county level institutions who can initiate community development activities in the area.

It is important to involve the resident community in the adequate protection and management of the reserve. A mechanism should be built to ensure direct contact with the villagers by allowing some of them to attend the meetings and holding discussions with the reserve staff. Quite too often, the village representatives do not speak on behalf of the community as they tend to be overpowered by the authorities from the provincial government offices who usually make up the majority in the annual meetings. In such case, the attendance of the village representatives often becomes an endorsement to conduct activities which might not be favored by the majority of the community. Thus, it is essential that a proper mechanism should be built to establish effective communication between the local people and the concerned authorities.

In order to fully understand the complexity of natural resources conservation and the impact of the reserve on local livelihoods, it is essential to conduct social and ecological impact studies. While the ecological impact could be related to effects of bamboo harvesting and human activity in the reserve land, social impacts should include the contribution of the reserve to the community as well as the effect of various policies made by the WNR authority on local resource utilization patterns. Only through a detailed understanding of these issues, the decisions on local resource management can be made. The quantity of bamboo poles to be cut and the bamboo processing limits should be based on scientific research rather than on *ad hoc* basis. Alternative activities such as growing fruit trees in the villages should be encouraged while some collection of medicinal plants may be allowed. The WNR authority should also help the villagers to market other products such as tea. Wildlife management techniques should be applied to control the bamboo damage or else provisions should be made to the households whose portion of bamboo stands are significantly destroyed. Tourism could be a good source of earning for the local people. The WNR authority with support from other agencies should take proper strategies to attract tourists. This could be done by building necessary infrastructure and providing various services. In fact, in the long run, bamboo harvesting may not be a viable option, therefore, efforts should be geared towards diversifying the local economy as much as possible. While it is necessary to regulate the current patterns of bamboo harvest, effective protection should be ensured by increasing the capability of WNR to supervise and monitor human activities inside the reserve. Only with the integration of several strategies, the balance between conservation and development in WNR can be achieved.

## *Chapter Three*

# **PROTECTED AREA AND INDIGENOUS PEOPLE: THE XISHUANGBANNA NATIONAL NATURE RESERVE, CHINA**

*by*

**Yu Xiao Gang\***

## **I. INTRODUCTION**

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Over the last decade, several studies have highlighted the potential of traditional knowledge in natural resources conservation (Johannes, 1991; Schultes, 1991; Dahl 1991; Falanruw, 1991). The potential for the application of traditional environmental knowledge to the modern day management of soils, crops, forests, water resources, wildlife and fisheries is vast. The traditional forms of land tenure and resources utilization have proved more effective means of environmental conservation than the introduced laws and regulations. During the last thirty years, the importance of indigenous involvement in protected area management has been reiterated in many policy statements of the IUCN (Eaton, 1992). In reality, however, this has rarely happened as the protected area authority in many of the countries have excluded the indigenous people and claimed that their land use practices and resource utilization have been unsustainable. The majority of the protected areas in Asia have resident or neighboring indigenous people who are politically and culturally marginalized, being officially distinguished from the society of the national majority by a range of value-laden terms. Some of the examples include the 'scheduled tribes' of India, the 'hill tribes' of Thailand, the 'minority nationalities' of China, the 'cultural minorities' of the Philippines, the 'isolated and alien peoples' of Indonesia, the 'aboriginal tribes' of Taiwan, the 'aborigines' of Malaysia and the 'native' of Borneo (Colchester, 1992 as cited in Pretty and Pimbert, 1995).

In the Xishuangbanna National Nature Reserve (XNNR), the authority see the indigenous people as a threat to the reserve. They held the view that displacement of these indigenous people is a precondition to effective and adequate protection of the XNNR. Owing to this preconceived notion, over ten villages, having a population of 800 have been relocated during the period between 1987 and 1990 which has resulted in severe negative impacts. It is worthwhile to examine if the indigenous people are really causing problems to the reserve by way of unsustainable land use practices and related activities. It is also necessary to examine if the reserve authority see any potential in their traditions which could reinforce conservation activities in the reserve. A systematic study of indigenous people living in or near protected areas in China is lacking. Thus, an attempt has been made to provide an overview of the land

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Tri B. Suselo. The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.

use practices and related traditions of two indigenous community living in and around the reserve.

The specific objectives of this study are to examine the traditional land use practices and related farming activities of the Dai and Jino communities near the XNNR, to assess the elements of natural resources conservation in their social and religious practices, to examine certain management issues of the reserve, and to explore the general attitude of the reserve staff towards the indigenous practices. Briefly discussed is the impact of relocation of the Balung community from the XNNR. The discussion that follows is mainly qualitative based on a two-month field visit of the study area, mainly three villages around the XNNR (Gang, 1993).

## II. THE XISHUANGBANNA NATIONAL NATURE RESERVE

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The Xishuangbanna National Nature Reserve (XNNR) is located in the southern section of Yunnan Province bordered with Laos and Myanmar. The reserve is composed of five separate nature reserves, namely, Mengyang, Menglum, Mengla, Shangyong and Mengao (Fig. 6). Mengyang is situated in northern section of the province in Jinghang County; Menglum is in the center of the province; Mengla and Shangyong are located in the southeastern section which lies in Mengla County and Mengao is in the northwest in Menghai county. The XNNR covers a total area of 207,000 hectares which is under the jurisdiction of the provincial government. Of the total area, Mengyang reserve covers 90,000 ha, Mengao 8,000 ha, Menglum 9,000 ha and Shangyong and Mengla combined 100,000 ha. The four reserves were initially established in 1958 while the Shangyong Nature Reserve was combined in 1980 to form the present size of the XNNR. The reserve extends from 21° 10' to 22° 24' north latitude and 100° 16' to 101° 55' east longitude. The elevation of the reserve ranges from 420 m to 2300 m. The landscape is mainly mountainous (90 percent) containing limestone, granites and sandstone. There are two distinct seasons, namely, dry season from November to March and the wet season from April to October. The mean annual temperature is recorded between 15.1 °C to 21.7 °C depending on the altitude while the annual precipitation ranges from 1194 mm to 2492 mm of which 80 percent falls during the wet season. The reserve supports a rich flora and fauna which is the true representative of tropical, subtropical and temperate climatic belt of China. It also protects a number of threatened species such as Asian elephant, gaur, green peacock, tiger and some economically important plant species.

There are 102 mammal species including tiger (*Panthera tigris*), leopard (*Panthera pardus*), binturong (*Arctictis binturong*), slow loris (*Nycticebus coucang*), gibbon (*Hylobates concolor*), gray langur (*Presbytis pileata*), Asian elephant (*Elephas maximus*), gaur (*Bos gaurus*), pangolin (*Manis pentadactyla*), and sambar (*Cervus unicolor*). Since the establishment of the reserve, elephant and gaur populations have increased (Anon., 1985 as cited in IUCN, 1993). Around 427 bird species have been recorded which include the rufous-necked hornbill (*Aceros nipaensis*), green peacock (*Pavo muticus*), great barbet (*Megalaima virens*), thick-billed green pigeon (*Treron curvirostra nipalensis*), thick-billed flowerpecker (*Dicaeum agile*), crimson sunbird (*Aethopyga siparaja*), peacock-pheasant (*Polyplectron bicalcaratum*), olive-backed sunbird (*Nectarinia jugularis*), silver pheasant (*Lophura nycthemera*), red jungle fowl (*Gallus gallus*), melodious laughing thrush (*Garrulax canorus*), eastern blossom-headed parakeet (*Psittacula roseata*), coppersmith barbet (*Megalaima*

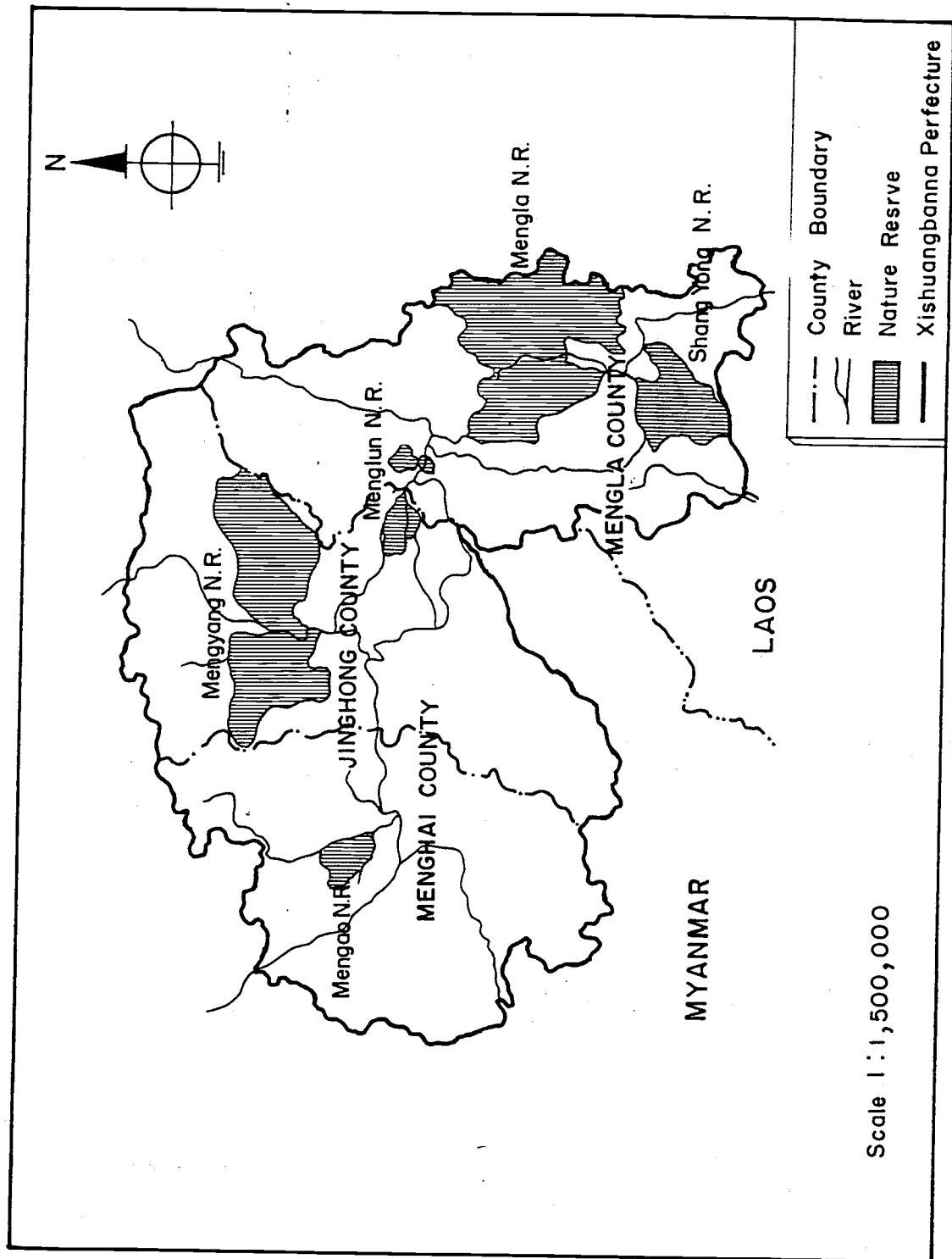


Fig. 6: The Xishuangbanna Nature Reserve Perfection in China

*haemacephala*), silver-eared mesia (*Leiothrix argentauris*) and several other species (Qinsong, 1985 as cited in IUCN, 1993). A total of 38 amphibians, 60 reptiles and 1,437 insect species have been recorded.

The XNNR consists of dense and diverse species categories. There are 60 species of trees per 160 square kilometers of tropical forest. The reserve contains 3,500 species of higher plants of which 300 species are rare. There are 200 species of food plants, 100 species of oil plants, 20 species of aromatic oil plants, 100 species of rapid-growing trees, 50 species of bamboo, 300 species of medicinal plants, and 30 species of 'living fossils'. Valuable genetic resources include wild varieties of rice, wild tea (*Camellia sinesis*), wild litchi (*Litchi sinesis*), and wild tea-oil (*Camellia confusa*). Four main types of vegetation are distinguished by the North-East Forestry Institute. The tropical rain forest covers almost 13,900 ha of land area and is found below 800 meters. The dominant tree species are *Parashorea sinesis*, *Catica fleuryana*, *Tetrameles nudiflora*, *Pometia tometosa*, *Nephelium chryseum*, *Terminalia myriocarpa*, *Knema surfuracea*, *Horsfieldia glabra*, *Cryteronia peniculata*, *Homalium laoticum*, *Garuga pinnata*, *Gironniera subaequalis*, and *Bacaurea ramiflora*. The tropical monsoon forest covering 3000 ha of land above 800 meters has tree species such as *Stereospermum tetragonum*, *Pterospermum acerifolium*, *Dolichandrone stipulata*, *Mayodendron igneum*, *Chukrasia tabularis*, *Gmelina arborea*, *Bombax insigne*, *Anthocephalus sinesis*, *Bauhinia variegata*, *Bischofia javanica*, *Cleistanthus sumatranus*, and *Duabanga grandiflora*. Above 1,000 meters is the subtropical monsoon broad-leaf evergreen forest covering an area of 179,830 ha. The main tree species include *Castanopsis mekongensis*, *C. Hystrix*, *C. argyrophylla*, *C. ferox*, *Lithocarpus fenestratus*, *L. mohaiensis*, *Pygium topengii*, *Erythroxylum kunthianum*, *Magnolia hennji*, and *Elaeocarpus austro yunnanensis*. The area above 1,800 meter is under mossy broad-leaf evergreen forest with tree species such as *Cyclobalanopsis rex*, *Lithocarpus inuensis*, *Lindera moghaiensis*, *Phoebe macrocarpus*, *Heliciopsis terminalis*, *Caryota urens*, and *Podocarpus wallichii* (Qinsong, 1985 as cited in IUCN, 1993).

For management purpose, the reserve is divided into core and experimental zones. The core zone is a strict protection zone where only scientific study and observation is permitted. Previously, there were 18 villages in the core zone, 10 of which were later relocated. There are 86 villages in the experimental zone where limited agriculture and subsistence hunting is allowed. The reserve is home to a number of minority ethnic groups such as Han, Dai, Hani, Lagu, Bulang, Jino, Bai, Yao, Miao, Hui, Zhuang, Va and Yi of which Dai constitute the majority (35 percent) followed by Han (30 percent). They live in more hilly areas and practice slash and burn agriculture. These groups have strong cultural identities and maintain traditional beliefs and customs (Bamford, 1988). The total population within the XNNR is over 14,000. During the past 20 years, the human population has more than doubled. Hunting is still practiced by the villagers (Santiapillai and Jackson, 1990) and there is no shortage of home-made guns. Wildlife is hunted partly for food, but also to meet the demands of traditional Chinese medicine, which depends to a large extent on animal products including skin, bone, and gall bladder of the elephant for basic ingredients (Xu, 1987). Shifting cultivation and permanent agriculture extend over 13,000 ha while 30 percent of the reserve is heavily forested. Much of the forest below 900 m in Xishuangbanna has been converted to rubber plantations over 66,000 ha. (MacKinnon, 1987). A major management problem is the raiding of cultivated crops by

elephants both within and outside the reserve. Because of the many villages within the XNNR, it is inevitable that the elephants come into contact with cultivated tracts (Santiapillai and Jackson, 1990). Such encounters lead to crop damage and economic loss to the farmers. The amount of paddy lost through elephant depredations varies between 540 and 56,000 kg per year (Santiapillai et al., 1990).

As the reserve is fairly remote and has limited facilities, there are very few visitors. Several research have been conducted on the flora and fauna of the reserve. The impacts of human activities and the prospects of tourism have been studied as well (IUCN, 1993). The reserve is administered by the protection division of the Prefectural Forestry Bureau, responsible to the Prefectural Government and Yunnan Provincial Forestry Bureau under the supervision of the Ministry of Forestry in Beijing. The Protection Division has 90 personnel including technical and nontechnical staff of which only four are forestry graduates. The management independently decides on the issues of boundary demarcation, path construction, resettlement, improvement of agriculture land, implementation of reserve management plan, and other related activities (IUCN, 1993).

The XNNR is located in the remote section of the country and politically sensitive area due to the proximity to Laos, Myanmar and Vietnam. The above average population growth has led to increased pressure on land in and around the reserve. Prevention of shifting cultivation has caused further problems due to shortage of flat agricultural land. There are plans to relocate the remaining villages from within the core zone. Enforcement of existing regulations on hunting and grazing is inadequate due to the shortage of field staff. Manpower and other physical and financial constraints hinder the reserve management.

### **III. THE DAI COMMUNITY IN MENGGAO VILLAGE**

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More than 100 inter-mountain basins and valleys in Xishuangbanna are mostly inhabited by the Dai community. They occupy the most favorable niche which consists of river basins and rain forests. The Dai settlements are usually located at the edge of the basin, usually near a river or forest. The lowland paddy cultivation is the major source of food supply, while the home garden is the source for vegetables, fruits, spices and medicines. The fuelwood groves around the house supply the domestic fuel energy. The tea plantations are located under the natural forest. Usually the village has a hilly grove which is considered sacred and is strictly protected. A Buddhist temple is a common landmark where sacred plants and tress are grown around it. The author visited several Dai villages including Longmen, Manle, Manzhang, Mannuo, and Mangao, the latter was chosen for a detailed study.

Mengao is located at the southern edge of the Mengao reserve (Fig. 7a). The settlement has a history of almost 300 years. There are 147 households with a total population of 753. The Paddy cultivation occupies 1483 mu (15 mu = 1 ha) of land of which 300 mu is within the reserve. It is the most dominant crop, however, recently, some legume crops, vegetables and fruit trees are grown as well. Upland covers almost 1,000 mu of land area on the undulating hills. Community forest occupies 3,996 mu of land of which 2,000 mu have been recently allocated to individual households under the household forestry production and management

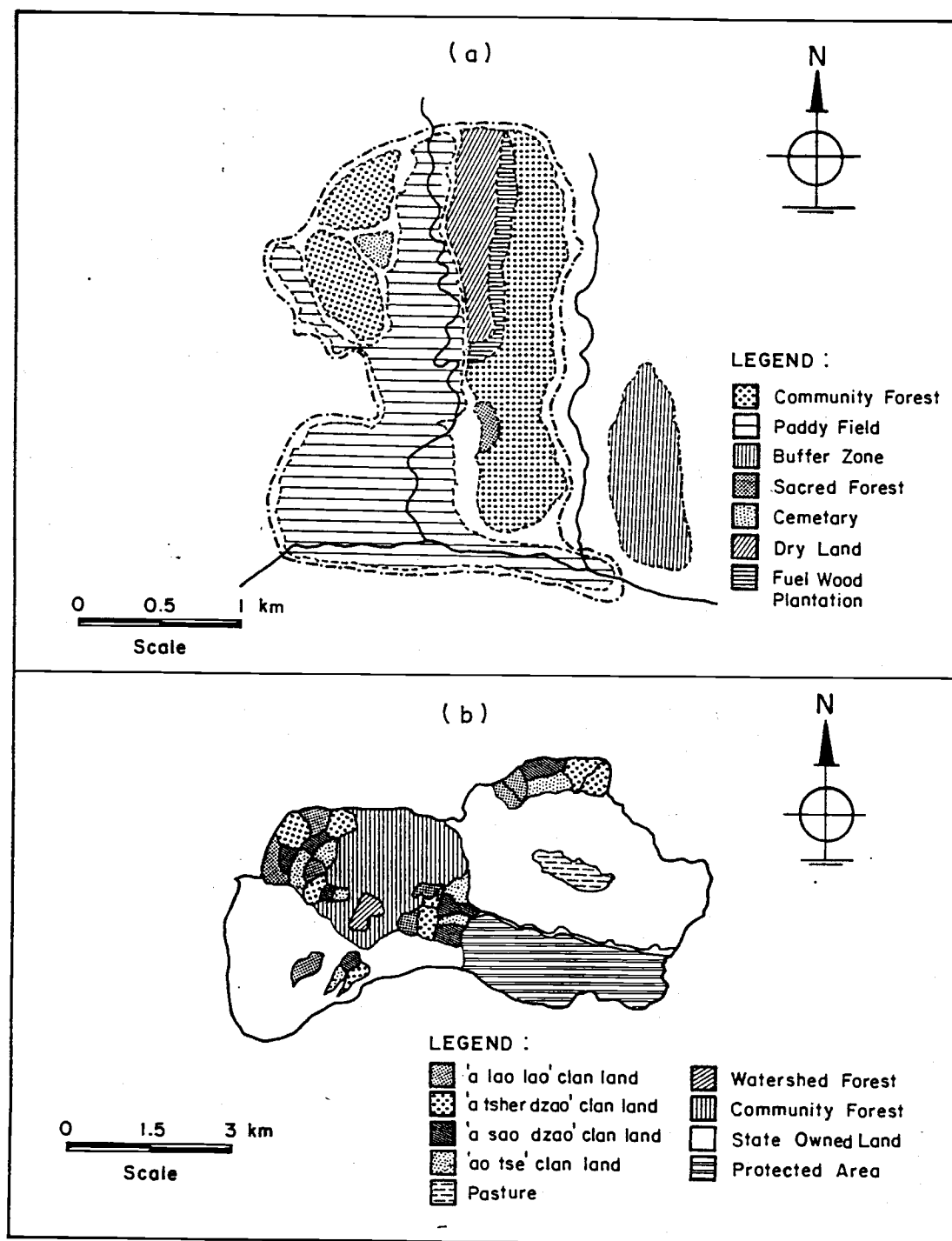


Fig. 7a: The Mengao Village b: The Yanuo Village

contract. The remaining is managed by the village committee for fuelwood and timber. A small river flows from the reserve passing through the valley and is the main source of irrigation water. There are two types of land, the state owned land such as the land under the control of the reserve authority, and the communal land such as the agricultural land and community forestry. In Mengao, the XNNR authority has allowed villagers to plant trees in certain sections of the reserve. The agricultural land is under contractual household utilization, however, the village committee has the right to supervise if the land user has applied appropriate land conservation measures. Each individual household has the right to cultivate the land, however, selling or transferring to another household is prohibited. Representatives of the community collect tax and monitor the land conditions. If the land is degraded or misused, the community withdraws the land from the household who is also asked to pay some form of compensation. Almost 50 percent of the collectively owned forest land was allocated to the households while the remaining land included sacred groves, community forests and watershed protection forests. The community forest was managed by the village committee which issued permits to individual households for cutting timber.

### ***Tea Plantation***

Tea plantation, which had been a traditional practice is one of the main source. It is grown under the natural forest and is also inter-planted with camphor trees. There were more than 1,500 mu of tea plantation under the natural forest. There were several benefits of adopting such a system. While the tea was of better quality, the soil underneath remained moist because of the multi-story formation. The natural forest remained uncut as it was good for the tea plantation. There was less occurrence of insects and pests. The tree canopy offered shelter when plucking tea leaves. The tea harvested from such plantation had a higher market value. Tea plantation together with camphor trees (*Cinnamomum porrectum*), covered almost 300 mu of land. The camphor tree is 10-20 meters high forming a thick canopy. It is believed that quality is good if tea is grown under camphor trees. This practice dates back to at least 200 years. Traditionally, around 5,000 tea saplings are planted together with 100 camphor trees. The modern practice is to plant in row and along contour lines in which 30,000 tea saplings can be grown together with 200 camphor trees per hectare. The plantation is controlled to about 80-100 cm in height. Camphor trees are coppiced when they reach a height of four meters. Recent research (Shouqing, 1993) has indicated that tea plantation with camphor trees have favorable economic and ecological conditions. If the camphor tree canopy is controlled within 20-30 percent, the tea plantation usually has 10 percent higher output than a mono-cropped tea plantation. Also, new leaf can be harvested one week earlier in the spring season. Because of the two-story structure with contour line planting, incidence of soil erosion is minimized. The other advantage is that the aromatic scent of the camphor leaf drives away insects and pests.

### ***Fuelwood Tree Plantation***

There were some patches of fuelwood plantation covering 3-5 mu each which belonged to the households. It was reported that, in the past, almost every household owned small fuelwood plantation, however, during the Cultural Revolution of 1966-1976, the owners cut all the trees fearing that the plantation would no longer be their property. Some of the fuelwood plantations were restored later. The dominant tree species is gemaixili (*Cassia-siamea* Lam.). Villagers



collect seeds during the dry season, and sow at the beginning of the rainy season. In four to five years, the tree becomes 15 meters tall with a diameter of about 10-15 cms. When the tree is cut, the stump is left which grows again and is good for cutting the branches every three years. This tree species grows very fast and is suitable for household use. A 3 mu of fuelwood grove, if managed properly can fulfill the household fuelwood need for a family of four.

### *The Collection of Medicinal Plants*

The traditional medicine of Dai is known as *dang haya*. According to historical documents, Dai medicine has been used for more than one thousand years. So far, the Dai community have developed more than 500 prescriptions from over 600 medicinal plant species. Every Dai household garden consists 30-50 medicinal plants for the treatment of common sickness. The Dai physician is known as *moya*, who acquires the knowledge from his ancestors. In Mangao, a Dai couple had run a small private clinic accommodating ten patients, some of whom had come from big cities. The couple were aware of more than 200 herbal plants and their distribution in the reserve. They followed a specific schedule for the collection of herbal plants which include picking leaves in summer, digging out roots in winter and cutting stems in spring season. A typical daily schedule of collecting herbal plants is shown in the table below.

Table 2: Dai's daily schedule for herbal plant collection

Time	Early morning	Late morning	Noon	Afternoon
Sunday	stem	leaf	root	bark
Monday	root	stem	leaf	bark
Tuesday	leaf	bark	root	leaf
Wednesday	stem	root	bark	stem
Thursday	stem	leaf	root	root
Friday	leaf	root	bark	stem
Saturday	root	stem	bark	leaf

Source: Field Survey, 1993.

### *Farm Yard Characteristics*

The Dai household have four different types of garden within their farmyard. The purpose of having a garden around the house is to beautify the house and utilize the space available. The size of such a garden would be 1,000 square meters. It consists of fruit and ornamental trees and is usually fenced, within which livestock is reared as well. The number of plants is less and the underneath is usually bare. The common fruit trees include papaya, coconut, banana, and jackfruit together with some bamboo trees. The fenced garden usually located behind the house is actually a part of the larger fenced garden and is off limits to the domestic livestock. Its size varies between 50 to 100 square meters and is intensively cultivated. Many different varieties of vegetables, fruits, herbal plants, ornamental trees, and dye plants are grown. It has a three layer structure - jackfruit, coconut and bamboo in the upper story, papaya, banana, mango, litchi and citrus in the middle story, and vegetables, herbal and aromatic plants in the lower story. A small garden in the balcony of the Dai house is typical which is the source for household spices and seasoning and some medicinal plants. These are grown in a wooden box of about two square meters filled with humid soil. Sometimes, it also serves as a nursery. The vegetable

gardens are located far from the household farmyard, usually on the riverside or narrow valleys where the soil and air is relatively humid. Its average size is 800 square meters.

Farmyard gardens contribute significantly to the household food consumption as well as some income. It keeps the household members busy. Such household gardens have a rich diversity as confirmed by the research conducted by Long Chunlin (1990) from the Institute of Botany, Academic Sinica. He has recorded as many as 463 plant species in the Dai and Hani gardens. This research identified 223 plants with medicinal properties, 206 edible plants and 150 ornamental plants. A typical Dai home garden would have about 90-100 various plant species. A detailed list of the plants is provided in (Gang, 1993).

### ***Sacred Forests***

The sacred forest, usually, situated on the hill in almost every Dai village is known as *nong* which is one of the ancient practices of forest conservation. There are three types of sacred forests: *nong man*, the sacred place for village guardian; *nong meng*, for tribal guardians, and *bahao* for the spirits of dead villagers. Owing to limited land availability, Dai maintain only one sacred forest in each village. In Xishuangbanna, there are about 400 such sacred forests covering a total area of 30000-50000 mu which is roughly 1.5 - 2.5 percent of the total prefecture (Pei 1991).

In Mengao, the *nong man* is located behind the village and is about 15 mu in size. The spirit of village guardian (*duwala man*) is placed in a small wooden house. The grove is less dense with tall stands of trees and clumps of bamboo. This sacred forest was restored ten years before. The *nong meng* is located three kms. north from the village. Today, only one big tree survives. The previously dense forest had been cleared during the Cultural Revolution when it covered an area of about 750 mu. Under the big tree, rituals are held every year. The *bahao* is located close to the community forest towards the north-western section of the village covering about 150 mu. It was restored in the early 1980s. The Dai community, particularly the elder members continue to believe that the spirits of the guardian reside in the forests. Any disturbance to the wildlife would result in natural calamities. The protection and management of the sacred forests is the result of the villagers respect for and fear of the spirits. By offering sacrifice to the spirits, the villagers ask for good harvest.

In Xishuangbanna, almost every Dai village have established a Buddhist temple. There were more than 360 temples in the area before the Cultural Revolution, however, only 220 temples exist today (Pei, 1991). In Mangao, about 20 different species were found in the templeyard. It is a common practice in Buddhist temples in Xishuangbanna to plant as many sacred plants as possible.

The natural forests, locally known as *nong* are located on the undulating hills. These are the dry seasonal rain forests which have been converted to rubber plantations or agricultural land. An earlier study conducted during the period between 1972 and 1982 by the Yunnan Institute of Tropical Botany, Academia Sinica indicates that the vegetation on these hills closely resemble to that of pristine forests in terms of character, structure, function and species composition. Another study conducted during 1989-1990 (Lin, 1990) shows very rich species diversity in

such forests, about 100 different species in an area of 1500 square meters. Many endemic species are found in such forests.

### **Rituals**

The Dai community have many traditional rituals which reflect their affinity to nature. The most common rituals are related to hunting, fishing, tree felling and planting and harvesting. In such rituals, the spirit should be worshipped, prayed and offered sacrifice, for example, before felling a tree, the spirit living in the tree should be worshipped and asked for mercy. The ritual is performed by *bomo man* for the village spirit and by *bomo meng* for the tribal spirit. The Dai strongly believe in the rituals and think that without such rituals, there would be natural calamities.

## **IV. THE JINO COMMUNITY IN YANUO VILLAGE**

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The Jino mountain is inhabited by the Jino community, who gave the mountain its name. The mountain is located in the central and eastern sections of the Jighong County. It is part of the Menglun reserve of the Xishuangbanna prefecture. The village of Yanuo is situated at the elevation of 1,310 meters above sea level (Fig. 7b). The climate is sub-tropical with the dominance of evergreen broad-leaf forest. The settlement history of Yanuo dates back more than 200 years. The village has a total population of 339 living in 89 households. The traditional social structure is characterized by the patrilineal clan system which consists of four inter-marriage exogamous clans (*aimao*, or *mamaoma*), namely, *a lao lao*, *a tsher dzao*, *a sao dzao* and *ao tse*. Before the 1960s, each clan lived in a long house, the last one was seen in 1985. The eldest male member of the clan is automatically the chief, *dzer ler*, who takes care of the clan affairs. Each village has a village elders committee, the members representing from four clans. The *dzer ler* from each clan become the committee members.

Besides this traditional social structure, there is a five member villager's committee including the village head, deputy village head, an woman representative, a book-keeper and a storekeeper. They are in charge of overseeing the agricultural production, collecting tax, seeking financial and technical support from the local government and reporting villager's problems to the government. They are also involved in other community development activities and are responsible for maintaining law and order. The main sources of livelihood of the Jino are swidden agriculture, vegetables and fruit tree farming, tea and cardamom plantation, and cattle rearing.

### **Land Management**

Yanuo covers a total area of 8,500 mu of which 4,100 mu is under swidden cultivation, 200 mu terrace (paddy) cultivation, 100 mu home garden, 500 mu grazing land and 3,600 mu under forest cover. Only about 1,600 mu is under healthy forest cover while the remaining is degraded forests and grasslands. There are three types of land tenure. While the *da lai mi tsha* or the community land is under control of the village elders committee, the *da pomi tsha* or the clan land is controlled by the respective clans. Similarly, the *a tsher mi tsha* is land controlled by

individual households. The community land include community forests, sacred forests, watershed areas and grazing land. The clan land is acquired from the past generations. Individual households belonging to a certain clan can acquire and cultivate the land which is returned again to the clan during fallow period. The fallow cycle is seven years, every year 600 mu is under cultivation. The household land are mainly the terraced paddy fields and home gardens. Such lands can be inherited but cannot be sold. It can be retained by the individual households as long as he cultivates the land.

The village elder committee is in charge of ensuring proper boundary demarcation of the village territory. Usually, there is a landmark such as a ridge, valley, a rock or existence of a road. If there is no clear demarcation, usually a forest belt is created. There is also a boundary along settlements of two different clans. Any boundary dispute is settled by the elders committee. A system of zoning is adopted by the committee which include swidden land, sacred forest zone, and watershed protection zone where different levels of human use is stipulated. For example, no human activities are allowed in the sacred forest zone. In watershed areas, limited use is allowed such as the collection of minor forest products, dead wood, leaf, litter, fodder, and some lopping and coppicing of tree branches. In the community forests, fuelwood collection, timber cutting for house construction, limited grazing, hunting and gathering are allowed. In swidden land, traditionally, a 13 year fallow cycle is followed, however, this has been shortened to seven years only owing to increase in population, land degradation, and expansion of the protected areas.

The clan elder or *dzer ler* is responsible for the clan owned land. It protects the ownership rights and regulates the appropriate use of the land. The elder ensures that the clan land is not encroached by the other clans. The land is equally allocated to the clan members. Every year, a meeting is held to decide which fallow land should be opened up for cultivation and what crops are to be grown there. Before clearing the land, rituals are held to please the spirits of the forest and mountain. Clearing the land is a collective activity which is supervised by the clan elder who ensures that adequate fire protection measures are taken. The clan elder also makes sure that the customary laws and regulations are observed. Any offenders are punished through some sort of sanctions and prayers in which the spirits are requested to inflict some harm to the offender.

The Jino have divided their swidden land into three categories, namely, *dzer xiao*, or the low elevation land (600-800 meters), *dzer jao* or the middle elevation land (800-1200 meters), and the *die tha*, or the high elevation land (1000-1450 meters). The *dzer xiao* is characterized by tropical seasonal rainforest, with laterite soil; the *dze jao* by tropical mountain rain forest where the soil is laterite to laterite red soil; and the *die tha* is characterized by tropical monsoon forest and subtropical evergreen broad leaf forest with laterite red soil. Another classification is in line with the swidden cycle: *hio na* is the swidden land with long, usually 15-30 years, of fallow. If the land is continuously cultivated for two years, it is known as *sa pher*. The short term fallow (3-5 years) is called *hia gu phi mei*.

Land clearing is done in early February, the first month in the Chinese lunar year while the burning is done in the second month when the land is completely dry. When burning, five to ten meters wide fire lines are constructed to avoid forest fire. The farming implements include

dibble stick, axe, and knife. By using dibble sticks for sowing seeds, tree roots are protected, facilitating unhindered growth of the vegetation.

The Jino community have lived in a closed environment for hundreds of years. Their self-sufficient agriculture production has fulfilled many of their necessities. Their traditional agricultural practices has resulted in a diversified combination of crops such as upland rice, maize, sorghum, cotton, tea, tobacco, peanuts, sesame, sweet potato, soybean, taro, pumpkin, wax gourd, cucumber, muskmelon, eggplant, chili, various beans, spices such as garlic, ginger, coriander, lemon grass, and sunflower. They grow cotton and glutinous rice at lower elevation and cold-resistant dry rice varieties at higher elevation. Sorghum, maize, millet, sunflower are inter-cropped with cotton while beans, melon, gourd, and vegetables are interplanted with rice. At least 70 varieties of upland rice were identified in the Jino mountain area by the Jino Agriculture Extension Station in 1985. Among these 15 are early maturing, 35 are mid-season and 20 are late maturing varieties. It is estimated that the introduction of high yielding varieties by the local government has resulted in the loss of over 30 varieties of upland rice.

Historically, the Jino Mountain is listed as one of the six tea producing region in the southern Yunnan Province. In Yanuo, about 1,000 mu of natural forest has tea plantation underneath. Similarly, 309 mu is under cardamom plantation in the natural forest, which is now within the reserve boundary.

### ***Hunting and Gathering***

Hunting and gathering are important aspects of the Jino way of life. About 120 species of wild edibles and over 20 wild animal species are recognized as their food source. The wild edibles include many varieties of leafy vegetables, seeds and nuts, fruits, tubers and roots, fungi, bamboo shoots, and insects. Although Jino cultivate upland rice, maize, vegetable, some fruits and rear livestock, their food is supplemented by hunting and gathering in the adjacent forest areas. Hunting of big animals is usually carried out by men, while other items are collected by the women who are very knowledgeable about various types of wild edibles located in the reserve. In some households, such edibles constitute as much as 50 percent of the total household food consumption. Especially at times of crop failure and during the lean periods between harvesting seasons, some of the households depend totally on such products. Collection of wild edibles is usually combined with gathering fuelwood and medicinal plants. The women not only can identify the plants but also perform the task of processing them which include steaming, roasting, drying, and fermenting. As many wild plants would be bitter or sappy, they are boiled or soaked to remove the bitterness before eating.

The swidden land is often the hunting grounds of the Jino. The best hunting locations are where forest and bush intermingle. The game include leopard, bear, wild boar, red deer, muntjack, jackal, wolf, yellow weasel, goat, blue sheep, squirrel, mouse, bamboo rat, and bird species such as peacock, hornbill, silver pheasant, ring necked pheasant, dove, sparrow, etc. The traditional hunting tools include *yamu*, *kouzi*, *jiazi*, crossbow, and bamboo bow. Hunting is done individually or collectively. If the game is big, it is shared with other villages as well. The early sprouts after slash and burning attract many wildlife species. Every year in March and April, villagers have a big hunting celebration by worshipping the spirits of the game animals. Sacrifices of pig or chicken are made to the spirits and prayers are held to request for a good

harvest. The villagers use mud-made decor of animal figures such as deer, muntjack, wild pig, wild buffalo, and various birds to represent the game that the hunting spirit would grant them. During hunting rituals, all agricultural activities cease, as almost all the members of the community are required to participate in the rituals. Hunting an elephant is prohibited, however.

## **V. PROTECTED AREAS AND THE INDIGENOUS COMMUNITY**

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The establishment of the Xishuangbanna Nature Reserve has resulted in successful conservation of flora and fauna in the region. However, the reserve is not free from its own problems which include internal management problems and external human pressure in and around the reserve. The management objectives are not clear, for instance, the first objective states that any form of human use of the resources inside the reserve is strictly prohibited, however, the second objective directly contrasts with the first one allowing some form of human uses. There is no management plan, so far. The management zones such as the designation of core and experimental zones are too broad for the varied nature of management tasks to be performed. The balance between adequate protection of the reserve and limited human uses is difficult to maintain. The reserve boundary is not clearly demarcated in many areas resulting in frequent dispute with the local community. The relationship between protected area staff and indigenous community is not favorable. The reserve staff have limited knowledge of the indigenous community's cultural and religious values and think of them as primitive.

As stated earlier, the human population in the Xishuangbanna region have more than doubled in the last twenty years. The region supports over 700,000 people. The conversion of previously dense forest areas into rubber plantations have been a major problem which has resulted in many sterile areas. Hunting is still practiced by many ethnic communities who do not have any shortage of home-made guns. Dai have traditionally cultivated certain fast growing species such as *Cassia siamea* to meet their energy needs. However, with the growth in human population, the demand for fuelwood far outstrips the supply. There are more than 530,000 ha of barren hills and lands in Xishuangbanna which urgently need reforestation (Shi, 1980). Crop raiding by wild elephants and monkeys is a common phenomena which causes significant economic set back to the indigenous community.

In the past, the XNNR staff were not expected to do anything than routine protection of the reserve. The concept of integrating rural development in the reserve management is new to China. The centralized system of government have virtually ruled out involving local people in protected area management. The physical boundary of the Xishuangbanna reserve often forms a psychological boundary to both the local people as well as the reserve staff. While the staff think that their conservation activities should be limited within the reserve only, the local people tend to exploit resources outside the reserve boundary knowing that the reserve authority has no jurisdiction over the area.

It was deemed essential to know the attitude of the reserve staff towards the indigenous community and their traditional practices. Altogether, 80 mid and lower level staff were interviewed. The majority expressed the opinion that a balance should be sought to provide adequate protection to the park while providing some benefits to the indigenous community.

They expressed that the reserve authority should have jurisdiction over areas outside the boundary of the park. With respect to the traditional natural resources utilization by the indigenous community, not even half of them said that they were sustainable. They held the view that indigenous belief on supernatural is not sensible. There were only few staff who were in favor of the indigenous community's traditional mode of production and natural resource utilization. The majority of the staff viewed the slash and burn agriculture as incompatible to the ecological conditions of the reserve. In fact, there were plans to plant economic crops in areas of shifting cultivation within and adjacent to the reserve. Preventing shifting cultivation is complicated due to the fact that there is very flat land available in the reserve. Integrating some aspects of traditional knowledge with the modern protected area management was seen as a viable solution by only half of the respondents.

The discussions with the indigenous community revealed that they were interested to participate in the conservation activities of the reserve. They were also interested in getting employed by the reserve authority. The reserve staff recognized that the indigenous community are becoming increasingly interested in various activities conducted by the reserve staff, for example, day to day patrolling, however, they had limited idea as to how this could be arranged. Nevertheless, they expressed their desire to cooperate with the indigenous community should such an arrangement be possible.

## **VI. RELOCATION OF THE BULANG COMMUNITY**

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Due to the increasing amount of pressure caused by the growing human population in and adjacent to the reserve, the reserve authority had planned a resettlement program in the core zone. The program was initiated in 1987 with a plan to relocate 18 villages from within the reserve boundary by the end of 1990. During the conduct of the field survey in 1993 it was found that only 10 villages had been relocated with the voluntary participation of the villagers. The relocated villagers had been dissatisfied with the area chosen for resettlement and were trying to return to their original place. However, the representatives from the reserve and the provincial government had been trying to persuade the villagers to stay.

Set in a valley in the Qima mountain, the village of Khun Han is inhabited by the Bulang community having a population of 123, living in 17 households. The protected area authority invested around 500,000 Yuan (US \$ 1 = 5.7 Yuan) for the relocation program which included building a small reservoir for irrigation, a tank for drinking water, electricity supply, road and purchasing 80 mu of paddy land and 30 mu of tea plantation in the new site. The new site is located 5 kms from the local market while the village is located 25 kms away. In the beginning, the relocation program was considered successful, however, many problems became apparent in due course of time. The relocated villagers complained of problems related to health, economy and cultural beliefs.

Before the relocation, the villagers had been living in a cool climatic zone surrounded by a dense forest with good water supply. The majority of them were in a good health and hardly consulted the government medical service. They relied on traditional medications. In the relatively isolated environment, the Khun Han had become a self-sustaining village. Each

household had kept 2-4 buffalos, 6-10 pigs and 30-40 chickens, who rarely acquired any contagious disease. The new site had a hot climate where the shortage of water during the dry season made their problems worse. Owing to frequent interactions with other villagers, they became infected to several kinds of disease. In the past two years, every family had at least one member who was sent to the local hospital. The vegetation in that area was so different that the new settlers were hardly able to find the required medicinal plants. There was a heavy toll on the livestock with an average death rate of 11 percent for buffalos, 39 percent for pigs and 62 percent for chicken, as reported by the representatives of the village committee.

Prior to the relocation, the Bulang community had been cultivating wet rice as well as practicing swidden agriculture. The average landholding was 8.25 mu of terraced paddy field with an annual yield of 350 kg/mu. Each household had 35 mu of swidden land with a ten year fallow cycle. The average yield was 250 kg/mu. Each household had 4 mu of tea and 1 mu of cardamom plantation from which they could earn 500 - 800 Yuan annually. There were some additional income from the sale of mushroom, bamboo shoots, rattan and bamboo products which amounted to 471 Yuan per household per year. Considering the economic situation of other villages adjacent to the reserve, the Bulang community was well off. In the resettled area, the average landholding was 10.4 with 3.9 mu of wetland and 6.5 mu of upland. Since there was not enough water for irrigating the wetland, the paddy yield was less than 150 kg/mu. As the upland could hardly be kept fallow, the soil nutrients depleted rapidly giving an average yield of 125 kg/mu only. The average cash income was from tea plantation was much lower (180 Yuan per household) and there was no income from the sale of minor forest products. In the past, the villagers used to grow more than 40 varieties of upland rice but now only ten varieties are grown, reflecting the decline in agriculture biodiversity.

Before the relocation, the Bulang community had well integrated themselves with the bio-physical environment in Khun Han. Every geographical or biological feature was meaningful to the Bulang who had associated these features in their spiritual and cultural life. Many spirits were worshipped which were believed to have protected the community. After the relocation, such belief were no longer upheld as they were surrounded by an unfamiliar and hostile environment. Their traditional practices of collecting herbs and other resources from the forest had to be given up. The many rituals which were performed with the participation of the whole community now were attended by few who take the burden of travelling more than 25 kms to their ancestors' place for performing such rituals. The villagers had to adjust with the neighboring villages and community. Thus, the resettlement was not only a matter of adjusting to the new physical environment but also of maintaining the cultural integrity, belief and value systems which was rather difficult for the Bulang community. The resettlement objective to maintain the socio-economic status of the relocated people has been hardly successful.

## **VII. SUMMARY AND CONCLUSION**

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This research has threefold objectives which include briefly describing the traditional land use practices of the Dai and Jino communities living in the reserve, examining the attitude of the reserve staff, and exploring how the previous resettlement program had fared in maintaining the socio-economic and cultural systems of the Bulang community.



The economic mainstay of the Dai community is paddy cultivation, vegetable gardening, fruit tree farming and tea plantation. The traditional production system is increasingly under threat of modern interventions and market force. It is likely that the technological access will have a strong impact on the livelihoods of the community. The agricultural and forestry systems are highly diverse. There is a equitable distribution of land and other property. The household production system has given some independence to the individual households. The Jino community mainly depend on slash and burn agriculture and limited terrace cultivation. Contrary to the popular belief that their agricultural practice may have negative impacts on the reserve, the Jino community have been able to utilize the resources in a sustainable way. In the past thirty years, they have hardly encroached any virgin forest land. Hunting is an age-old tradition and many wildlife species are not hunted due to religious beliefs. The clan system allocates land on an equity basis while the other areas such as sacred forests, watershed areas, community forests are common property resources.

The attitude of the reserve staff towards the indigenous community is favorable in the sense that they are willing to cooperate should there be a need to involve the local community in protected area planning and management. However, they do not think that their farming practices and natural resources utilization are sustainable. There were only four forestry graduates among the 93 staff in the reserve. They lack proper perspective on indigenous knowledge and their resource management practices. Integrating rural development with protected area management is a new concept to them. Thus, they have adopted the policy of relocating the resident community from the core zone of the reserve. However, the relocation of the Bulang community suggests that it is very important that not only the ecological and environmental factors should be properly considered when relocating people, it should also be ensured that the cultural beliefs and value systems are upheld and cohesion of the society is maintained. The relocated people must be allowed to maintain relationship with their place from where they are displaced, for example, letting them visit the holy hills or sacred forests.

The reserve authority should seek a balance between the protection of the reserve and meeting livelihood needs of the resident community. They should understand that biodiversity conservation will depend on empowerment of local people in planning and decision making based on their culture and knowledge system. While strict protection should be ensured against illegal hunting of animals such as elephant, tiger, snow leopard, musk deer, etc., limited use of the reserve resources should be continued as that has been the way of life of the indigenous community.

## *Chapter Four*

# **CONSERVATION ISSUES AND MANAGEMENT GUIDELINES IN ALAUNGDAW KATHAPA NATIONAL PARK, MYANMAR**

*by*

**Thaung Tint Lwin\***

## **I. INTRODUCTION**

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The attempts to conserve wildlife in Myanmar dates back to the period of Myanmar kings with the establishment of a game sanctuary at Mandalay Royal City (Lwin et al., 1990). Several game sanctuaries had been established as early as 1918. Currently, there are 16 game sanctuaries and five parks designated by the Forest Department of Myanmar which is one of the oldest in Southeast Asia established in 1856. Though designated as such, the majority have no legal provisions for adequate protection and management. The game sanctuaries and parks are originally forest reserves utilized for commercial timber extraction. Although the reserve forests, in some ways, could be compared to the modern protected areas, it had no provisions for recreation, research, education, ecotourism and community development which are the basic elements of modern concept of protected area management.

The reserve forests in Myanmar cover about 15 percent of the total land area. Apart from logging many reserve suffer from illegal encroachment. Although nearly half of the land area in Myanmar is under forest cover, the gradual destruction of forests has occurred in many parts of the country as a result of shifting cultivation, logging, and indiscriminate tree felling for firewood. Wildlife poaching has become an organized crime killing big mammals such as elephant, tiger and leopard whose products are traded illegally along the eastern border of the country. Insurrection is also responsible for the dwindling population of some wildlife species. Inadequate legislation is another problem in areas such as control of activities within a wildlife sanctuary which include expansion of human settlements, encroachment and vegetation damage; protection of various carnivores such as tiger, leopard, clouded leopard, bears and reptiles. The existing 1936 Burma Wildlife Protection Act is not adequate to address all these problems. As is the situation in other developing countries, the public awareness of the value of natural resources conservation is still at the low level. Land use conflicts between local people and the protected area authority is also a major issue. Relocating people from the reserve forest areas or wildlife sanctuaries had been very difficult which took longer period than had been anticipated. Conservation is still

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Tri B. Suselo. The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.

of least priority in the development process as there is not much support for funds, trained manpower and field equipments. Few personnel who are assigned the task of wildlife conservation have undergone formal training in wildlife management techniques, and research, thus, lacking a proper understanding of the modern concepts of conservation. Continuing civil unrest, particularly in more remote regions, largely preclude development of the protected area system (IUCN, 1992).

The game sanctuaries established earlier were managed by the Divisional Forest Offices and Range officers until 1981. In 1981, the Nature Conservation and National Park Project (NCNPP) conducted with support from UNDP and FAO identified areas suitable for national parks, wildlife sanctuaries etc. and brought them under the jurisdiction of the People Settlement Board (PSB). The 1902 Forest Act and the 1936 Wildlife Protection Act theoretically provide protection for wildlife, however, they do not state any specific measures for habitat protection. The Act prohibits all hunting, fishing, and willful disturbance to any animal in sanctuaries, and similar activities in reserve forests could be conducted only upon receiving appropriate permit. In 1985, a new legislation was proposed which provided legal grounds for the establishment of national parks and nature reserves (FAO, 1990).

It is essential that protected areas be managed effectively; it does not make sense to establish many protected areas if they are not well managed and protected, remaining as "paper parks" only. It is sensible to have few but well managed protected areas rather than many inadequately protected conservation areas, as the prime objective to establish a protected area is to protect the wildlife species and habitat in a well planned, scientific manner. A management plan guides and controls the management of protected area resources, the use of the area, and the development of facilities needed to support that management use. It facilitates all development activities and all management actions to be implemented in an area (MacKinnon et al., 1986). In Myanmar, the only protected area which has a management plan is the Alaungdaw Kathapa National Park (AKNP) which was based on a six-week scientific survey and the forest working plan of 1969/70-1978/79 for the lower Chindwin Forest Division and Myitha Forest Division 1937/38-1951/52. The management plan was drawn for a three-year period, 1984-1986; however, it has several weak aspects. Since 1987, the old management plan still serves as the guiding document for the management of the park.

Providing a brief background of the AKNP, this study focusses on various conservation issues in the AKNP. Based on the findings, several short-term and long-term strategies are suggested for effective control, protection and management of the park. The discussion is mainly qualitative based on a two-month field survey conducted between January and March in 1992. Nine neighboring villages were visited to gain insight of the issues related to local people. These villages include Kabaing and Yagyi in the east, Kuzeik, Pwintkha, Saingte, Labo and Tatchaung in the north and Kunze in the east and Sityin in the south of the park. Both primary as well as secondary data were collected. While primary data included field observations of flora, fauna and habitats; interviews with local people around the park, park staff, village headmen and pilgrims; the secondary

data was utilized from various published and unpublished sources obtained from the Forestry Department.

## II. THE ALAUNGDAW KATHAPA NATIONAL PARK

Of the five national parks proposed by the FAO/UNDP Nature Conservation and National Parks Project, Alaungdaw Kathapa is the only one that has been designated. Established in 1984, it covers an area of 160,580 ha which lies between 22° 24' north latitude and 94° 26' east longitude. It comprises of the Patolon Reserved Forest and the Taungdwin Reserved Forest, both established in 1893 (Fig. 8). The park is located between Chindwin river to the east and Myittha river valley to the west and is approximately 160 kms. west of Mandalay. The area is an upper catchment basin of Patolon and Taungdwin rivers, which flow north into the Chindwin river. The two river basins are separated by three north-south ridges which rise to the height of 1,200 meters above sea level. These parallel ridges are characterized by fairly steep escarpments on the eastern face and moderate on the west. The Mahudaung is the eastern most ridge forming the watershed between the Patolon drainage to the west and the broad settled valley of the Chindwin to the east. Letpandaung - Modaung ridge is located to the west. These are the watershed areas of the Patolon, Petpa and Taungdwin valleys. Beyond the valleys, the Pannyadaung ridge separates the park from the heavily settled Myittha valley. The park is well drained by the Patolon and Taungdwin rivers and their numerous tributaries. It has a monsoon climate, the wettest period being from August to September (FAO, 1982). The annual mean rainfall is 150 cms. with a temperature ranging between 10.7° C in January to 41.5° C in April.

The AKNP is well-forested despite some human disturbances on natural forest cover which lies outside the park boundary. The mixed deciduous forest is the most common forest type in the area except in the higher slopes and ridges. The major species include teak (*Tecton grandis*), pyinkado (*Xylia dolabriformis*), myaukchaw (*Homalium tomentosum*), zinbyun (*Dillenia pentagyna*), taukkuyan (*Terminalia tomentosa*), padauk (*Peterocarpus macrocarpus*), nabe (*Lannea grandis*), and several bamboo species of tinwa (*Cephalostachyum pergracile*) and wabo (*Dendrocalamus brandisii*). The upper part of mixed deciduous forest at higher altitude where pyinkado, padauk and teak are the most common species is reduced in both occurrence and quality. The other common tree species include hnaw (*Adina cordifolia*), myaukchaw, thinwin (*Milletia pendula*), gyo (*Schleichera toleosa*), and thitmagyi (*Albizia odoratissima*). Semi-indaing forest occurs on the higher ridges with major species of ingyin (*Pentacme siamensis*), in (*Dipterocarpus tuberculatus*), thitya (*Shorea oblongifolia*) and Taukkuyan. Pine forest (*Pinus kesiya*) occurs along the crest of the higher ridges above 750 meters in Ponnyadaung, Petpa and Paya Chaung where as the evergreen forest appears near the crest of the Mahudaung and rocky streams of Paya Chaung in the Alaungdaw Kathapa gorge. The understorey of bamboo species such as myin (*Dendrocalamus strictus*), thaik (*Bambusa tulda*), wabo (*Dendrocalamus hamiltonii*) and tin (*Cephalostachyum pergracile*) in association with grass *Imperata* spp., provides big game habitat (IUCN, 1993).

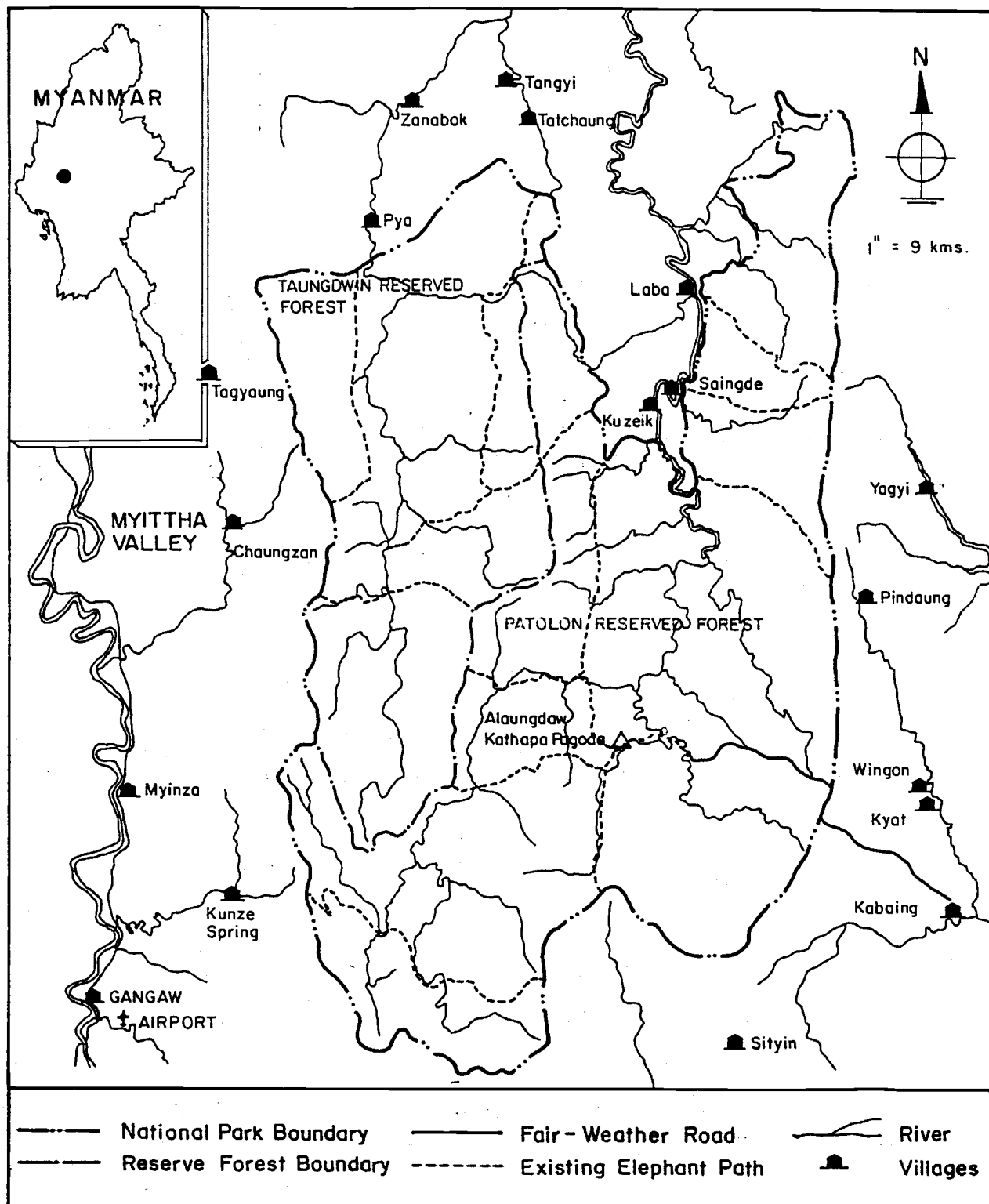


Fig. 8: The Alaungdaw Kathapa National Park, Myanmar

The park is relatively rich for fauna. Large mammals such as gaur (*Bos gaurus*), sambar (*Cervus unicolor*), barking deer (*Muticus muntjak*) and black bear (*Selenarctos thibetanus*) are the main species. Elephants (*Elephas maximus*) are found in the west and appear in small groups of about a dozen individuals which are vulnerable to illegal hunting for ivory trade (FAO, 1983). The total number of elephants in the park has been estimated at 200. Gaur is fairly abundant in the less disturbed area of the Petpa drainage and adjoining ridges where as Banteng (*Bos banteng*), which is reported to be abundant, is found in the deciduous forests of east Magyinbin (FAO, 1983). Serow (*Capricornis sumatrensis*) are reported to occur sporadically on the steeper slopes of the Ponnyadaung ridge. The park is also noted for the widespread occurrence of tiger (*Panthera tigris*). About 80 bird species are found in the park.

There are two village enclaves in the Taungdwin reserve Forest, namely, Pya and Zanabok, however, they are legally excluded from the reserve. The human population is concentrated to the west in the broad fertile Myittha valley. The nearest villages in the west are Kunze, Chaungzon, Myinza and Togyaung. The nearest town, Gangaw, is located 15 kms away and is a center for tourism activity. Along the Chindwin valley to the east, the main population centers include Kani, Monywa and Yinmarbin whereas areas closer to the park are small villages such as Yagyi, Yebyer, Nyaungbinle, Wingon and Kyat. There are no settled areas immediately contiguous with the southern boundaries of either the Patolon or Taungdwin reserves. Beyond the southern boundary of the park, the main villages are Sityin, Mayin, Banbwe, Khintha, Thityidaing, Zitaung and Kyawdaw. There are some settlements in the valley of the Sitlin Chaung river which borders with the northeastern section of Taungdwin Reserve Forest among which the largest is Tongyi.

The main livelihood of the surrounding population is agriculture. Rice, groundnut, maize, chili and tomato are the main crops, supplemented by hunting and fishing. The reserved forests and the unclassified forests outside the park land were exploited for timber and forest products, though, this has been stopped now. Taungya is practiced on the hill slopes of unclassified forests. The lack of wildlife around the villages suggests that illegal game hunting is widespread. The people in Pya and Zanabok had been traditional hunters. Villagers collect a variety of forest products in the reserve and unclassified forests. Orchid collection is a lucrative enterprise as it could fetch good price in the town markets. Some villages are employed as mahout (elephant pilots) in the Myanmar Timber Enterprise. At present, the only visitors are the pilgrims to the Alaungdaw Kathapa Pagoda. There are no all-weather roads, and during the rainy season, travel is almost impossible.

### III. PARK MANAGEMENT

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Formerly, the Patolon, Taungdwin and other adjoining reserve forests were exploited commercially by the Bombay Burma Trading Corporation under a concession originally granted by King Thibaw and subsequently extended by the British Administration. During the World War II, it was partly utilized by the Nippon Burma Timber Union. After the independence, it came under the management of the State Timber Board and following the

nationalization of the timber industry, it was managed by the State Timber Corporation which was renamed as the Myanmar Timber Enterprise in 1989 (Lwin, 1992).

The park is considered the foremost in Myanmar, because of its outstanding natural beauty, its historical, religious and scientific interest; the lack of human disturbance; the protection of catchment areas of the Chindwin and Myitha rivers; the protection of wildlife habitat; and relatively easy access (Lwin et al., 1990 as cited in IUCN, 1993). Although, the site is termed as a national park, there is no legal provision for it being gazetted as such. The park has been zoned into wilderness zone, sanctuary zones and an intensively used visitor zone. Field staff are posted at outstations in Gohnnyin, Wetkya, Kabaing, Payawa, Kunze, Gangaw and elsewhere, along the park boundary.

Initially managed by the People Settlement Board, the park was later handed over to the Forest Department in 1985. It is currently under the jurisdiction of the Forest Department which deploys a Senior Deputy Director as the warden of the park under which five township supervisors who are the assistant directors supervise different administrative areas within and outside the park. The park headquarter is located at Yinmabin, south-east of Kabaing. The main responsibilities of the park staff are to patrol the park, repair boundaries and roads, build guard posts and erect sign boards, prevent illegal activities and conduct regular administration. The park objectives include protecting as much of the natural habitat as possible; preserving viable populations of flora and fauna; protecting watersheds; facilitating public access to the pagoda; encouraging tourism, recreation, education, and research; and providing benefits to the local human population through employment and the sale of local products (FAO, 1982).

#### **IV. CONSERVATION ISSUES IN AND AROUND THE PARK**

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Though there are routine problems of park management such as inadequate funding, manpower and lack of strong governmental commitment, the major conservation issues as related to human activities in the AKNP include inadequate protection against wildlife hunting and logging, low level of development in the peripheral villages resulting in higher dependency on park resources, and problems caused by pilgrimage to the Kathapa shrine. The following sections discuss these issues in detail.

There is extensive hunting by heavily armed gangs with dogs, particularly in the western part of the park. The inhabitants of Pya, Zanabok, Taung and Chaungzon have been traditional hunters. The hunting of elephant for ivory by Chin and military personnel and also hunting of other large mammals such as sambar, gaur, wild pig, barking deer for meat is intensified during the rainy season when animal tracks are easily discerned and followed. While the hunters are heavily armed, the park guards are not, which makes it difficult and often dangerous to prevent or arrest the hunters. Game meat as well as other minor forest products are traded in the nearby areas. There is also evidence of some desultory hunting, mainly of birds and small mammals by pilgrims, staff of the Myanmar Timber Enterprise and private elephant camps. During the field research, four hunters had been arrested. After having their weapons seized and some penalties levied, they were set

free. The hunter's access routes are mainly located in the southwest, northwest, northern and western sections of the park. Some local villagers were also found to be assisting the hunters for they would get attractive payment in doing so.

Many of the rivers and streams in the park are poisoned with highly toxic pesticides such as Endrin, which totally eradicates not only fish but other forms of aquatic life as well. These activities are mainly concentrated in the western section of the park. Many areas in the park suffer from haphazard burning during the dry season as a result of fire deliberately set by hunters and pilgrims. The dry season elephant camps established by the Myanmar Timber Enterprise and their private contractors are widely scattered and impossible to control effectively. They are in effect small villages, each with several houses where the mahout bring their families to live during the hot season. They cut trees, collect forest products, set fires, trap wildlife and inevitably cause considerable disturbance. Collection of honey and wax is also common in the park. Unfortunately, orchid collection by villagers, the military personnel and some park staff is a common practice. Usually, the entire plants are ripped indiscriminately from trees, especially if they are found to be rare. Quite often, orchid collection involves tree felling as the majority of the villagers are not skilled in tree climbing. A large collection of wild orchids were seized in Myaunggyigon, a nearby village where the collectors were trying to sell the orchids in Mandalay.

Logging is the principal activity in the park. The forests inside the park is endowed with high quality teak and hardwood such as pyinkado (*Xylia dolabriformis*) and padauk (*Pterocarpus macrocarpus*). Logging operations are carried out by the Myanmar Timber Enterprise, military (Northwest Command Army) and several private companies. While the state enterprise extracts teak, the others can extract other hardwood species only. The logging operations are based in most of the townships around the park. Illegal logging is conducted by many neighboring villagers, particularly in Kabaing and Kuzeik. Felled trees, entry routes and evidence of chainsaw use are frequently encountered in the reserve forests. The park authorities had given 98 acres of unclassified forests to the Kathapa Shrine Management Committee who usually felled trees for building constructions around the shrine. On occasions, security troops were also found cutting trees, their excuse, however, was the construction of building and bridges in the area.

Except for few villages, the majority of the inhabitants around the park are dependent on agriculture. The park continuously faces threat from agricultural expansion. Though the average landholding per household is 2.3 acres, it is not sufficient to fulfill the needs of increasing number of household members. As a result, encroachment of reserve forest land is a slow but continuous activity. This threat is apparent in Saingte where the settlement and the park is separated by the Patolon stream and there is no other physical hindrance in preventing the villagers in encroaching the park land. Kabaing is the largest village with 700 households and 850 acres of paddy land which is the product of gradual encroachment of the reserve forest. Shifting cultivation is common in all the villages. The main crops grown are paddy and groundnut. Farming method is traditional. Owing to good soil fertility, adequate water supply and normal weather conditions, crop production is good,



however, due to the absence of accessibility to the market center, not much trading is done. The other crops are corn, sesame, potato and cotton.

The average income of the household is highest in Kabaing with about 25,000 Myanmar Kyat per year, while it is the least in Tatchaung with only 1,135 Kyat. There is little off-season (August-October) employment available. It is a common practice to go fishing in the park or work as guides for licensed hunters. Few villagers had been employed in the Park, the largest proportion came from Kabaing and Kunze villages where eight persons each were employed. Pwintkha is located close to the park, yet, there was nobody employed in the park. Before the park's establishment, the local people were hired by the logging companies who work in various menial jobs such as cook, guide, mahout and other daily wage jobs. These people lost their job once the area was declared a national park. The local people showed their interest in various park related jobs such as road construction and maintenance, building construction, wild animal inventory and other forest operations. Aside from the little employment in the park, some were self-employed in traditional handicraft enterprises, particularly in Kunze which is noted for its weaving industry.

Dependency on fuelwood is a major issue in the peripheral villages of the park. The average fuelwood consumption by a household is roughly four tons per year. The local people collect their fuelwood from nearby unclassified forests. As there is increasing demand for fuelwood due to population growth, the declining firewood stock should be urgently compensated by establishing village fuelwood plantations. Otherwise, potential buffer forests would be lost soon. However, due to open access to the nearby forests, people are less willing to venture into such activity.

The education level and the school facilities in the vicinity of the park are rather limited. There is only one middle school and one high school adjacent to the park. Similarly, health facilities are very limited with only one hospital in Kabaing and one health center in Labo, Pwintkha and Yagyi each. As mentioned earlier, infrastructure in the region is poor as well.

One of the park's main attraction was the location of the Alaungdaw Kathapa Pagoda. According to legend, Maha Kassapa - or Kathapa - was one of the ten Bodhisattavas chosen by the Lord Buddha to become Buddha in the future world (Tun, 1959 as cited in FAO, 1984). According to the story, the Maha Kassapa died at the place known as Alaungdaw Kathapa within the park boundaries, and that he was buried in a cave in the rocky Paya gorge, the entrance to which subsequently became miraculously sealed (FAO, 1984). The site of the cave and the shrine which now stands above it is visited by pilgrims during the dry season. The number of pilgrims is increasing annually from 18,643 in 1984 to 21,567 in 1991 (information available from the Kathapa Shrine Management Committee). The most common route passes through Monywa, Yinmabin and Kabaing villages. There is a motorable road up to Thapeiksay sakan from where the pilgrims have to walk around 4 kms or ride elephant. There are other routes as well which are used by the local villagers. These routes are usually very difficult. Accommodation is extremely limited. During the peak season, pilgrims stay in the rest houses or camp out under

makeshift shelters. The visitor survey showed that almost half of the pilgrims were in a group size of 2-10 persons while 36 percent were in a group size of 11-20 persons. Almost 80 percent of the visitors were staying for one to three nights (Lwin, 1992). The lack of sanitary facilities pose a serious threat. The design of the buildings and layout is haphazard, with no attempt to make the best of a potentially very attractive site. The pilgrims often become involved in wildlife poaching, especially birds and small mammals and collection of rare orchids. Haphazard burning by the pilgrims is also a potential threat. There is no entry charge for the visitors, however, it is estimated that the Kathapa Shrine Management Committee receives two to three million Myanmar Kyat from donations.

## **V. THE AKNP MANAGEMENT PLAN**

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The management plan of AKNP published in June 1984 was prepared by the UNDP/FAO national park project. The plan stressed for the effective conservation of natural resources with limited human activities, specifically for the purpose of research and education. Its main concern with respect to resources protection was the continuing illegal hunting and burning, and the establishment of administrative infrastructure necessary for sound management. It was envisaged that at the end of the plan period in 1986, based on the previous knowledge and experience, additional data could be gathered to improve the management efficiency. The revised preliminary master plan prepared in 1984 contains updated information and gives greater emphasis to management problems such as control of poaching, fire protection and the importance of training for the field staff. The management plan is divided into seven chapters including (1) Introduction, (2) General Description (3) Population and Land Use, (4) Discussion and General Conclusions, (5) Establishment and Management, (6) Development (7) and Organization (FAO, 1984).

The relationship with the local people is mentioned in the fifth chapter which states that a National Park Liaison Committee should be established including local government officials, representatives from the village councils and AKNP trustees, and park personnel as a forum to deal with issues related to local people and discuss matters concerning the impact of AKNP on local livelihood. An extension program was planned in consultation with the Liaison Committee to inform the local people of the park objectives and their possible implications on their livelihood. Visits by the park staff were expected in the neighboring villages for frequent interaction with the local people.

Though well planned, the management plan did not implement any activities which could have strengthened the integrity of the park and improved relationship with local people. No Liaison Committee was established as mentioned in the plan document and people's participation in the planning stage of the park never occurred. The management plan needs to be updated and necessary changes should be made and its weaknesses rectified. It is essential to revise the existing management plan, with a strong focus on people's participation in the planning and management aspects of the AKNP.

## **VI. THE AKNP MANAGEMENT STRATEGIES**

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Based on the general findings of the study, management guidelines are suggested with reference to park administration, community development projects around the park, zonation, tourism development, environmental education, and law enforcement.

### ***Park Administration***

As immediate measures, increased availability of funding for effective management of the AKNP is essential. Financial assistance should be solicited from external agencies such as UNDP, WWF and FAO as well as internal funding from the Forest Department and other government agencies. It is also feasible to generate revenue from the park by promoting tourism activity within park lands, particularly by managing the pilgrimage tourism in the Kathapa shrine. Currently, the park's research, scientific and development activities are very limited due to financial, technical and manpower constraints. Another factor to be considered in the effective functioning of the park administration is the employment of adequate number of field staff. A total of 315 staff had been sanctioned for the park but only 112 positions had been filled.

As mid-term strategies, with adequate improvement of the infrastructure, the patrolling unit should be made strong by providing vehicles and field equipments. Equipments for construction and regular maintenance of roads and building is essential as well. As a long-term strategy, the park personnel, particularly, the field staff should be adequately trained. The mid-management officials should be trained abroad, however, it should be ensured that after their training they continue to serve in the park. While the local staff training could be conducted by the Forest Department, overseas training should be made possible by external funding agencies.

Similarly, as long-term strategies, the park management should emphasize scientific research so that wildlife species and habitat are closely monitored. Research should be an integral aspect of the management. A detailed information on socio-economic aspects of the local villages is urgently needed to develop effective community development programs.

### ***Community Development around the AKNP***

Community development activities should be widely carried out in the peripheral areas of the park. Without development efforts at the community level, it would be difficult to solicit their support in conservation related activities. The ultimate objective of any community development activities should be improving the quality of life of the local villagers and maintaining healthy environment.

As a priority action, the Yinmabin - Kabaing road must be upgraded to an all weather road while the road from the Kabaing to the Kathapa shrine should be improved. The existing road from Kani to Yagyi used by the logging companies should be connected to Kuzeik. Similarly, the existing road from Yagyi to Kabaing must be upgraded.

Currently, the paddy lands in the study are rainfed. Small irrigation systems should be introduced. With better access roads, marketing of the agricultural produce would become feasible. With increased availability of irrigation water, intensive cultivation would also be feasible resulting in higher productivity. The perennial streams like Patolon, Taungdwin, Lesha and Yama hold good irrigation potential. The traditional weaving in Kunze and Chaungzon villages must be improved and encouraged by supplying raw materials, instruments and appropriate technology. Bamboo, rattan and pottery products should be promoted in the nearby villages.

As mid-term strategies, it is desirable to have community development workers group in every village who would take part in the planning and decision making aspects of the park. This group should act as the coordinator between the park and the local authorities as represented by various institutions. Similarly, women should be encouraged to form their own group and become involved in traditional handicraft enterprises as well as managing fuelwood plantations. The majority of the guard force should be recruited locally.

The long-term strategies should include establishment of the village fuelwood plantation to balance the declining fuelwood sources. Such plantation could be managed by the villages, however, initial support should come from the Township Forest Department and the AKNP authority as well. The existing health and education facilities in the surrounding areas of the park is rather poor. The health centers do not have adequate number of health assistants. It is suggested that at least one health assistant and three nurses should be appointed in each village. Necessary support should be extended by the Divisional Health Department.

### ***Zonation***

The previous management plan had divided the park land into several use zones such as buffer zone, development zone, strict sanctuary zone, sanctuary zone and wilderness zone. The zoning system, however, has not been implemented. Buffer zones had been proposed in the northern sections of the park. The clear demarcation of park boundary and establishment of buffer zones should be given a high priority. The existing reserve forests outside the park boundary may serve as buffer zone. However, it is essential to regulate or control the logging activities in the reserve forests and gradually have them transferred to the villagers. The management objective should be one that of sustainable harvesting of forest for fuelwood and timber supply with continual reforestation activities. It is feasible to demarcate five kilometers of area from the park boundary as buffer forests. The jurisdiction over the buffer forests outside the park boundary should be entrusted to the Township Forest Office, the national park township supervisors and the local people. In the case of Kuzeik, and Pwintkha, some portion of park land has to be designated as buffer forest. These villages are so close to the park that virtually no buffer forests or land strip is available. A development zone should be created along the route to the Kathapa shrine where facilities could be concentrated for meeting the needs of the pilgrims which should be planned very carefully. The park should also identify areas for strict protection zones where no human impact is allowed.

### ***Tourism Development and Visitor Impact Management***

One of the ways to provide local communities of funding required to conduct development projects in their village is to promote nature tourism. Tourism would also help in safeguarding the cultural heritage of the local people. The immediate action should be taken to provide service facilities to the pilgrims. A visitor management strategy should be formulated and implemented so that negative impacts from visitors can be avoided or mitigated. The acceptable changes from visitor impacts should be clearly defined for management purposes. It may perhaps be necessary to control the number of visitors if the service facilities cannot accommodate them. Providing accommodation facilities is necessary as at present no such facility exists along the pilgrimage route. This could be jointly undertaken by the park authority and the local community. Profits from this could be channelled both to the park as well as the local economy. Care should be taken not to destroy the naturalness along the route. The building should be well suited to the natural conditions in that area. Various service facilities should be concentrated in Payawa sakan, Mindon sakan, Gonnyin bin sakan and Thanatkhaye sakan. Several trekking points could be developed in Kabaing, Kuzeik, Yagyi, Kunze, Sityin and Chaungzon. After adequate training, local people could be hired as trekking guides. The existing elephant paths could be used as trekking routes leading to Lesha sakan, Kyamalay fall sakan, Kyamagyi fall sakan, Mayin sakan, Wabopin sakan, and Yemin sakan. Many tourists have their luggage carried by the elephants from within the park and the staff of the Myanmar Timber Enterprise who get nominal amount of money for their services. This should be regulated by the park authority. A nominal amount of entry fee should be collected from the visitors which can be utilized in park management activities as well as community development in the surrounding villages. Visitors should be closely monitored so that they would not involve in wildlife trapping, burning and orchid collection. Appropriate visitor signs and warning posts should be erected, however, the ultimate objective of these should be to make the visitors aware of their activities which would be detrimental to the natural resources of the park.

As long term objectives, wildlife watch towers could be erected on several locations, particularly the Mindon area, Hyingya sakan and grassland areas along the ridges of Letpandaung which are also the habitats of big mammals. The design and construction of the trails and watch towers should be done in such a way that they are well integrated into the natural surroundings. As the Kathapa shrine and the AKNP itself has good prospects of attracting local as well as foreign tourists, there should be a feasibility study to construct a luxurious hotel in Monywa, a city in the east bank of the Chindwin river. It is only a one-day trip to the AKNP from Monywa, however, at present, there are restrictions for tourists to visit Monywa. Considering its potential as a tourist center, this restriction should be lifted.

Tourism in AKNP should be planned in such a way that it will not be overcrowded with visitors. In order to do so, the region's visitor capacity should be ascertained and proper visitor management strategies should be developed.

### ***Environmental Education***

It is mandatory to establish a visitor education center in the park which would provide necessary instructions to the visitors to observe certain regulations and also make them aware of the conservation values of the park. This could be done by distributing pamphlets, newsletters, screening films about nature conservation on religious occasions, and organizing exhibitions in the nearby villages. It may be necessary to establish a position for conservation education officer. A mobile education reaching beyond the park boundary is essential to create public awareness of the importance of the park. Youth groups may be encouraged to participate and conduct such mobile campaigns. This could be in the form of poster/slide presentation, video screening, organizing public forums and so on.

A long-term strategy should be to prepare an education/interpretive plan for the park. In the local schools, introduction of AKNP could be well incorporated in the environment curriculum. Conservation newsletters should be published and distributed by the park authority. Making postcards and selling them in the local market as well as other areas could be a good source of revenue generation in the local economy as well as increasing conservation awareness. Visual media could also contribute in disseminating information regarding AKNP and its natural heritage.

### ***Law Enforcement***

In order to control the logging and poaching activities in and around the AKNP, the park authority must be well equipped. The strength of the park authority should be increased by hiring more park guards and providing them adequate equipment. It is essential to erect strategically located guard posts supplemented by a network of informers, mainly from the local villages. Incentives to those who honestly fulfill their duties are necessary. As the Regional Authorities and the Northwest Command Army have allowed armed guards inside the park, necessary equipment should be purchased. There should be regular intensified patrolling to prevent poachers from sneaking into the park. It is recommended that there should be at least five guards in a patrolling unit.

Extension of guard posts is another important concern. At present, there are six guard posts around the park which should be increased by establishing two in Gangaw, one in Pale and one in Yinmabin townships. There should be at least three guards in each post. As a long-term strategy, efforts must be geared towards controlling wildlife trade, particularly in Monywa, Kani and Mandalay which are the major wildlife trade centers. The existing Burma Forest Act (1902) and Wildlife Protection Act (1936) are already out of date and need modifications to address the emerging issues in wildlife trade. The Forest Act has been amended recently, however, it has only one chapter on national park. There is no separate national park act. The country needs bilateral and multilateral cooperation to support its efforts on establishment and maintenance of protected areas. It should also be party to the international agreements such as the Ramsar convention, World Heritage Convention and the CITES.

## **VII. SUMMARY AND CONCLUSION**

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Myanmar has lately started the establishment of the protected area network. Though conservation has a long history in Myanmar, the political turmoil after the second world war has resulted in massive destruction of the forests and wildlife species. As Myanmar has remained isolated for a long period, bilateral or multilateral cooperation in conservation of prime wildlife habitat has not been successful owing to inadequate funding and trained manpower. This research examined some of the conservation issues in the country's only national park, the Alaungdaw Kathapa National Park and recommended some management strategies.

Though the conflict between park and local people is not so serious, the AKNP suffers from several management problems. The main conservation issues include commercial wildlife poaching, haphazard burning, poisoning of rivers, orchid collection, some illegal logging and visitor impacts caused by pilgrims. There is low level of economic activity in the surrounding region which makes the local people heavily dependent on the park. The park's management plan which was prepared in 1984 has not been followed mainly due to funding and manpower constraints. As a result, effective protection and management of the park has not become possible.

Several management guidelines with respect to park administration, community development projects around the park, zonation, tourism development, environmental education, and law enforcement are suggested with short-term and long-term strategies. It is essential that the AKNP management be based on a new management plan which contains updated and detailed information of the park and its surroundings. The protected area management philosophy should encompass the integration of conservation and development programs. As the support of the local villagers is essential for the long-term existence of the park, their benefits and involvement should be adequately considered in the overall planning and management of the AKNP.

## Chapter Five

# MANAGING LIVESTOCK ON THE EDGE OF THE KOSHI TAPPU WILDLIFE RESERVE, NEPAL

by

Ram K. Shrestha & Karl E. Weber

## I. INTRODUCTION

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Koshi Tappu Wildlife Reserve (KTWR), the only "Wetland of International Importance" in Nepal designated under the Ramsar Wetland Convention in 1987, has been the site of grave resource conflicts. The reserve was established in 1976 with the main objective to preserve the habitat of the last remaining wild water buffaloes (*Bubalus bubalis*) as well as the prime land staging winter habitat of tens of thousands of migratory birds and several tropical and subtropical wildlife as well as plant species. The reserve, one of five protected areas in the subtropical climatic belt of the Tarai, is located at the southern edge of the Eastern Development Region. It covers 17,500 ha of land in the flood plains of the *Koshi* river covering Sunsari, Saptari and Udayapur districts.

Historically, local people had open access to the flood plains where they would collect fodder and firewood, hunt and fish, and let their livestock graze. They had become heavily dependent on the particular resources which probably had determined their occupation and way of life. The establishment of the wildlife reserve constrained their activities resulting in an escalation of conflicts between local people and the reserve authority. The National Park and Wildlife Conservation Act 1973 declares illegal the collection of resources and livestock grazing inside the reserve. The local people have continued their resource use despite the heavy fine imposed by the authority, which represents one of its major sources of revenue. Encroaching into the reserve are not only villagers from the adjoining area but people from far beyond the Koshi Tappu region and from India many of whom drive their livestock to graze inside the reserve.

In the immediate surrounding of the wildlife reserve livestock rearing is a major economic activity which complements field and tree cropping. Household income from livestock rearing contributed about 20 percent of farmers' gross income (Sah, 1993). Residents around KTWR had been rearing large herds of up to eleven heads of livestock per household. It was estimated that between 15,000 and 18,000 heads of livestock regularly grazed and 10,660 heads permanently stayed inside the reserve. An estimated 3,000 heads of livestock were owned by Indian nationals at the peak of grazing season (Sah, 1993; Shrestha, 1994).



Feed scarcity for the huge livestock population is the most pressing problem. Public forest, pasture and open ground have been insufficient to meet the feeding and grazing needs. Most arable land had been under cultivation to meet the growing food requirements of the dense human population. As a result, there seem to be no options available for local people other than letting their livestock graze inside KTWR.

## **II. RESEARCH METHODOLOGY**

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Based on a field survey conducted in 1993, this research identifies and explains the main socio-economic factors impairing KTWR management and hardships caused by KTWR management to the local residents. Specifically, it has the following main objectives:

- assessing the livestock population characteristics and its management practices;
- examining the significance of livestock rearing for the household economy in communities adjacent to KTWR;
- analyzing the pressure exerted by livestock rearing on KTWR; and
- formulating an alternative strategy for the conservation of KTWR in a socio-economic perspective.

Six among the twelve Village Development Committee (VDC) areas adjoining KTWR in the Sunsari, Saptari districts were selected, namely, Haripur, Kushaha and Prakashpur in the former and Badgama, Pipra and Odaha in the latter district were selected. To ensure a proportionate representation, all households in the adjacent VDC areas were purposively included on the basis of their location, namely, along the southern, middle and northern sections of the eastern and western boundaries of KTWR. Furthermore, households were identified as adjoining the reserve and detached from the reserve. Thus, a total of 160 households were selected of which 87 were distinguished as adjoining the reserve and 73 as detached from the reserve.

The impact of local communities on KTWR and vice versa is a function of distance, i.e., the shorter the distance, the greater is the impact. The sampling based on two locations, i.e., adjacent and detached, may not truly reflect the linear spatial distribution but rather a relative comparison of the spread effect. Hence, items of information were analyzed based on a three tiered location classification namely, near, middle and remote which is largely based on the road distance of each sampled household to the reserve. The community buffer zone adjacent to the reserve is considered to be of six kilometers wide. Based on this perimeter three ranges, namely, 0-1 km, 1.1-3 km and greater than 3 km were identified representing the near, middle and remote areas. These areas represent 55.6, 21.29 and 22.5 percent of the total sample, respectively.

Due to the dominance of large ruminants, the analysis is focused on cattle and buffaloes. The livestock unit (LSU) has been used for the standardized measurement of all species of livestock. On the basis of the maintenance ration (according to body weight), production ratio and work ratio, the LSU was calculated for livestock of varying age and sex. The LSU coefficients for adult male and female buffaloes are considered equivalent to one unit, while a

young buffalo is counted as 0.33, adult male cattle 0.75, adult female cattle 0.66, and young cattle 0.17 unit (APROSC, 1985).

The standardized assessment of livestock feed was calculated from available feed sources in terms of total digestible nutrients (TDN), which is the sum of all the digestible organic matter present in the ration. The annual average TDN requirement per LSU was assumed to be 1,100 kg at subsistence level (APROSC, 1985). To assess the TDN sources from the farm, the coefficients of TDN available from residues of paddy, wheat, maize, millet, mustard, pulses, feed from risers and bunds, fallow grazing, kitchen leftover, green grass, fodder and concentrates were used. The TDN available from the wildlife reserve and public lands were derived based on the estimation of land cover under forest, grass and others. The estimation was done using the ARC/INFO, a Geographic Information System (GIS) software. The information derived from the analysis of TDN was further applied to assessing the livestock carrying capacity.

The participatory rural appraisal (PRA) technique was employed for the assessment of domestic livestock permanently grazing inside the wildlife reserve. Considering the difficulty in obtaining accurate information on illegal practices of livestock grazing inside the reserve this method was employed through which the population and movement of livestock and the location of livestock holders were determined.

### III. THE KOSHI TAPPU WILDLIFE RESERVE

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The Koshi Tappu Wildlife Reserve is located in the subtropical Terai belt of the Eastern Development Region of Nepal and is close to the southern border with India (Fig. 9). Extending between 26° 35' to 26° 40' north latitude and 86° 56' to 87° 04' east longitude, the wildlife reserve covers 17,000 ha. of flood plain of the Sapta Koshi River. It has an elongated shape as it runs along the river for almost 24 kms. Officially established in 1976, its revised boundary descriptions were published first time in the *Nepal Gazette* in 1980. It is the only wetland in Nepal designated to be of international significance in 1987 under the Ramsar Wetland Convention.

There is a large expansion of open waterbody, marshes, and reed-beds covering an area of 13,000 has. which extends between the northern border of the reserve and the Koshi barrage, along the border to India. This large expansion is mainly the result of the heavy sedimentation which followed subsequently after the dam construction during the period between 1958 and 1964. Though this area is the major habitat of migratory waterfowl, it is still excluded from the reserve as the barrage area had been leased out to the State Government of Bihar in India for 99 years (IUCN, 1993). The annual average rainfall in the region is 2,100 cms. of which 85 percent falls during mid-June to September. The average daily maximum temperature ranges between 23.5° C to 33.4° C and minimum between 7.8° C to 25.3° C. The Koshi River has a discharge of 287 m<sup>3</sup> per second in March and 15,940 m<sup>3</sup> per second in August (IUCN, 1993).

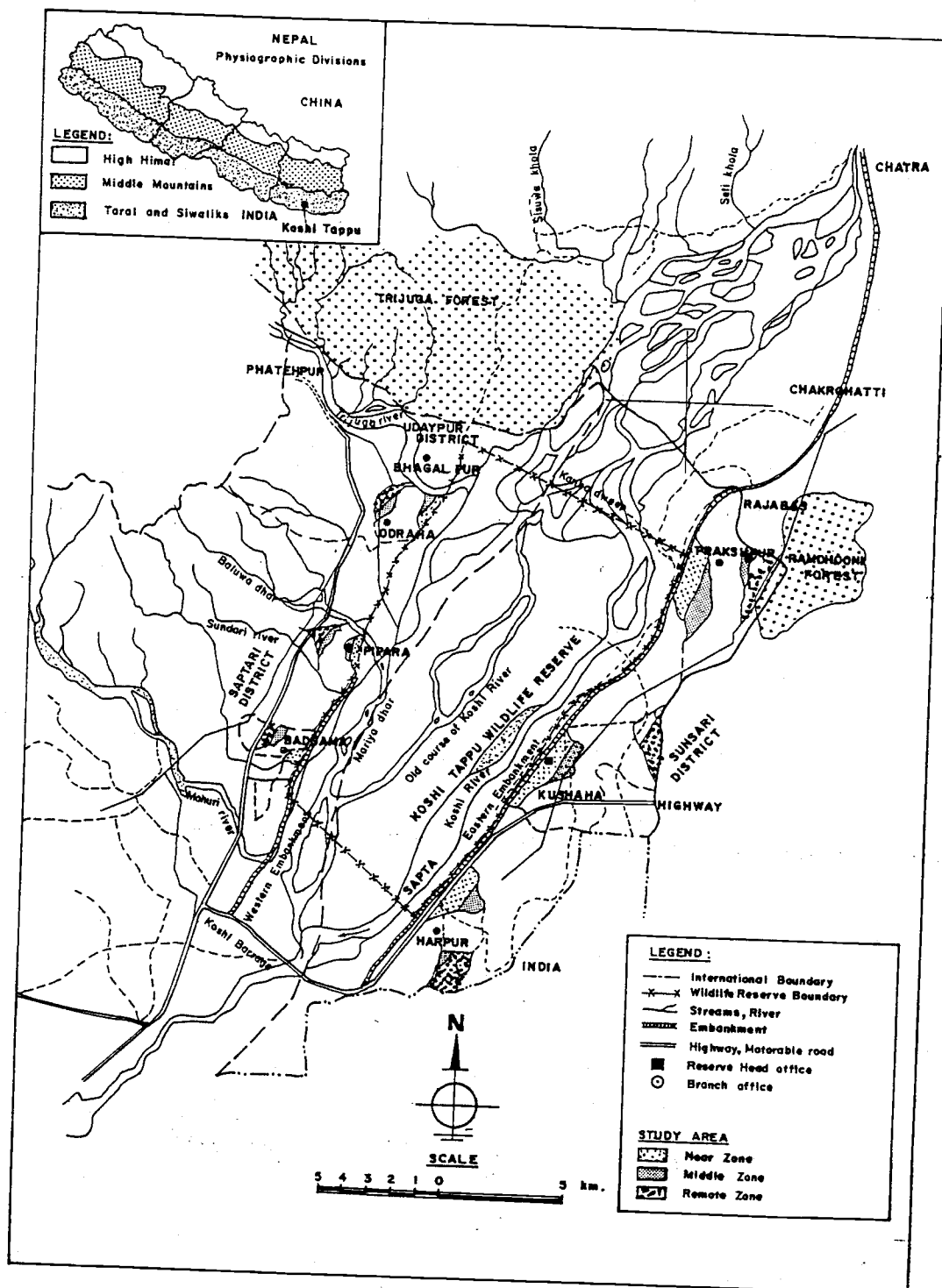


Fig. 9: The Koshi Tappu Wildlife Reserve, Nepal

The wildlife reserve is the habitat for the last remaining population of wild water buffalo (*Bubalus bubalis*) in Nepal which appears to have increased from estimated 60 heads in 1977 to about 100 in 1988. However, it has been reported that the entire population is being hybridized with the feral water buffalo grazing inside the reserve. The other mammals include chital (*Axis axis*), hog deer (*Axis porcinus*), barking deer (*Muntiacus muntjack*), wild boar (*Sus scrofa*) and blue bull (*Boselaphus tragocamelus*). The other wildlife observed in the reserve are leopard (*Panthera pardus*), fishing cat (*Felis viverrinus*), jungle cat (*F. chaus*), smooth-coated otter (*Lutra Persicillata*), spotted deer (*Cervus axis*), and nilgai (*Boselaphus tragocamelus*) (IUCN, 1993). The Gangetic dolphin (*Platanista gangetic*) and gharial crocodile (*Gavialis gangeticus*) which were common in the past are no longer seen in the reserve area, however, the dolphin is still observed down stream of the barrage. Most of the wildlife are heavily affected by illegal hunting. The reserve is rich for migratory birds especially wintering ducks and waders. About 295 species of birds have been recorded in the KTWR, among which the swamp partridge (*Francolinus gularis*) and Bengal florican (*Hubaropsis bengalensis*) are significant (Shrestha, 1994). The other remarkable species include swamp francolin (*Francolinus gularis*), red-necked falcon (*Falco chiequera*), and Straited marsh wabler (*Mehalurus palustries*). Koshi Tappu is the only protected area in Nepal where watercock (*Gallix cinerea*) and Abbott's babbler (*Trichastoma abotti*) are known to occur (Inskipp, 1989 as cited in IUCN, 1993).

The vegetation is mainly tall khar-patter (*Typha - Sacchurum* species) grassland with patches of khair-sissoo (*Acacia catechu - Dalbergia sissoo*) forest. Due to the changes in the river course, much of the vegetation composition has been disturbed. Much of the simal (*Bombax ceiba*) and riverine deciduous forests have been converted into grasslands along with the increase in sandy and transitional areas for vegetation regeneration. The other important species are *Eegenia Tambolina*, *Garuga pinnata*, *Trewpa nudiflora*, *Zizyphus mauritiana*. The shrub layer is represented by *Artemisia indica*, *Clerodendron vis cosum*, and *Solanum erienthum*. The dominant species of grassland include narkat (*Phragmites karka*) and kans (*Saccharum spontaneum*). In the swampy areas pater (*Typha aungustifalio*) and khaskhas (*Vetiveria lowsonni*) are dominant (Sah, 1993; Shrestha, 1994).

The human population in the surrounding areas is estimated to be 64,640 with the average density of 370 persons per square km. Approximately, 120 households are still residing inside the reserve. The majority are engaged in agriculture and livestock rearing while few others are dependent on fishing. The people living adjacent to the reserve are engaged in illegal activities such as firewood collection, wildlife poaching and livestock grazing (Sah, 1993; Shrestha, 1994).

The management of KTWR falls under the DNPWC. The reserve is managed by the Warden including 60 other staffs, however, the responsibility for its protection is with the RNA who has deployed a force of 205 army personnel. There are eight army check-posts, two of which are located inside the reserve. As the six check-posts are located outside the reserve boundary, it has created some resentment among local people. There is no congenial relationship between the armed force and reserve management.

The management constraints of KTWR lies in the heavy pressure exerted from livestock grazing inside the reserve, loss of crops and human injuries caused by wildlife which is

aggravated by its open boundary and fragile situation. The intense pressure from domestic stock as a result of 15,000 to 18,000 livestock grazing regularly and 17,000 permanently residing inside the reserve has put the reserve in jeopardy (Sah, 1993; Shrestha, 1994).

#### **IV. LIVESTOCK PRESSURE ON NATURAL RESOURCES**

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The livestock sector in Nepal contributes 15 percent of the total GDP and 25 percent of its agriculture sector portion (FINNARGO, 1985; ADB/ADB/IDS, 1989; HMG, 1993). Livestock provides almost all draft power, fuel energy and manure which is vastly used for composting and in some areas the only means of replenishing soil nutrients. Livestock population almost equals the human population. This is indicative of the intensive pressure on forest and rangeland which are the main sources of feed supply which is, however, deficient by up to 46 percent yet local ruminants have obviously developed survival traits to cope with the low nutrient intake (HMG/IUCN, 1991; HMG, 1991).

Although livestock grazing could be a means of seed dispersal through dung dropped on the grazing ground, the negative impacts are significant. The movement of livestock reduces the vegetation cover through the mechanical effect of trampling. It reduces a grazing area often to the bare soil. Effects include changes in soil compaction, with reduction in micropore space and increase in leaching. The result is the formation of loose sandy soil which has properties unsuitable for vegetation regeneration and is prone to erosion (HMG/IUCN, 1988). Moreover, where manure is collected from the grazing areas, as is the case in Koshi Tappu, seed dispersal is hindered (Sah, 1993). While letting livestock graze, the caretakers collect fodder, firewood and other forest products. Lopping of branches and twigs from trees adversely affect formation of a forest crown cover which, in turn, deprives herbaceous species, hinder regeneration and flowering, and ultimately causes the death of the tree.

Another issue related to livestock is that of the carrying capacity of the vegetation in a given area. The carrying capacities of open grasslands and forests in the middle hills of Nepal are estimated as 0.54 and 0.31 heads of large livestock per hectare, whereas present stocking rates are 7.0 and 2.8 heads indicating that capacities had been exceeded by 13 and nine times, respectively (Mahat, 1987 cited in Thapa and Weber, 1990). The increasing use of dung cake as fuel has affected the agro-ecosystem in terms of lesser availability of manure for cultivation. The share of traditional energy items comprising firewood, agricultural residues and dung cake equalled 95 percent of the total energy consumed in Nepal during the 1980s (Sharma, 1992). A major shift in the use of firewood (from 93 to 75 percent) to agriculture residues (from 2.1 to 11 percent) and dung cake (from 0.1 to 8 percent) during the period 1979/80 until 1987/88 had further aggravated the dilemma (Bhatta, 1992). This is apparent in the Koshi Tappu region where public forests as the source of firewood supply are rare and farm sources insufficient.

The detrimental impact of livestock grazing is the disturbance, then destruction of the wildlife habitat in conservation areas (Sah, 1993; Nepal, 1993). One such ruinous practice is the burning of scrubs and under growth in forested areas to manipulate early sprouting for grazing domestic stock. The transfer of diseases from domestic stock to wildlife and vice versa is another threat to conservation areas. Livestock grazing becomes critical where wildlife

species are accorded high conservation priority and, thus, are protected, while local people view the wildlife reserve as grazing grounds for their livestock during periods of fodder shortage. The Koshi Tappu region well exemplifies this situation.

Permitting limited grazing in a wildlife sanctuary ensures good relations with local people at the cost of some disturbance to the natural ecosystem. This trade-off is questionable as it contravenes the principles of protected area management. Under certain circumstances, however, grazing or browsing by domestic stock may be permitted but should be kept under tight control (MacKinnon et al., 1986).

Traditionally, livestock has been the primary source of milk and dairy products, fertilizer, fuel, the draft power for cultivation and a means of transportation. In the study area, the main purpose of buffalo rearing was milk production, which was the first priority of 80 percent of the sampled households, while dung as a by-product. The purpose of rearing cattle was different in that. It was for calves which is obviously due to the use of cattle as draft power. Oxen were reported to be faster and more agile than other species. Livestock rearing is also justified by the excessive dependency on dung cake for fuel which, of course, contributed 68 percent of the annual household energy supply. The variation was distinct between the middle (53 percent), nearby (71 percent) and remote (78 percent) sections.

## V. LIVESTOCK POPULATION CHARACTERISTICS AND DISTRIBUTION

The sampled households had kept large herds of cattle or buffaloes. The average numbers of heads of livestock were 11.2 in the nearby, 12.3 in the middle and 9.94 in the remote areas (Table 3).

Table 3: Average Livestock Holding by Location

Livestock holding	Nearby	Middle	Remote	All
Mean number of livestock heads	11.2	12.3	9.9	11.2
Mean LSU (within farmyard only)	3.3	3.6	3.4	3.4
Mean LSU (farmyard + reserve)	7.4	8.6	7.1	7.6

The average livestock holding size was largest in the middle section, at distances between 1.1 and 3 kilometers from the reserve boundary. This is probably due to the influence which some holders were wielding though living far from the reserve, yet having good access to it. However, the difference between average LSU kept within farmyard and those of including wildlife reserve indicates tendency of keeping more domestic stock inside the reserve from nearby section, 55.4 percent of the total, compared to 52.1 percent from remote section.

Altogether 900 heads of livestock including both buffaloes and cattle were kept within the farmyard, with 55.2 percent in the nearby, 22.2 percent in the middle, and 22.2 percent in the remote areas. The proportions of adult cattle were greater than those of other categories,

however, they were somewhat smaller in the near and remote areas accounting about 50 percent of the total livestock reared than in the middle area, where it was 55 percent. The numbers of cattle calves were also greater compared to those of buffalo calves in all locations, indicating local people's preference for the former over latter owing to the high cost of buffalo rearing compared to local species of cattle (Table 4).

Table 4: Proportion of Livestock Species by Location

Livestock		Nearby	Middle	Remote	All
Species	Categories	% of n=497	% of n=200	% of n=203	% of n=900
Buffalo	Adult	18.14	17.00	22.16	18.77
	Calf	10.46	10.50	10.85	10.52
Cattle	Adult	49.50	55.00	49.25	50.51
	Calf	21.90	17.50	17.74	20.20

The proportions of lactating buffaloes to their respective number of female adults were greater in the nearby area compared to the middle and remote areas while proportions of lactating cattle were highest in the nearby area, followed by the remote and middle areas. Similarly, the proportion of adult male to adult female buffaloes was highest in the remote area, followed by the nearby and middle areas. The proportion of adult male to female adult cattle was high in all three areas which was even higher in the middle and remote areas (Table 5). This was mainly due to the excessive use of bullocks for draft power. There were average of 1.75 bullocks per household who had 1.64 ha of farm land on an average. This indicates apparent overstocking of bullocks. The proportion of old livestock was significantly low mainly due to frequent livestock transactions in the local markets.

Table 5: Proportion of Lactating and Adult Male Livestock Population

Species		Near	Middle	Remote	All
Buffalo	Lactating	58.82	53.84	46.15	55.00
	Adult Male	32.35	30.76	50.00	35.83
Cattle	Lactating	58.16	32.43	52.94	51.48
	Adult Male	144.89	197.20	191.10	165.68

Note: Figures indicate proportion from female adult livestock population.

The growth rates of buffalo and cattle were calculated for the past three years, based on the recall technique. Three categories of adult female and adult male animal and calves below three years were identified (Table 6). The average annual growth rates of different species of livestock were calculated on the basis of the opening stock in the base year (1991/92). The growth rate indicates a somewhat unstable trend owing to the subsistence nature of livestock rearing and high occurrence of diseases. The average annual growth of male buffalo and calves is higher compared to that of the cattle during the three-year period. The growth of female cattle is higher than female buffalo which could be attributed to fertility, mortality, and buying and culling rates. Female cattle is less marketable due to the religious precept which gives them a motherly status.

Table 6: Annual Growth Rate of Livestock Population

Livestock		Number in 1991/92	Growth Rate			Average 1991-94
Species	Categories		1991/92	1992/93	1993/94	
Buffalo	Female	115	-5.20	4.58	5.26	1.54
	Male	45	15.50	3.84	-9.20	3.38
	Calf	87	1.16	5.74	3.26	3.39
Cattle	Female	155	2.58	4.40	1.80	2.93
	Male	265	2.26	0.36	5.51	2.71
	Calf	177	-0.50	-3.90	6.50	0.66

The fertility rate was calculated on the basis of the birth ratio of the respective female species which shows a declining fertility rate among both livestock species. The cattle fertility rates of 42 percent during 1991/92, 41 percent in 1992/93, and 33 percent in 1993/94 are higher than that of buffalo during the same period. The mortality rate was computed on the basis of death ratio to corresponding number of the opening stock. The mortality rate for adult male buffalo was found to be the highest at 11 percent in the period 1991/92. The average death rates for the other categories were between two and four percent during the three-year period.

Various livestock holding groups were identified considering both small and large ruminants kept by the households. Their distribution is classified into four categories namely, marginal, small, medium and large holdings (Table 7). Households with livestock less than five LSU were considered as having marginal holdings, five to ten LSU as small holdings, 10 to 15 LSU as medium holdings and more than 15 LSU as large holdings.

Table 7: Size of Livestock Holding by Locations

Farmers Group	Near (n=89)	Middle (n=35)	Remote (n=36)	All
Marginal	18	37	6	20
Small	27	9	33	23
Medium	25	14	25	21
Large	30	40	36	35

Note: Figures are in percentage.

The data on livestock holding size by location indicates that the proportion of households having a marginal holding is higher in the middle area followed by near and remote areas. In stark contrast, those households with small holdings form the majority in the remote areas followed by the near and middle areas. The proportions of households having a medium livestock holding size were equal in the near and remote areas, and slightly lower in the middle areas. Similarly, the highest proportion of households is in the middle area in the case of large livestock holding followed by the remote and near areas.

Among the various ethnic groups *Yadav* were found to be the dominant livestock holders (Sah, 1993; Shrestha, 1994). Their dominance prevailed in both buffalos and cattle holdings with mean holding of 18.29 LSU. They were the major contributors to increasing threat to KTWR as most of their livestock were found to be permanently grazing inside the reserve. The other ethnic groups engaged in livestock rearing were *Mahato*, *Teli*, and *Rauniyar*, who reared relatively more cattle followed by *Chaudhari*. *Brahman* were the second major holders of buffalo.



The size of land holding is not necessarily the sole determinant of livestock rearing though there is significant correlation between size of land holding and livestock size in the Koshi Tappu region (Sah, 1993). This study indicated that even the landless farmers reared cattle who grazed their stock in open fields and collected fodder for stall feeding. The LSU for buffalo rearing varied between 0.73 and 3.62 where as for cattle, it was between 1.65 and 4.76. Overall variance ranges between 1.65 to 40.26 LSU including the livestock kept inside the Reserve (Table 8). When the LSU for different farm size is calculated two distinct groups are identified, one with less than six LSU consisting of landless, marginal and small farm size, the other with more than 13 LSU consisting of medium and large farm size. This clearly is an indication that the medium and large farmers are mainly responsible for livestock encroachment in the reserve.

Table 8: Livestock Unit Size by Farm Category

Farm Category	Buffalo	Cattle	Including inside the Reserve
Landless	—	1.65	1.65
Marginal	0.73	1.32	2.14
Small	1.05	2.14	5.59
Medium	2.09	3.15	13.52
Large	3.62	4.76	40.26

## VII. LIVESTOCK MANAGEMENT PRACTICES

The local people in the Koshi Tappu region had maintained their livestock herd size balancing their essential needs for bullock and dairy products, ability to generate additional cash income, and feed supply from the available local sources. The ratio of livestock disposal contributes to the maintenance of total herd size (Maskey et al., 1992). The disposal rate was calculated considering the culling and selling rates of different livestock species. The assessment of livestock disposal is a complex task considering the diversified caste and ethnic groups whose practices vary greatly. The existing government legislation sufficiently ensures the protection of cattle, and female quadrupeds (HMG/IUCN, 1991). Cattle slaughtering is strictly prohibited by law though there were some ethnic groups who had utilized the meat after the cattle had died. Livestock transaction was very common within the local communities as well as along the Indian border though official records do not reflect the detail on the number of livestock sold across the border.

The culling rate was higher among male buffalo and oxen owing to their importance in draft power, which was also exchanged between households for monetary benefits. The next important transaction was that of calf, mainly, one to three years old. Rearing calf and selling them later for a fairly high price was one of the major incentives which highly motivated the households to rear more livestock. The transaction of lactating buffalo was also common. The major increment in livestock numbers was also because of new procurement. The inflow rate was higher for adult buffalo (23 percent) and calf (29 percent) followed by oxen (10 percent). The average inflow remained at 7.89, 13.57 and 12.64 percent during 1991/92, 1992/93 and 1993/94, respectively.

The common disease affecting livestock were found to be related to eye, mouth and foot infections, intestinal worm, and liver fluke. The mouth and foot infection, and liver fluke was widespread irrespective of locations. About 19 percent of the livestock were found to be affected by such disease among which 49 percent were buffalos and 40 percent were cattle. Early livestock immunization was a common practice so as to prevent them from catching any disease. The local veterinary doctors reported the need for vaccination twice a year but the majority of the respondents had immunized only once a year while 33 percent did not immunize at all. Though, the incidence of the disease and its prevention was similar in all locations, the area near KTWR was more vulnerable as it remained wet almost throughout the year being close to the Koshi River. The veterinary services were provided by local private physicians who did not have adequate knowledge about the disease and its treatment. The consulting fee including vaccines and medicines were often highly priced.

The occurrence of livestock disease is critical considering the frequent interaction between domestic stock and wildlife. Domestic buffalos were often found together with the wild herd of *Arna (Bubalus bubalis)*, which was very common since the buffalo herd inside the reserve did not retain their breeding stock. Cross breeding with wild buffalo was one of the major incentives for the owners. Hence, out-break and transfer of diseases could be potentially devastating for the wild buffalo herd.

### ***Pressure on Farm***

Livestock feed sources include open grazing fields around the villages, crop residues and to a large extent, forest resources inside the reserve. The livestock holding per hectare was found to be higher among marginal and small farmers, and declined in the case of medium and large farmers (Table 9). This indicates that marginal and small farmers had to look for sources of feeding other than the farm which was barely enough to support their livestock. Obviously, no other sources of feeding could be as attractive as the public forests and the reserve.

Table 9: Average Livestock Size Per Hectare

Farm Category	Mean Landholding Size (in ha)	Mean LSU	LSU/Landholding Ratio
Landless	—	1.65	1.65
Marginal	0.50	2.05	4.10
Small	1.63	3.19	1.96
Medium	3.42	5.24	1.53
Large	7.55	8.38	1.11

The issue of livestock feed scarcity is further aggravated by the use of crop residues for household fuel energy. The study showed that 5 percent of paddy, 15 percent of maize and 39 percent of wheat residues were utilized as fuel energy (Table 10). Animal dung cake contributed more than 68 percent of the total household fuel energy in the region.

Table 10: Proportion of Crop Residue Utilization by Location

Crop Residues	Near		Middle		Remote		All	
	Feed	Fuel	Feed	Fuel	Feed	Fuel	Feed	Fuel
Paddy	85.02	5.48	74.27	4.32	90.11	5.33	83.27	5.03
Wheat	27.48	40.82	31.77	42.49	24.89	36.33	27.96	39.69
Maize	75.01	19.47	53.67	40.33	94.52	5.42	83.50	15.37

Note: Remaining proportion was used for other purposes.

### *Feed Supply Situation*

Livestock feed supply situation is analyzed in two different ways, i.e., the feed produced from different sources which mainly reflects the total available sources, and the feed actually fed to the livestock. The reason in doing so is that the feed sources such as crop are not necessarily used for livestock feeding which may be used for some other purposes such as fuel energy, thatch, and could even be sold out to the paper mills in the Koshi Tappu region. Hence, more realistic figure could be obtained if the feed actually fed to the livestock was calculated.

For the assessment of feed supply, the monthly livestock feed per household was calculated and extrapolated for seasonal and annual average. Crop residues, green grass, and leafy fodder, the major sources of feed in the Koshi Tappu region, had contributed to 1,825 kg TDN per household (Table 11). This is only about 50 percent of the actual TDN requirement for the average LSU at household level. Considering the TDN requirement of 1,100 kg for one unit of livestock the feed available for the average LSU of 3.4 per household in the Koshi Tappu region is apparently less, indicating the TDN deficit of more than 104 percent which is much higher compared to the deficit in the Terai region which is - 44 percent (Rajbhandary, 1991).

Table 11: Annual Average Livestock Feed (TDN in kg) at the Household Level

Feed Sources	Near	Middle	Remote	All
Crop residues	937	980	1377	1098
Green grass	477	516	554	516
Leafy fodder	310	141	181	211
Total	1724	1637	2112	1825

Two implications are apparent from the above situation. Firstly, the feed available for livestock is not completely used since the actual TDN obtained by livestock is less than that available. The present feed deficit is 27.8 percent (Table 12). It should be noted that the use of crop residues for fuel energy is increasing in recent years. Secondly, the feed deficit may have been compensated by grazing, resulting in intensified pressure on local grazing grounds. Moreover, the livestock outnumbers the feed available resulting in largely under nourished livestock population which is the common characteristic throughout the country.

### Carrying Capacity

Broadly, carrying capacity is the capacity of an ecosystem to support healthy, organisms while maintaining its productivity, adaptability, and renewal capability. More specifically, the carrying capacity in relation to livestock is the capacity of local resource base in a given geographical space to sustain particular number of livestock. This is largely an estimation of LSU based on supply of feed resources. The major feed sources in the study area were identified as farm and non-farm sources. The farm sources consist of crop by-products, green grass, grass available as risers and bunds, and kitchen leftovers. The non-farm sources refer to the feed supply from public lands, community owned lands, and the wildlife reserve. The wildlife reserve was included in carrying capacity analysis due to the over-reliance of households on it and its future potential as a controlled feed source.

Crop residues, one of the major feed for livestock around KTWR, has been assessed on the basis of production of various crops and their by-products. The average crop production of the sampled households was converted to the TDN value using the standard TDN coefficient (APROSC, 1985). Among the crop residues, paddy straw contributes more than 87 percent. Since the forest inside the reserve is protected, an estimated 25 percent was used for the analysis assuming that sustainable utilization of forest products is possible. The concentrates, though very rarely used, were mostly from the by-products of mustard. The concentrates were mainly used for lactating animals and draft power. The amount of TDN from concentrates was computed from the average quantity of concentrates used by the sample households for their livestock.

The data shows that there is roughly about 27.8 percent feed deficit to sustain the present livestock herd size from the feed sources (Table 12). The feeding capacity could be increased by diminishing the current deficit to about 15 percent considering the present utilization of the reserve resources by the 11,420 households in 12 VDC areas within the 6 km. zone. The carrying capacity, however, would decline if the livestock herd kept permanently in the reserve by outsiders is included in the calculation.

Table 12: Livestock Feed Demand and Supply Assessment (TDN in '000 kg)

Feed Sources	Farm Supply	Scenario I	Scenario II	Scenario III
Farm	471.35	36126.24	36126.24	36126.24
Public land	—	697.71	174.43	697.71
Wildlife Reserve	—	3183.51	968.50	3183.51
Total supply	471.35	40007.46	37269.17	40007.46
TDN Required	602.47	46102.54	46102.54	95471.20
Balance	-131.12	-6095.08	-8833.37	-55463.74
Feed Sufficiency (%)	-27.82	-15.23	-23.70	-138.63

Notes:

1. Farm supply is based on the TDN available from farm sources for average LSU per sampled household.
2. Scenario I considers the additional TDN availability from public land and the wildlife reserve.
3. Scenario II assumes only 25 percent of the total TDN available from public land and the wildlife reserve.
4. Scenario III considers LSU as 7.6 per household with the additional livestock grazing permanently inside the reserve.

The carrying capacity of the region was assessed considering the total livestock population in the surrounding zone of 6 kms. The feed availability on farm was calculated from the sample household data while other feed were from within and outside the reserve. Three different scenarios are explained with various method of calculations of LSU and feed resource assessment.

An optimistic estimate has been made considering the average LSU per household which indicates that the livestock feed sufficiency for the region could be increased up to 85 percent, thus, reducing the deficit to 15 percent (Scenario I). This analysis, however, assumes that the reserve and other public lands can be fully utilized for livestock grazing, which, in fact, could hardly be the case. Therefore, a realistic analysis would be the inclusion of an estimated 25 percent feed availability from these sources assuming that the reserve and the public land could be partially available as grazing grounds under the controlled management of the reserve and public lands in the surrounding 6 km. zone (Scenario II). This method ensures 76 percent feed sufficiency as compared to the two other scenarios. The existing situation in the Koshi Tappu region shows rather a desperate one (Scenario III). The third scenario of livestock feed supply situation is disappointing if the average LSU of 7.6 is considered which takes into consideration not only the domestic stock kept at the farm land but also includes the stock reared inside the reserve. This shows the feed deficit of 136 percent.

## **VIII. LIVESTOCK GRAZING IN AND AROUND THE WILDLIFE RESERVE**

Livestock grazing in public lands is common in rural areas of Nepal and is the primary issue in the Koshi Tappu region. There is virtually little grazing land available in the vicinity of KTWR. The most common grazing practices are either stray grazing along the road side, canal, and or the eastern embankment, and illegal grazing inside the reserve (Sah, 1993).

There were mainly three types of grazing inside KTWR, namely, permanent, regular, and occasional (Sah, 1993). Permanent grazing was the result of household practices of keeping livestock herd permanently inside the reserve. Regular grazing was more frequent among the community living towards the western side of the reserve who had grazing opportunities throughout the year. The communities living far away from the reserve let their livestock graze only during winter season when the road conditions would normally improve and sufficient time would be available to look after the livestock (during off-farm seasons). Occasional grazing refers to livestock grazing along the eastern border of the reserve mainly during rainy season when the agriculture fields are under paddy cultivation and the risers and bounds do not have grass cover.

A distinction is made between grazing grounds, namely, grazing outside and inside the reserve. The number of stock grazing in both areas and grazing hours per month are calculated. Grazing hours were estimated by asking the household respondents the daily grazing hours in different months and then calculating the monthly average. As mentioned earlier the domestic stock outside the reserve were usually found to be grazing in the public forests, open fields, road side, along the canal, and near the reserve border. Almost 35 percent of the total livestock were

found to be grazing outside the reserve in the public forest and community grounds. The proportion of cattle was much higher than that of the buffalos which were 66 percent and 34 percent, respectively. The proportion of livestock grazing outside the reserve was higher in the remote area (93 percent) as compared to the middle (76 percent) and near areas (51 percent).

The average monthly grazing hours was higher in the Middle area (150 hrs) which was followed by the Remote (146 hrs) and the Near areas (144 hrs). The difference in grazing hours among the three areas is probably due to the inclusion of travel time which could have exaggerated the effective grazing hours for the former two areas. Livestock grazing practices inside the reserve were common in the western section. Obviously, both the number of stocks and grazing hours were found to be higher in the Near area due to less travel time and easy access to the KTWR. The number of cattle (107 heads) and grazing hours (187 hrs) is greater compared to that of the buffalo with 71 heads and 178 hrs. This was just the reverse case in the Middle area both in terms of livestock number and grazing hours, where there were 200 livestock with an average of 155 grazing hours. An informal understanding between the reserve authority and the villagers in the western section allowed the domestic stock up to the *Trijuga Dhar* for drinking water, which was usually the entry point for getting inside the reserve.

There were frequent incidence of livestock capturing by the reserve authority. During the period of field survey, the first named author observed five such cases, two in the western and three in the eastern section. Such incidence, however, did not discourage villagers to let their livestock graze inside the reserve. The penalty for illegal grazing largely depend on the livestock species caught, its age and obviously, the discretion of the reserve officials. The extent of grazing problem is also reflected by the revenue earned from the penalty, which was NRs 19,000 (US\$ 400) in 1990/91, 55,775 in 1991/92 and 44,642 in 1992/93. This is equivalent to 11, 32 and 24 percent of the total income of the during these periods.

The intensity of livestock grazing varies according to the season, the most crucial period being the season soon after paddy plantation when crop residues and feed from the cultivated field are most scarce. However, this is also the season for bad road conditions and farmers' busy schedules in the farm. The grazing pressure based on grazing hours recorded for different seasons indicate winter to be the most intensive season, followed by the summer and rainy seasons. The latter refers to the period from mid June to mid September. The average monthly grazing hours inside the reserve was the highest during winter with 167 for cattle and 143 hours for buffalo while outside it was 183 and 198 hours respectively. Grazing pressure is more intensified in the Near area with 204 hours of buffalo and 206 hours of cattle grazing inside and 173 hours of buffalo and 120 hours of cattle grazing outside the reserve.

Livestock stall feeding is generally understood as the feeding of animals at the house yard without taking out them for grazing. Such an absolute stall feeding practice is rare in rural households who rear mostly the local breeds of cattle and buffalos. The owners usually stall feed their livestock if they are calf, lactating, or used for draft power, however, the conditions vary depending upon the household status and external factors such as the availability of grazing grounds. Among the stall fed livestock in the study area, 24 percent were lactating animals and 48.8 percent were bullocks. Villagers usually did not let bullock graze outside as they were afraid of loosing them.

Livestock rearing was found to be the traditional occupation of the people living in the Koshi Tappu region. The *Mirge-ban*, as the reserve is known locally was an open access land used intensively by the local people for grazing livestock and collecting other forest products as well. From time immemorial the *Yadav* community had grazed their livestock freely and had maintained their herd permanently inside the reserve, which was established in 1976. Since the declaration of the wildlife reserve, it has faced continued threats arising from intensified conflicts between livestock holders and the reserve authority. Though several policy recommendations were made to the reserve authority, they have not been implemented yet. The dilemma on KTWR is that while livestock rearing in its surrounding communities provides significant income to the villagers who are dependent on a subsistence agriculture economy, its existence as an "open access" resource has become an incentive to rear large number of livestock. Studies have shown that local people tend to rear more livestock if and when protected areas exist near human settlements (Nepal and Weber, 1993). Also, households with small land holdings tend to increase their livestock herd and balance the meager income from field crop production. Moreover, the income from livestock constitutes a major source of income for the affluent class who exert pressure on the decision making authority as well. The alarming population of livestock species around KTWR has posed many difficulties to the KTWR management, given the small size and limited resources available within the reserve.

The majority of the heads of livestock grazing permanently inside the reserve belong to the *Yadav* community. Various estimates of the number of livestock inside the Reserve are available. Sah (1993) reported about 50 households keeping 10,000 to 12,000 large livestock with a minimum of 100 heads per household. The maximum number of livestock in a herd ranged between 600 to 750 heads. Bhandary (1992) reported that one household had 2,500 buffalos. Heinen (1993) estimated 7,000 heads of cattle illegally grazing inside the reserve. Although, the estimates vary, strong pressure on the reserve is apparent.

To estimate as accurately as possible the number of heads of livestock grazing inside the reserve, a participating appraisal was conducted. At the initial stage of the appraisal, key informants who know well the distribution and location of livestock herd inside the Reserve were identified and consulted. On the basis of the information provided, four sample areas were identified which contain almost 85 percent of the total livestock inside the reserve. Each of the sample areas were visited and discussions were held with the several livestock owners. There were 3,581 heads of buffalo and 7,079 heads of cattle in the four areas which belonged to 58 households from 15 villages adjacent to KTWR. Four villages were located adjoining the reserve boundary while the others were from within 5 to 15 kms away from the boundary. More than half of the livestock population concentration was towards the southern boundary while the remaining were in the northern and middle sections. The proportion of cattle was more than 66 percent.

### ***Livestock Movement and Management***

The main strategy that the local people had adopted was to keep their herd right outside the boundary towards the northern and the southern sections of the reserve, where the boundary had not been clearly identified. During the day, people tend their livestock outside the reserve

boundary for various reasons such as milking, feeding concentrates and trading milk. At noon, they move their livestock herd towards the reserve. After spending night inside the reserve the livestock herd is driven out in the morning by the owners who also spend their night in the reserve. Usually, the livestock owners are less fearful as they are among the most influential people in the villagers. The livestock movement is concentrated usually towards the western, northern and southern sections of the reserve.

The livestock herd were usually under control of their respective owners, however, cattle were not looked after, which were occasionally fed concentrates to maintain their familiarity with the owner. Buffalo grazed during the night and often came out together with the wild herd to graze in the cultivated field, thus, damaging crops. As the cattle did not graze at night, the incidence of crop damage did not occur though their population is far higher in the reserve. Hence, people feel safe to keep cattle inside the reserve which involved less risk. However, being feral, they stray extensively within the reserve in a large herd. The owners could recognize their livestock because of the mark inflicted at their early age, the color of their hair and other physical traits. The owners did not inflict any mark on the male calf as this could discourage their selling. Since the female cattle calf is not sold, the growth rate is high. The growth could only be hindered by the high death rate. There were high incidence of death of calf caused by flooding and trapping in the marshes. Livestock disease was found to be epidemic, however, few buffalos were inoculated. The transfer of disease from the domestic to the wild stock may have caused the declining population of *Arna* and other associated wildlife. The cross breeding of domestic and wild buffalo was common which also motivated the owners to keep buffalo inside the reserve. One of the wild buffalos which was frequently seen together with the herd of domestic buffalo was believed to be adopted by the latter for the past four years.

Though the KTWR is under the formal, legal control of the Government, the intensity and magnitude of livestock grazing inside the reserve indicates its "open access" nature. It was reported that even the herds of livestock from India had access to the reserve which may be potentially dangerous in the long run. Some of the Indian owners were among the relatives of the influential, large herd owners in the Koshi Tappu region (Sah, 1993) which is possible due to closer socio-cultural ties between the residents across the border.

The most noticeable incentive derived from rearing livestock is the income from the sale of male calf of both, buffalo and cattle. They are usually sold at the age of one to three years, the price of a cattle calf ranging between NRs 6,000 and 10,000 a pair, and buffalo calf between NRs 6,000 and 8,000 a pair. If the calf is a cross breed from the domestic and wild buffalo, it would fetch 20 percent higher than the average market price as they are generally expected to be stronger. Most of the calf were often exported to the Indian market extending as far as West Bengal. Livestock trading with India could be considered illegal as the current rules and regulation in Nepal do not allow trading cattle and female quadrupeds even though they are unproductive. Such trading is possible due to informal contracts between the Indian and Nepalese traders which is facilitated by the open border. As was revealed during the discussions with the livestock owners, the Nepalese traders usually sale on credit based on good will and recognition of the counterparts. In a way, the Indian traders are controlling the livestock transaction in the area who are responsible for the large number of livestock inside the reserve as well. The participatory appraisal as mentioned earlier revealed that there were as many as 15



Indian livestock owners from eight different locations within 2.5 to 25 km from the reserve. Their livestock herds were estimated at 3,000 heads (1,000 buffalos and 2000 cattle) depending on the seasons.

The livestock business in and around KTWR is in the favor of the local elite and influential outsiders, who are thus responsible for the impact on the KTWR eco-system. Usually, an adult female livestock gives birth to one calf at the interval of one and a half year. Assuming 50 percent of the calf to be male, their total estimated population in the reserve could be 12,282 heads with 10 percent mortality rate and five percent loss due to other reasons. The gross earning that could be generated from trading calf is estimated at NRs 24.36 million per year.

## **IX. ALTERNATIVE STRATEGIES FOR CONSERVATION OF KTWR**

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The dense human population and their huge number of livestock has far exceeded the capacity of the Koshi Tappu region. Among other threats such as fodder and firewood collection, fishing, hunting, and illegal settlements inside the reserve, the threat posed by livestock grazing is the most alarming. The vulnerability of the reserve is further aggravated by the existence of Koshi Dam where excessive siltation has caused frequent shift in river course resulting in loss of wildlife and vegetation and threatening the surrounding human settlements as well. This situation calls for the strict protection of the reserve which is beneficial for its conservation as well as the protection of human life and property in the Koshi Tappu region. The immediate actions need to be undertaken by the management authority should include border demarcation towards the northern and southern sections and some parts in the western section of the reserve, and fencing around it, and relocation of the people from inside and along the southern and northern boundary of the reserve. This should be complemented with controlling crop damage by wildlife and removal of domestic stock grazing inside the reserve. The extension of the reserve towards the south including the *Koshi Dam* area and towards the north up to the *Chatara* area would be a long term strategy for the complete protection of wildlife in the reserve. Law enforcement alone is not feasible. The alternative strategies should address the underlying issues in conservation of the reserve and development in the surrounding communities and revitalizing the management capability of the reserve.

The development of the community around the reserve has the long term potential to reduce the dependency on the reserve ultimately, minimize the conflict. The activities within the framework of community development may include agriculture intensification, livestock development, creating off-farm income opportunities, improving energy efficiency, establishing vegetation buffer zone, skill development and training, and building conservation awareness and promoting tourism. Building management capability by improving physical facilities, working out a detailed management plan, and manpower development are equally important factors for successful implementation of the strategies.

Implementing all the above mentioned strategies within a short period of time is not feasible. The management and development of livestock may be one of the preferred strategies and the starting point as it is the major economic activity of the local community

and the main source of threat to the reserve. Moreover, the participation of the local people is indispensable in all activities related to community development and conservation in the region, which is a rather lengthy process.

### ***Livestock Development***

Development of livestock sector is an absolutely bounded condition for Koshi Tappu region considering the local people's heavy dependency on this activity. The livestock development strategies should be considered with a view to serve the long-term interests of the local people as well as the wildlife reserve. The association between natural resources management and improvement in the livestock sector should be highlighted, which if appropriately addressed could result in sustained economic growth with improved environment (HMG, 1993).

The livestock development project could result in two major benefits, firstly, direct production benefits with increased productivity and profit for the households participating in the project and, secondly, reduction of livestock pressure on the reserve resulting in a healthy eco-system in and around KTWR. The livestock interest group is the recent concept adopted by the Livestock Development Master Plan of 1993, which views the group as the catalyst to implement extension programs related to livestock development which could support the activities related to the conservation of natural resources as well. The user groups, however, should be identified from the existing formal or informal community institutions at the grassroot level (HMG, 1993). The major benefit of livestock development is the increased productivity of the livestock sector of the individual households resulting in an increment in their income, and breaking the vicious cycle of poverty, resources scarcity, and exploitation. This could be best achieved by the adoption of improved breeds. Its direct impact would be increased availability of livestock products such as dairy products and manure.

The adoption of improved and semi-improved breeds of livestock would result in increased production benefits for the farmers. As the improved breeds are stall fed, the increased volume of manure would improve crop production thereby increasing availability of crop residues. It is estimated that a cattle stall fed at night produces 200 kg manure per month whereas the same animal stall fed day and night will produce an estimated 600 kg of manure per month (Oli, 1985 cited in HMG, 1993). The availability of semi-improved heifers in the local community would have greater impact for the expansion of the project. Improved and semi-improved breeds of livestock would require stall feeding and care taking, which means lesser number but productive livestock rearing. This could substantially relieve the existing pressure on the forest resources in the reserve resulting in the protection of the KTWR ecosystem. The grazing pressure even outside the reserve would be minimized, and the problem of resource scarcity could be overcome.

The target group for implementing such a strategy should be identified on the basis of their needs, priorities and capabilities to be involved in the developmental activities. The introduction of improved breed such as *1/2 Friesian* cattle is considered suitable for the Terai region (Shrestha, 1993). The *Murrah* buffalo, also an improved breed common to the

region is recommended by the government livestock farm in Tarahara in Sunsary District. The local people prefer *Hariana* cow which could also produce oxen for effective draft power. An appropriate strategy would be to diversify the breeds in such a way that the net market value is higher. The provision of good quality breeding stock of cattle and buffalo under the joint responsibility of the community and artificial insemination services, wherever possible, could be a good start.

The local community preferred buffalo over cattle which provide more benefits to the owner. The major problem expressed was the cumbersome operation of keeping buffalo at the stall for longer hours. There is no disposal problem associated with buffalo rearing as it is also used for meat by many ethnic communities. The ecological viability of buffalo rearing in the region is indicated by the existence of the wild water buffalo, the close relative of the domestic ones. One of the experienced livestock owners reported that buffalos are less affected by insects such as lice which was the major cause for the failure of one improved breed cattle farm in the region. The technical support for buffalo rearing is available from the government owned livestock farm in Terahara. The support for funding small scale agricultural activities in the village could be provided by the commercial banks, particularly, the Agricultural Development Bank. The local people complained that credit unavailability is the major obstacle in shifting towards rearing improved breed of livestock. The *Gramin Bank*, which was recently established in Kanchanpur, a nearby market center, may initiate such scheme helping mainly the small and marginal entrepreneurs.

As the improved breeds rely heavily on farm feed, leafy fodder, green grass, and concentrates, it should be ensured that their supply is reliable. Since feed resources both, outside and inside the reserve are not sufficient to meet the demands of the local community, plantation of fodder trees on private and communal lands, and promotion of efficient use of agricultural residues should be carried out. Cropping pattern and cropping intensity in majority of the VDC areas indicate the gross under utilization of available cultivated land around the reserve. The majority of the farmers were found to be growing only one crop, i.e., paddy followed by a long period of fallow. Similarly cropping intensity was reported as 145.1 in the near, 161.1 in the middle and 180.1 percent in remote areas. This indicates that there is good scope for agriculture intensification which could substantially increase farm income and support livestock as well.

To improve the cropping intensity as well as growing green grasses irrigation facility should be provided, particularly through small irrigation schemes such as the construction of wells, tube-wells, and community canals. As an initial incentive subsidies should be provided for livestock insurance and irrigation water. The Credit Guarantee Corporation has been operating a livestock guarantee scheme in cooperation with the ADB and other commercial banks since 1987 (HMG, 1991)

The efficient harvesting and utilization of wheat straw could increase its use as feed from 40 to 70 percent. Efficient utilization of paddy straw by chaffing and soaking in water, will substantially increase digestibility, nutrient value and the voluntary intake. This technique should be demonstrated to farmers who initiate rearing improved breeds (HMG, 1991). Additional feed supply could be met with the utilization of fodder crops and forage

such as Napier (*Pennisetum purpureum*), berseem (*Trifolium alexandrinum*), and molasses grass (*Melinis minutiflora*) which could be grown within short period of two to three weeks. Fodder trees could be planted along the eastern and western boundaries of the reserve and at the farm edge or on risers. The land under public ownership could be utilized for community forestry while the land presently encroached by some influential people should be allotted under community ownership rather than the current proposal to distribute among the so called landless people.

Being located along the east-west highway which links the major growth centers of the Terai belt, the Koshi Tappu region has comparative advantage for marketing dairy products. Approximately two percent of the estimated national milk production is collected and marketed by the Dairy Development Corporation of Nepal, the only institution collecting and processing milk widely in the country, which indicates that the major proportion of milk is consumed locally or processed into *ghee* (clarified butter) and curd for sale at the local markets or household consumption (HMG, 1991). Thus, there is high potential for marketing dairy products.

The feasibility of improved and semi-improved livestock could be hindered by the existing and other new disease. The Koshi Tappu region is relatively more accessible for veterinary services. It is necessary that local community develop their skills and know-how in livestock health with support from the government veterinary services. The other option could be to develop semi-improved breeds of livestock with cross breeding of local and improved breeds which may have higher resistance to the local environment.

## **X. SUMMARY AND CONCLUSION**

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Livestock rearing in and around the protected areas has been one of the major threats to the wildlife reserve. There is a tendency to keep more livestock near the reserve which build heavy pressure on resource conservation through illegal grazing, browsing, and trampling. Livestock encroachment inside the reserve has not only caused the loss of biological diversity but also created severe conflict between local people and the reserve management. The local people around KTWR are heavily dependent on livestock rearing which contributes a significant proportion of their household income. More livestock population means more feed requirement from various sources. The open access status of the wildlife reserve has encouraged the growth of livestock population in surrounding surrounding villages. Most of the livestock in the region are of local breeds which are unproductive. The low productivity of the stock reinforced in keeping more livestock heads to meet the growing demand of its products. The affluent farmers who are also the influential groups in the region are the major livestock holders, however, the marginal and landless farmers have higher livestock-land ratio compared to the large farmers.

Scarcity of feed sources and grazing ground is the main problem in rearing livestock in the region. The feed sources from farm has not been fully exploited and properly utilized. The other sources of feed and grazing grounds outside the reserve are very limited which has resulted pressure on the wildlife reserve. Due to its small size and dense human population around it, the reserve will no longer be able to support the livestock population. Moreover, the livestock

population has exceeded the carrying capacity of the farm household and the region as well. Local people are competing for every opportunity to exploit available resources, however, their activities cannot be sustained due to the limited resource base. The situation is further aggravated by the dominance of the influential households keeping larger herd size, most of which, are residing permanently inside the reserve. The case of the KTWR typifies the mismanagement of open access resources.

The situation in KTWR calls for the strict protection of the reserve, however, the enforcement of laws in the face of the subsistence needs and political influence of the surrounding communities is simply not feasible. The comprehensive strategies for the conservation of the wildlife reserve may include boundary demarcation, fencing, management and control, and community development. Livestock development with improved breeds and community participation in conservation and development activities should be considered as the first priority.

## Chapter Six

# RESOLVING THE PARK - PEOPLE CONFLICT: THE ROYAL CHITWAN NATIONAL PARK, NEPAL

by

Sanjay K. Nepal and Karl E. Weber

### I. THE SETTING

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The Royal Chitwan National Park (RCNP) is located in the southern section of Chitwan District in the Central Terai region of Nepal (Fig. 10). The park encompasses parts of the flood plains of the three main rivers, namely, Narayani, Rapti and Reu across the Narayani river in the west and extends well beyond Chitwan District covering the southern section of Nawalparasi District merging with the Parsa Wildlife Reserve in the east. Towards the south, it is bordered by the Valmiki Wildlife Reserve in the Indian State of Bihar. It has a varied topography ranging from the syndinal basin of tectonic origin to the Churia Range and Somewor Hills. The park extends between 27° 20' to 27° 40' north latitude and 83°52' to 84°58' east longitude. The altitude in the park ranges between 150 and 815 meters above mean sea level. Climatic conditions are subtropical with summer monsoon from mid-June to late-September and a relatively dry winter. The mean annual rainfall is 2,400 mm with about 90 percent falling in June to September. The mean temperature in summer is 33 °C and in winter, 17 °C, however, it may reach to a maximum of 38 °C during monsoon and lower to 6 °C during October to January (Bolton, 1975; Laurie, 1978 as cited in IUCN, 1993).

Declared as the first national park in Nepal in 1973, the RCNP covers an area of 93,200 hectares. It was designated as World Heritage Site in 1984 owing to its extremely high animal biomass and diverse habitat types (Thorsell, 1985 as cited in Heinen and Kattel, 1992a).

The sal (*Shorea robusta*) is the dominant vegetation covering 70 percent of the park which is also the climax vegetation of the Inner Terai, however, the continuous interaction of natural forces such as floods, fires and riverine erosion maintain a continuously changing mosaic of grasslands and riverine forests in various stages of successions (Laurie, 1978 as cited in Nepal and Weber, 1993). The sal trees are associated with other tree species such as *Terminalia bellerica*, *Garuga pinnata*, *Briedlia retusa*, *Anogneissus latifolius*, *Buchanania latifolia* and *Dillenia*, *Pinus roxburghii* and creepers, such as *Bauhinia vahlii* and *Spatholabus parviflorus*. The riverine vegetation are commonly composed of Khair-Sissoo (*Acacia catechu-Dalbergia sissoo*), semal-vhellar (*Bombax Ceiba-Trewia mediflora*) and tropical evergreen forest species such as *Albizzia* sps., *Litsaea monopetala*, and *Mangifera indica*. The grassland comprises diverse and complex communities of several species occupying about 20 percent of the park

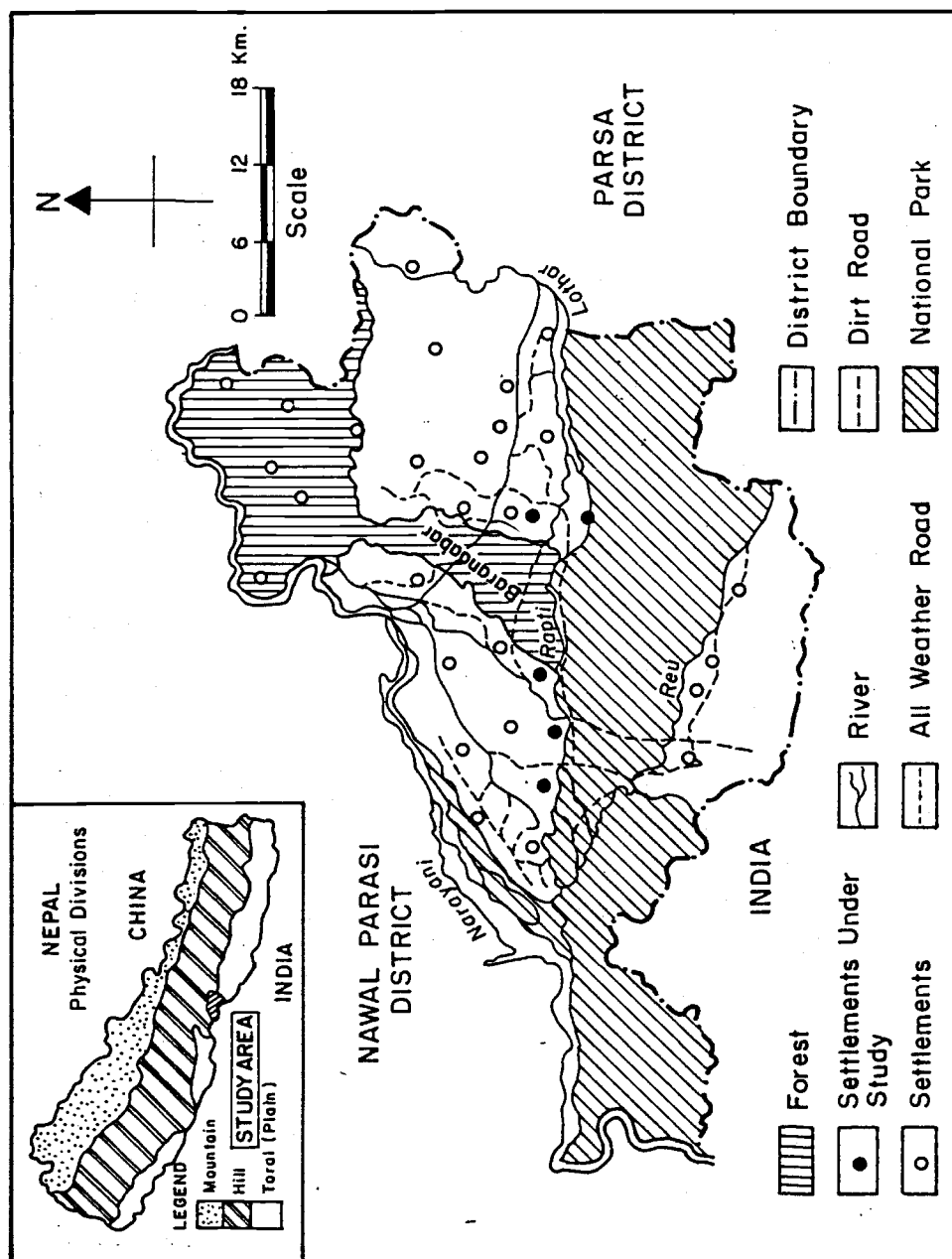


Fig. 10: The Royal Chitwan National Park in Chitwan District, Nepal

Source: LRMP, 1984

area. Some dominant grass species include *Themeda villosa*, *Sqaccharum-Narenga*, *Arundo Phragmites* and short grasses of *Cynodon dactylon* and *Chrysopogan aciculatus* (IUCN, 1993; Laurie, 1978; as cited in Nepal and Weber, 1993).

Over 40 species of mammals have been recorded within the park. The park contains the Indian rhinoceros (*Rhinoceros unicornis*) the population which is estimated between 375 to 400 heads. The population of tiger (*Panthera tigris*) has also increased from estimated 25 in 1975 to about 110 in 1980. There were 24 to 30 resident breeders which has recently been crashed. Half of the resident tigers in the western portion of the park disappeared during the 1990 monsoon and two-thirds of the dependent young were also missing (McDougal, 1991 cited in IUCN, 1993). Leopard (*Panthera pardus*) is also common in the park. The other threatened mammal species include wild dog (*Cuon alpinus*), sloth bear (*Melursus ursinus*), gangetic dolphin (*Platanista gangetica*), gaur (*Bos gaurus*), and gharial (*Gavialis gangeticus*). A detailed account of the parks's fauna is given by Gurung (1983). Many wetlands within the park in the floodplain of the three rivers support a great variety of fish and waterfowl, large population of marsh crocodile (*Crocodylus palustris*) and gharial, and many bird species (Scott, 1984)

The park has the largest number of bird species among the protected areas of Nepal, with a total of 489 species. There are ten breeding species for which the country may hold internationally significant population which includes Bengal florican (*Houbaropsis bengalensis*) and rufous-necked laughing-thrush (*Garrulax ruficollis*). The park provides the only habitat for striped buttonquail (*Turnix sylvatica*), bristled grass warbler (*Chaetornis striatus*), slender-billed babbler (*Turdoides langirostris*) in addition to several other bird species which are under risk. 19 species of snake and 113 species of fish are recorded in the RCNP.

Human pressures have been built around the RCNP only after the malaria eradication in the 1950s which resulted in a vassive population migration from the hills to the pristine area of Chitwan Valley. The Rapti Valley Development Plan of 1954 had proposed to resettle a population of 30,000 by reclaiming 20,500 ha of prime land. The number of migrants, however, increased from 42,833 in 1954 to 193,655 in 1971 (Gurung 1984 cited in Nepal and Weber, 1993). The consequence of this huge influx of population was the rapid and large-scale conversion of forest lands resulting in dwindling population of many important wildlife species. The recent Parks-people Project Document reported 22,348 households living in 15 VDC areas adjacent to the park. About 126,830 people were directly affected by the park establishment.

Management constraints of the RCNP lies on the conflict between park and local people with some additional exogeneous factors. The external threats are mainly from the proposed establishment of hydroelectric project on the Narayani River upstream of the park and the East Rapti Irrigation Project, which would reduce the base flow by 75 percent. Loss of human life (three to five people were killed each year by wildlife), loss of livestock, crop damage and restriction on collecting basic sources of firewood, fodder and timber are the problems of the local people whereas their illegal activities such as livestock grazing, collection of firewood and fodder, wildlife poaching are the problems faced by the management (IUCN, 1993; Nepal and Weber, 1993). Though the park attracts a large number of tourists, the benefits have not reached to the local people.



Conservation measures have been highly successful, as indicated by the substantial increase in wildlife population despite severe conflict with the surrounding communities of the park. The main incentives provided to local people was the annual harvesting of grass from the park which valued at Nrs. 9.9 million (US\$ 450,000) (Lehmkuhl et al., 1988). The park management comprises of a Chief Warden and an Assistant Warden with 76 supporting staff. 37 junior positions have to be filled yet (HMG/IUCN, 1994).

The agricultural land adjacent to the RCNP in the Chitwan valley is the outcome of the conversion of dense forests into a new frontier of human habitation after the completion of the malaria eradication programme in the 1950s which resulted in a massive population migration from the hills (Gurung, 1984). The significant wildlife conservation efforts of the His Majesty's Government of Nepal have resulted in an increase in the wildlife population which had been on the verge of extinction in the Chitwan Valley. Concomitant with this increase, however, the human population has also grown by 3.5 percent per year which is very high compared to the national average of 2.7 percent (HMG, 1991).

Long before the establishment of the park, the local communities had been utilizing forest resources to meet their various requirements. The establishment of the national park and the imposition of park regulations restrained them from using those erstwhile accessible natural resources to the required extent and intensity hitherto available without any restriction. They strongly resented and even violated the new regulations by engaging in wildlife poaching, logging and sabotaging park properties and justified their actions on the grounds of aggravating threats to their life, livestock and crops by the wildlife in the park. This led to escalating conflicts between the local communities and park authority, in some instances causing irreparable damage to park resources. The various causes of the park people conflict in and around the RCNP and their potential solutions have been well documented in numerous past and recent publications (Milton & Binney, 1980; Mishra, 1982 & 1984; Nepal, 1987; Lehmkuhl et al., 1988, Sharma, 1990; Nepal and Weber, 1993). The negotiations to resolve these conflicts have not been successful, and dialogues between the park authority and the local people have reached an impasse. Unless pragmatic approaches are considered to contain and mitigate the conflict, biodiversity in RCNP remains in jeopardy. This study examines the major sources of conflict between park and local people, the need and dependency of the local people on park resources. It examines local people's attitude towards the park and their potential for conservation, the feasibility of establishing a buffer zone and several other strategies to resolve the conflict.

A total of 200 heads of households in five Village Development Committee (VDC) areas were randomly sampled for interviews. This sample size represents 46 village units at the periphery of the park. The five VDC areas, namely, Bachyoli, Patihani, Jagatpur, Sukranagar and Padampur, the latter of which is almost surrounded by the park, were further classified into three distinct areas on the basis of their locational attributes and the existence of forests. Thus, Padampur was identified as the area close to the park (CP), Bachoyli and Patihani as close to the forest (CF) and Jagatpur and Sukranagar as far from the forest (FF). A total of 50 respondents were interviewed in the CP, 71 in the CF and 79 in the FF areas. Based on this classification, the complexities and dynamics of the conflict were compared and analyzed.

The qualitative analyses presented here is drawing on detailed quantitative analyses based on an extensive field survey conducted in 1991 (Nepal, 1991). Three different methods of primary data collection were applied, namely, household survey, informal interviews and observations. The recording of observations on a notebook and photographic coverage were of great value in judging and validating actual field situations with reference to the local communities' pressure on the park. When asked some respondents would report that their community neither trespassed the park in search of firewood and fodder nor took their livestock to graze on park grounds. The observations and photographs in these areas proved otherwise.

## **II. THE QUANDARY OF LOCAL PEOPLE PARK RELATIONS**

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Five major sources of conflict namely, illegal transactions of park resources, livestock grazing, hunting and fishing, crop damage, and loss of human life and livestock are discussed hereunder.

### ***Illegal Transactions of Park Resources***

One of the most common and critical sources of conflict is the illegal transactions of park resources by the local communities living adjacent to the park. According to the 1991 census report, 275,000 people from 36 VDC areas caused an impact on the park (HMG/UNDP, 1994). The local communities were dependent on the park resources to a certain extent, however, in the CF area this dependency was not as heavy as in the case of the CP and FF areas. The park had become the vital source for their supplies of firewood, fodder, thatch grass and timber. The fact that there is very little forest remaining outside the national park has further aggravated the problem. Except in the CF area, there were no alternative sources of forest or/and grazing land available. The Barandabar Forest was the source for firewood needed by the villagers in the CF area, yet, they had to go into the park to collect fodder, as this was hardly available outside the park. The difficult access to the park did not discourage the local communities, as the collection of fodder and firewood had become a necessary part of their daily household chores.

The frequency of visits to the park increased during winter, when fodder is hardly available outside. The low frequency of visits by respondents in the CF and FF areas during summer was mainly attributed to the high flooding caused by the Rapti river, when attempts to cross the river could often be futile. The frequency of visits remained high in the CP area, as crossing of the river was not required there. The frequency of visits shows variations due to several socio economic and locational factors. The result of the regression analysis underlines that only age, distance and crop damage are significantly related to the frequency of visits. It shows that younger people were more frequent visitors to the park than older persons, and people living far away from the park were less frequent visitors than those living nearby. The frequency of visits is also found to be proportionate to the crop damage (Nepal and Weber, 1993).

Five major items were extracted from the park by local communities, namely, fodder, firewood, khar (thatch grass, primarily sini), khadai (canes of tall grasses, mostly phark and baruwa), and timber. The other items of interest were babiyo and simti (for their fibre which is used in rope making) and wild edibles such as mushrooms, roots, nuro and siplikan. The Darai, Bote and Tharu communities were found to be engaged in and dependent on fishing. Fodder, firewood and timber were extracted throughout the year, though mainly during winter. Although only fodder, khar and khadai collecting were legally allowed during the grass cutting season for fifteen days in January, people would hide firewood and small sized logs in the grass loads. If the logs are of big size which could possibly fetch a good price, they are hidden inside the house or buried in the cowdung pit. When the time is opportune, these logs are either sawn in the backyard for the owner's specific purpose such as producing building materials, furniture or agricultural tools, or are sold. The average volume of resources extracted from the park by one household was highest in the CP area, followed by the CF and FF areas. The frequency of visits and the volume of resources extracted from the park are positively correlated. Both are higher in the CP area and lower in the CF and FF areas. There is no significant difference between the latter two, indicating that the existence of the forest in the CF area has contributed little to supplementing the park resources or to alleviate pressure on these rather. The accelerating deterioration of the forest in the CF area has further intensified the pressure on park resources.

### ***Livestock Grazing in the Park***

The integral association of livestock rearing with subsistence crop production has resulted in a concentration of domestic biomass in the vicinity of the park. An earlier study showed that a village at the park border had supported a livestock biomass of 41,764 kg/km<sup>2</sup>, whereas a village six kilometers away supported only 27,895 kg/km<sup>2</sup>, or 33.2 percent less (Seidensticker, 1976). The biomass density of domestic livestock was observed to be higher in the vicinity of the park, which presumably had been due to the availability of and easy access to park and forest resources.

The highest proportion of livestock grazing inside the park was observed in the FF area, which did not have any alternative grazing areas. On the contrary, the proportion was insignificant in the CF area, where the majority of household heads stated that their livestock grazed in the Barandabar Forest, as there was no grazing restriction. A large number of cattle were observed grazing there. The CP area showed the smallest proportion of livestock grazing in the park. This is implausible as that area lies almost inside the park and does not have any grazing areas except the park. On several occasions it was observed that, indeed, cattle were grazing inside the park. Usually, the park guards captured those heads of livestock which they found grazing inside the park and would keep them in the park corral where they would be detained until the owner showed up to claim his animals. The owner could take them back upon paying a fine of roughly Nepali Rupees 20 (US\$ 0.40) per head. Actually, there were very few recorded cases of such offences, since most went unnoticed or were settled unofficially.

## ***Illegal Hunting and Fishing***

Hunting in Chitwan Valley has been a practice since time immemorial. Prior to the successful completion of the malaria eradication programme, the Rana regime (1846-1951) had sealed off this area and used it as a hunting ground, which resulted in a heavy toll on the wildlife, mainly tiger, rhinoceros and wild buffalo. Massive hunts were organized such as that held for King George V of Great Britain, when 39 tigers, 18 rhinoceros and great numbers of smaller game were killed (Milton and Binney, 1980). The biggest toll recorded in this century during the 1937/38 season included 38 rhinoceros and 120 tigers (Smythies, 1942 as cited in Laurie, 1978). The park was a source of game meat for the native Tharu, which caused some depletion of wildlife, although to a much lesser magnitude. After the demise of the Rana regime and the launching of the malaria eradication program, the rapid expansion of agricultural land resulted in large scale destruction of wildlife habitat. While wildlife such as deer and wild pig (*Sus scrofa*) were hunted for their meat, rhinoceros was heavily poached for its highly valued horn. The rhinoceros population dwindled from 1,000 in 1951 to 90 in 1969, a relative decrease by 91 percent. The population of tigers was reduced to 25 heads. Wildlife species such as water buffalo and swamp deer became extinct. Today, the enforcement of Royal Chitwan National Park Regulation (1974) prohibits hunting in the park.

Most respondents were against hunting wild animals inside the park. There were, however, incidents of rhinoceros poaching and deer and wild pig hunting. Although deer and wild pig hunting were rare cases, rhinoceros poaching was an organized crime. The park officials suspected at least 29 persons of rhinoceros poaching, however, no case had been filed yet due to lack of conclusive evidence. Since 1973, eleven heads of rhinoceros outside and eighteen inside the national park had reportedly been killed by poachers, which accounts for 17 percent of the total rhinoceros deaths, despite the massive preservation effort of His Majesty's Government.

The Tharu, Bote and Darai communities traditionally have relied on fish, which has been one of their important food stuff. The three river systems, namely, Narayani, Rapti and Reu were once heavily fished by these ethnic groups. Today, Bote and Darai are the only traditional fishermen who have been given concessions for fishing which otherwise is legally prohibited. However, there were occurrences of fishing by poisoning and blasting. The villagers were discontented with outsiders fishing illegally who sold their catch at town markets. The imposition of the ban on fishing was not strictly enforced as long as it was a subsistence activity. Commercial fishing in these rivers was banned, indeed.

## ***Crop Damage***

Crop damage was mainly associated with three principal wild ungulates of the park, namely, rhinoceros, wild pig and chital. Their feeding on field crops could only be hindered by human interference. During the cropping seasons, the farmers built elevated pole platforms on which they sat out at night to guard their crops. If detected, they simply scared the animals off their fields into fallow land, or someone else's field and woke the neighboring guards by calling it to their attention. When crop raiding was unhindered, the damage was often serious causing an economic setback particularly for small and medium farmers. Crop raiding continued

throughout from May to March in any one cropping cycle and was more destructive during misty or cloudy nights, and during the dark periods of the lunar year, because their detection was very difficult (Laurie, 1978).

The damage of paddy was mainly attributed to rhinoceros and wild pig. No damage had reportedly occurred in the FF area. Maize was mainly damaged by wild pig which far exceeded the damage caused by rhinoceros and chital, however, in the FF area, most damage occurred due to rhinoceros while none due to chital. Wheat was mainly damaged by rhinoceros which was more than triple the damage caused by wild pig. Wheat damage caused by chital and wild pig were at par, except in the FF area where damage due to chital was very low. Unlike other crops, mustard was mostly damaged by chital followed by rhinoceros. Wild pig caused little damage only in the CP area.

It was deemed essential to identify the factors contributing to the crop damage. The result of the linear regression analysis shows that crop damage is a function of size of landholding, distance, and frequency of crop raid which are significant in explaining the damage. The damage increased as the size of landholding and frequency of crop raid increased. Distance and crop damage had an inverse relationship, i.e., the shorter the distance, the greater was the damage (Nepal and Weber, 1993).

### ***Threats to Human and Animal Life***

Encounters with wild animals and incidents of being knocked down, maimed or even killed down by wild animals such as rhinoceros, sloth bears, leopards, wild pigs and tigers were often talked about. It was reported that there were at least three to five rhinoceros and tiger related casualties every year (HMG/UNDP, 1994). In 1990, ten persons were estimated to be killed in such encounters, as related during group discussions held with the local communities. Most of these fatal incidents took place inside the park. Such incidents obviously made people averse to wildlife conservation efforts. The local communities felt that while their life continues to be at stake, the park staff vociferously condemn their activities which in the villagers' opinion is tantamount to wildlife being invaluable as compared to human life.

There were heated discussions among the local communities concerning the killing of livestock by wildlife. Some even expressed their feeling that perhaps wild animal hunting should be permitted in view of the damage incurred, which sometimes had cost them their income of a whole year or even more. There were numerous reports of tiger predating on cattle and buffalos inside the park, and goat and sheep lifting by leopards in villages.

## **III. PROSPECTS OF COEXISTENCE: WILDLIFE AND LOCAL PEOPLE**

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Findings related to the local communities' conservation attitude, favourable and unfavourable aspects of the park, degree of restrictions, inconvenience and loss, park priorities and desired benefits as perceived by the local community, and their suggestions for conservation and preferences are discussed with a view to give insight into their capabilities for wildlife conservation.

### ***Conservation Attitudes***

Overall, the positively inclined respondents form the majority. Proportions of respondents signalling an indifferent attitude declined as the distance from the park increased. The proportions of respondents signalling a negative attitude are similar, except in the CP area where it is relatively high. Since the respondents in the CP area were entirely dependent on the extraction of resources from the RCNP, it was unlikely that all of them would appreciate the conservation efforts of the park authority. This may also explain why among those living far away from the park, many more reacted positively.

The conservation attitudes of the respondents can be explained in relation to various aspects of their socio economic conditions. The results of discriminant analysis show that only landholding size, frequency of visits and distance between homestead and park are significant in explaining a positive conservation attitude, which is due to bigger landholding size, lower frequency of visits, and increasing distance to the park (Nepal and Weber, 1993).

### ***Favourable and Unfavourable Aspects of the Park***

The most favoured items are wildlife conservation, animal protection (mainly large mammals), and forest conservation. Some degree of variation appears among the three distinct areas in terms of respondents' priority for each favoured item. The index values for the items ranking first to third are comparatively higher in the CF area. Livestock grazing shows a significant variation indicating its relatively greatest importance in the CP, great importance in the FF and lesser importance in the CF area.

The overwhelming majority across all three areas strongly objected to the restrictions on the use of park resources such as, fodder and firewood collection, timber cutting, livestock grazing and herbal plant collection. Similarly, losses were reported owing to wild animals raiding crops and preying on livestock. The raiding of crops by wild animals was a major complaint in the CF area, followed by the CP and FF areas.

### ***People's Perceptions of Park Priorities and Desired Benefits***

By and large, most respondents were concerned about the apathy of the park administration toward local people's need and, thus, rated the understanding of farmers' problems as the highest priority. However, CF area respondents differ markedly in regard of their highest priority which is strict protection and control. The reason can perhaps be related to the existence of the Barandabar Forest which is an alternative source for fulfilling villagers' need for firewood and grazing grounds.

The major three benefits included collection of firewood, fodder and utilization of deadwood and driftwood. They held the opinion that deadwood could be utilized as firewood rather than letting it decompose. Not much emphasis was laid on employment and livestock grazing. While fodder collection was named most frequently in the CP area, it was firewood in the CF and FF areas. Almost equal references were made to livestock grazing, utilization of deadwood and park related employment, except for the CP area without any reference to employment.

### ***Suggestions for Conservation***

Only one third of all respondents reacted on this matter. Their suggestions include fencing, utilization of deadwood, growing trees on private land, creation of a buffer zone, extension education, controlled hunting of certain obnoxious wildlife, strict patrolling and controlled fodder collection. Almost half of those respondents, overall, strongly suggested the fencing of the park for its protection. In the case of other suggestions, very few references were made. In fact, during group discussions, many local people indicated the possibility of sound management by utilizing the logs and snags available in the park. They suggested that perhaps a village firewood depot could be set up, which might minimize the illegal firewood collection. Although, highly positive of this scheme, owing to the preconceived notion that the park administration would never implement it, very few respondents reacted on this matter.

The majority of the local people made constructive suggestions on matters related to reducing their dependency on the park. These include growing trees on private land, developing areas for firewood, and fodder collection as well as pasture, establishing private woodlots, reducing the size of cattle herds, stall feeding and developing alternative sources of energy. The most frequently mentioned items are developing areas for firewood as well as fodder collection and pasture, and growing trees on private land. This reflects that the respondents were, indeed, pressured due to unavailability of alternative sources. Slight variations in priority appear across the three areas. Other items are considered less feasible although desired by some respondents in certain areas.

### ***Controlling Crop Raids by Wild Animals: Methods & Implementation Mechanism***

One common feature observed in the cultivated area was the individual farmer's elevated pole platform built amidst the field. At night, farmers would stay awake on these guard posts to watch out for wild animals. Most cultivation areas were surrounded by fences mainly made of tree branches, which were largely ineffective measures, as they were partly damaged or completely destroyed by frequent wildlife intrusion. Other methods included making noise using clangers and clappers which, however, were hardly successful, given the unrelenting crop raids of unpredictable frequency and intensity. Most farmers shared the experience that scaring away rhinoceros and wild pig was difficult. These wild animals would often retreat a few hundred meters toward the park boundary or to a safe place, only to return when things calmed down. Despite these protective measures, crop damage had worsened over the years.

Farmers preferred various methods to fend off crop raids. Most respondents favoured constructing a strong iron fence on the park boundary to prevent wild animals from intruding into crop fields. An earlier attempt to fence the western border at Padampur (CP) had resulted in the digging of a deep trench, with a barbed wire fence running alongside the agricultural land (Milton and Binney, 1980). Although initially helpful, the fence and trench deteriorated over time, yet this protective device was still preferred owing to the fact that it could be implemented soon which could offer protection at least for a certain period while other long term measures are being conceived. Farmers' past experience with unsuccessful attempts of fencing suggested that such barriers ought to be high enough to prevent chital

from jumping over, strong enough to resist trampling by rhinoceros, deep enough to prevent wild pig from tunneling, and long enough to prevent these animals from circumventing them. Developing grazing areas was sought as an indirect solution to the problem and ranked second. This indicates local people's realization that crop raiding is somehow related to the competition for foraging grounds between wildlife and domestic livestock. The third ranking restraint of poaching reflects some respondents' difficulty to refrain from trespassing into the park. The local people implicitly expressed their doubts whether income opportunities could be created, given the few references made. Likewise, controlled hunting for crop protection was indicated by few only.

Owing to the small numbers of respondents who reacted to the directly related, preceding questions, few answers were obtained with regard to the implementing body for suggested conservation measures. Across all areas, respondents held the view that the recommended conservation measures should be implemented by a government agency, viz. the RCNP authority. While the few references made by CP area respondents refer to government agencies only, those made by CF and FF area respondents vary. Relatively most suggestions imply the direct involvement of government agencies, either solely or jointly with the local population. Also, it was envisaged to have farmers or the public as such put in charge of implementing conservation measures. The local people opted for somekind of co management for the implementation of suggested conservation measures. Three possible management mechanisms, namely, management committee, users committee or local cooperative were identified. The respondents' definition of a management committee was similar to that of the existing Village Development Committee, whose members are elected by villagers. The users committee was similar to some existing forest and grassland management committees, where people select the members among themselves, requiring less formal procedure. The majority were in favour of a users committee, owing to the expectation that each user could have his voice heard.

#### **IV. BUFFER ZONE MANAGEMENT**

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This section discusses potential areas for buffer zone establishment and identifies some key factors for its success with reference to the involvement of local communities in buffer zone activities.

##### ***Existing Buffer Forests***

There were several small parcels of forest outside the park, however, they were inadequate to alleviate pressure on resources inside the park and provide protection owing to their small size and structure. The national park did not contain any exclusively designated buffer zone. A strip of forest immediately outside the park boundary extended towards the Mahabharat range in the northern section of the district. Known as the Barandabar Forest, this was envisaged as an additional protection to the park, however, continual grazing, lopping branches and twigs from trees, and timber extraction have extensively diminished its ecological values. Covering an area of 5,927 hectares, this forest functions as a habitat linkage and dispersal



corridor for the migratory wildlife of the park, as it encompasses two different topographical realms, the Churia and Siwalik hills in the south and the Mahabharat range in the north.

The Barandabar Forest, the last remaining forest outside the park, came under the protection of the government when a resettlement commission in 1965 removed the settlers from the forested area (Studsrod et al., 1988). It is predominantly a sal forest, however, smaller patches of riverine and mixed forests can be found in certain locations. Classified as a mature, degraded hardwood/sal forest with a crown cover of 40-70 percent (LRMP, 1984), the use and status of the Barandabar forest is not clearly defined, although it is occasionally referred to as the production forest of the Chitwan District. It is guarded by the 'Rhino Patrol', mainly to control wildlife poaching and illegal timber extraction.

To the first author's knowledge, the Barandabar Forest suffered massive destruction during times of political turbulence in the country in 1980 and 1990. Today, anyone looking from the edge of this forest will be horrified to find trees of inferior standard standing far apart, the underneath just a good enough playground for the local high school soccer team. Continued lopping of tree branches and livestock grazing have vastly changed the vegetational patterns of the forest. Day after day, the distance to the sites of firewood and fodder collection is increasing. Aside from the Barandabar Forest, there were few patches of forest trees covering a small area each. The total area of all parcels of forest, including the Barandabar Forest, within five to ten kilometers from the park boundaries south of the Mahendra Highway was about 42,000 hectares. The CF and FF areas had buffer forests at Bachyoli, Jagatpur and Sukranagar. Near the park headquarter at Kasara, Jagatpur, there were two interesting cases of a government managed and a community managed forest. Both parcels of forests had initially been established to mitigate the threat of flooding caused by the Rapti river and its riverbank erosion. Until 1990, the plantation forest established by the Timber Corporation of Nepal was well protected by a barbed wire fence and guarded by park staff. The fodder grown inside the area was auctioned to local villagers for which a nominal amount of money was levied. The grassland was well maintained and controlled. However, during the political unrest in 1990, the fence was removed by a mob of villagers and the grassland opened for cutting and grazing. Due to lack of law enforcement and the irresponsibility of the villagers, this area has been in peril ever since. The community forest, in contrast, remained intact even during the political unrest. The villagers had employed one guard. The fodder growing inside the forest was auctioned twice a year under the management of a nine member committee, which was the body responsible for this small patch of forest. While the former case exemplifies local villagers' negative attitude towards government forest conservation efforts, the latter case strengthens the argument for community ownership as the fundamental necessity for any effective forest resource management strategy.

### ***Buffer Zone Viability***

Overall, not even half of all respondents indicated the possibility of establishing a buffer zone. Only one quarter of the respondents in the CP, nearly one third in the FF and two thirds in the CF areas considered this feasible. The virtual non availability of land was considered as the main limiting factor. The higher proportion of constructive references made in the CF area is mainly due to the existence of several alternative areas, as compared to

the CP and FF areas. When asked about the possible location of such buffer zones, the majority of the respondents referred to the Rapti riverbank as a potential area. However, they were skeptical if any buffer zone could be established along the riverbanks owing to their exposure to soil erosion. Some of the respondents, particularly in the CP area, suggested that the inward edges of the park boundary could be suitable at numerous locations. This was stated in view of the increasing population pressure and non availability of land outside the park boundary. The Barandabar Forest in the CF area, if properly managed, was considered viable to function as a very effective buffer zone.

### ***Local Participation in Buffer Zone Planning and Management***

Various criteria were identified by local people as relevant for creating a buffer zone. The level of response was quite low in the CP area, accounting for only half of all responses indicating such possibility. Most references by respondents in the CP area were equally made to fodder and firewood collection as the main criteria, followed by livestock grazing and flood control. In stark contrast, many more respondents in the CF and FF areas cared to identify criteria. While in the CF area, most references were equally made to firewood and fodder collection, followed by flood control, in the FF area, it was fodder collection, closely followed by firewood collection and flood control. Livestock grazing was yet of relatively greater importance to CF than FF area respondents.

With reference to the buffer zone managing body, most albeit few respondents in the CP area were in favour of local people, followed by a government agency, whereas in the cases of the CF and FF areas, half of the respondents each favoured some form of joint management by local people and a government agency, which might reflect their willingness to collaborate with government agencies and staff. A rather large proportion of the respondents in the CF and FF areas also referred to local people as the managing body. Overall, there were very few respondents who named the government as the sole managing authority. Several reasons were stated for selecting a particular management body. Those selecting a government agency reasoned that management tasks required knowledge of biological, technical and economic aspects, which the local people did not have. Some stated that these tasks needed careful planning, for which only the government is well equipped. Still others held the opinion that without government intervention, the local leaders and some influential persons would be the sole beneficiaries. Those in favour of putting local people in charge of management pointed out that, if empowered, they would manage the resources in a better way; once they were recognized as proprietor, their sense of ownership would strengthen their management performance. Those who favoured joint management by local people and a government agency stressed the need for government support; some believed that a check and balance constellation should be induced, which is feasible only if local people collaborate with a government agency. In comparison, the emphasis on local people's better management capability was the most frequently named reason irrespective of location.

Considering the fact that differences in opinion were expressed, it was deemed important to examine people's willingness to share the management responsibility for a buffer zone in the event that the authorities will go ahead and establish one. The overwhelming majority were positive about sharing management responsibility. Compared to the CF and FF areas, a higher

proportion of the respondents in the CP area did not show any interest. The result of discriminant analysis indicates that willingness is the function of respondents' age and level of education, crop damage, household size and landholding size. It was the more pronounced, the older the age, the higher the level of education and the bigger the landholding size. Crop damage and household size were found to be inversely related to it (Nepal and Weber, 1993).

### ***Buffer Zone Design: Findings of a Preliminary Survey***

The above analysis elicits local people's varied knowledge about the concept of a buffer zone and its management aspects. Moreover, several constraints became evident in creating a buffer zone outside the national park such as growing population pressure, lack of land, riverbank erosion, deteriorating forest cover and lack of strong local institutions. These limiting factors should be carefully considered in planning and designing a buffer zone. The basic requirements for the establishment of a buffer zone around RCNP include a careful assessment of the impact zone or sphere of influence of the park. Studies revealed that this zone extends up to ten kilometers from the RCNP boundary, however, the immediate impact zone would be a three kilometer belt alongside the park boundaries (Sharma, 1990).

Some criteria that were identified for establishing a buffer zone include the existence of forests; average distance (travel time) to collect firewood and fodder; average linear distance that cattle traverse for grazing on public lands; modes of transportation such as bullock carts or canoes facilitating access to the buffer zone; the distance that the wildlife traverse to raid field crops; and availability of easily recognizable landmarks for demarcating its boundary (Sharma, 1990). In addition to that, local land use, topographical features and areas vulnerable to flooding, the possibility of expanding community forests and grassland areas managed by local people, reforestation of marginal lands and reclamation of the riverbanks which at present are serving as grazing grounds should also be carefully examined (Nepal and Weber, 1993).

The size of a buffer zone largely depends on the need for threatened species for an extended habitat, the size and degree of dependency of the surrounding community and other local circumstances. The buffer forest around RCNP covers an area of 415 km<sup>2</sup> which means that the land cover ratio of the park and the buffer area is 1:45 excluding the proposed boundary strip discussed below. This area should be large enough to establish a buffer zone, however, its effectiveness depends on several other considerations. The majority of the respondents indicated that a buffer zone could be developed only along the riverbanks and must not be extended towards the villages, mainly due to lack of land. There is virtually no possibility of allotting private land for the creation of a buffer zone as the vicinity of the park is populated mainly by marginal and small farmers with landholding sizes of less than one hectare. Some people, mainly in the CP area suggested that perhaps the edge of the park area could serve as a buffer zone. This would mean the loss of some portions of the riverine habitat that is frequently utilized by many wildlife species in the park. Given this constellation, the following seem feasible:

- establishing a buffer zone in the impact area to the north of the park comprising the existing forests, mainly the Barandabar Forest;
- demarcating a buffer belt alongside the Rapti riverbanks; and
- gradually transforming the agricultural landscape outside the park into an economically productive yet protective buffer area by intensifying community forestry, agroforestry and private forest tree cultivation.

The Barandabar Forest could be converted into a buffer area given proper restoration, control and management. The core of this forest should be left intact as this serves as the migration corridor for wildlife in the park. The estimation of the width of the core may depend on location specific home range size of the rhinoceros or tiger. As it is the last remaining corridor linking upland and lowland habitats, the protection of this corridor should be given high priority in an overall conservation strategy of the park. The corridor can increase the effective size of the park and thus lower the probability of extinction of individual populations by providing additional feeding and breeding habitat and cover as well (Harris, 1985 as cited in Newmark, 1993). The edges of the Barandabar Forest could be converted into a 'multipurpose buffer'. In order to entrust the villagers with the control and utilization of the forest in a sustainable way, sections at the edges of the Barandabar Forest should be divided among different village units. The size of the forest entrusted to each village unit may vary depending upon the number of households in each unit. Extensive plantation is required at numerous locations within this buffer area. It is essential that authorities responsible for the park and forest protection understand the concept and objectives of creating a buffer zone and be able to convince the local communities of its potential benefits as well. The village level institutions may be responsible for managing the resources given the fact that local people had been capable of managing natural resources by themselves, as exemplified through cases as such reported above.

The northern and southern riverbanks of the Rapti are potential areas for creating a buffer strip, however, there are two major constraints, namely, the high vulnerability to frequent flooding and issue of ownership of the barren land. While the northwestern section of the CP area would remain submerged during the high flooding season, the once fertile agricultural land adjacent to the Rapti river had been converted into pasture for grazing by domestic livestock. The villagers estimated that Padampur had lost some 340 hectares of land due to frequent flooding. Given this situation, the creation of a buffer strip along the riverside would not become feasible without reclaiming the eroded land. This requires comprehensive land use planning not only for this particular area but the entire region as well, based on the potential and constraints of the land and local support for conservation. The second underlying difficulty is that the owners of the barren lands are still paying their land tax, hoping that someday the government might offer some compensation. Should any land reclamation occur, these people will be the first to claim ownership of their erstwhile landed property. In such a situation, some additional cost for payment of compensation might have to be incurred.

The flood prone stretches of land on either side of the Rapti river are quite extensive, with a width of more than two kilometers in certain locations. The southern river bank could be developed as the extended habitat for wildlife, while the northern bank could be developed as a 'socio buffer' (Fig. 11). Such a buffer strip would provide additional protection to the park

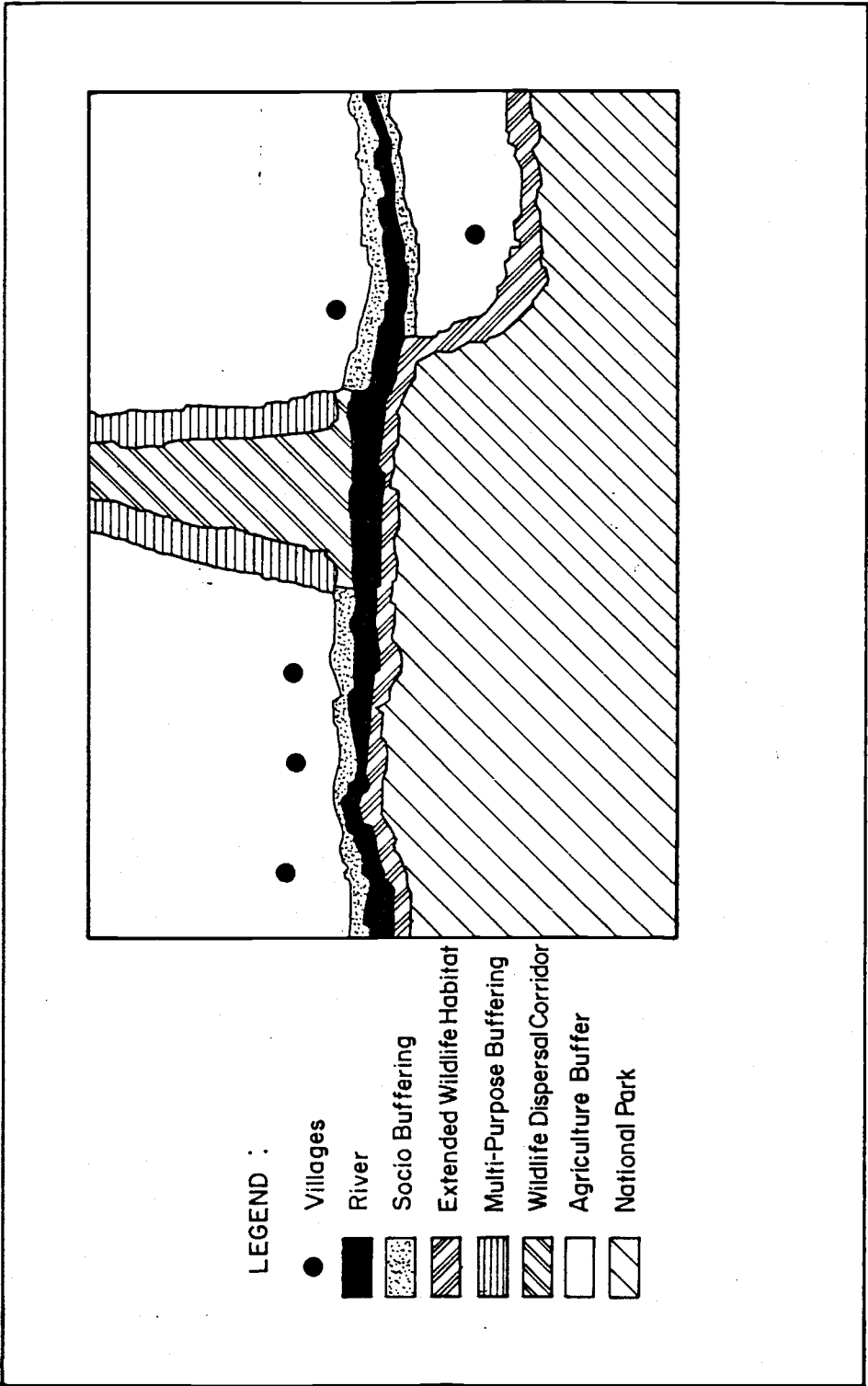


Fig. 11: Design of a Feasible Buffer Zone

and, at the same time, fulfill the firewood and fodder needs of the local people. However, in sections where such wide riverbank belt does not exist, a small strip of unfavorable habitat should be created to prevent the wild ungulates from intruding into the edge of the cultivation areas. The minimum width of this strip should be 20 meters which allows its satellite monitoring in future. The buffer zone should be monitored to evaluate its effectiveness in enhancing integrity of the park and crop and livestock protection as well.

In the case of Padampur (CP), the buffer zone design would have to be different. Since this area is situated to the south of the Rapti river, the northern as well as southern riverbanks should be allotted as a 'socio buffer', while towards the park boundary, a small strip of unfavorable habitat for wildlife should be created to deter wild animals from intruding into the cultivation area. The objective of such a buffer should be the creation of an ecotone between park land and cultivation areas that is difficult for animals to penetrate and undesirable to herbivores for browsing, keeping at bay both wildlife and domestic livestock. The initial temporary fencing of the park boundary may be required.

Furthermore, the surrounding agricultural landscape can be gradually transformed into an economically productive and protective, semi agricultural buffer zone with the extension of community forestry, agroforestry and tree cultivation in private lands. The systematic and widespread increment of the tree cover in this zone may not only provide tangible benefits to the local people, but also provide habitats for sedentary creatures required to restore diversity that is conducive to environmental conservation as well. By enriching the semi agricultural buffer area with wildlife and plants, a salutary relationship between wildlife and local people can be built.

## **V. CONFLICT RESOLUTION STRATEGIES: FUTURE DIRECTIONS**

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The Park administration have attempted to reconcile the conflict by implementing several strategies. Following the public outcry for lack of forest products outside the Park boundary, the Park administration, since 1976, have opened the Park for annual grass cutting season for 20 days in January, which later was reduced to two weeks. During the grass cutting season, the local villagers are allowed to extract as much khar, kharai and fodder as they can. The Park administration estimated that up to 130,000 people entered the Park during this season (Mishra, 1982). In a similar study, 216, 706 visitation was estimated for the 1986 and 1987 seasons (Lehmkuhl et al., 1988). The total weight and value of all grass products removed was 11,132,287 kilograms valued at NRs. 9,940,393 (Lehmkuhl et al., 1988). It is questionable if the annual grass cutting practice is ecologically sound. Meanwhile, the local people's resource needs are partially fulfilled, although, at the expense of some depletion of Park resources. An attempt, particularly in Padampur, was also made to prevent wild animals raiding agricultural crops by digging a deep trench with a barbed wire fence running alongside the agricultural land (Milton and Binney, 1980). Although initially helpful, the fence and trench deteriorated over time. During the field survey, this fence was hardly noticeable. However, the local people still indicated their preference for the fence option as it could be helpful at least for a certain period. Amendments to Park rules also allowed local farmers to capture or kill wild pigs which came into the agricultural land (Heinen and Kattel, 1992b).

The Park administration, in 1977, initiated a consensus building process involving representatives of the local people, in which, villagers complaints and views were discussed. However, any negotiations, whatsoever, were ruled out (Mishra 1982). This process no longer exists. There were also attempts to generate employment in park related activities. The park administration offered training programs to the local people so as to enable them to work as tourist guides and/or visitor interpreters (Heinen, 1990). Because of its small scale, the overall impact was weak, for many participants were unable to find employment even after successfully completing the training. The first named author met one such trainee at Bachyoli (CF). Although, the trainee was not able to find any employment, he was satisfied with the outcome of the training program in the sense that he is now aware of the real value of the Park. This indicates the need for launching conservation education programs. The Park administration, in fact, have launched such programs, however, the villagers claim that the activities hardly reach out to the vicinity of the Park.

It is essential to continue enforcement (Balakrishnan and Ndhlovu, 1992) as well as let local people partially use Park resources (Sharma, 1990; Prins, 1992). A balance, however, should be maintained in implementing both of these measures (Sharma and Shaw, 1993). While short term solutions such as the continuation of the annual grass harvest would provide immediate relief to the local people, long term strategies are urgently needed. Such strategies should include the establishment of a buffer zone, community forestry, agro forestry, tree plantation in private land, and efficient use of agricultural residues by adopting appropriate technologies (Sharma and Shaw, 1993). One strategy alone cannot solve such a complex issue, hence a multi pronged approach is essential, which includes not only the forestry aspects but other developmental measures as well (Nepal and Weber, 1993). This requires the park authority to get rid of their "inward" looking approach and rethink their policy direction.

Currently, the DNPWC with support from the UNDP, is in the process of launching the Parks and People Project, which aims to enhance the capacity of the local communities and the DNPWC to jointly manage five Terai parks and their buffer zones and improve the socio economic conditions of the people living in adjacent areas (HMG/UNDP, 1994). Preparing and implementing the park and buffer zone management plans and guidelines are considered the main outputs. The Project is significant and timely, given the fact that the growing body of literature on protected area conservation suggest that if future efforts to protect parks were to succeed, protected area managers need to address problems that lie beyond the park boundary, particularly, those of local communities (Hanks, 1984; Durbin and Ralambo, 1994). The Project is comprehensive, however, some specific issues are not addressed explicitly and merit further consideration.

One of the most important aspect in park management is the information needs of the park administration vis a vis local people. Information sharing between the park administration and local people is vital for effective communication (Hough, 1988) and future negotiations, whatsoever. Although, mentioned throughout the Project document, the involvement of local people in park planning and management, and preparing management plan are not adequately addressed. The past HMG bureaucracy ignored the role and significance of local involvement. This means attitudinal change is urgently needed, without which, any sincere efforts to resolve the conflict may not succeed. The indigenous methods of natural resources conservation could

be an important way to reinforce modern vis a vis traditional resource management practices. The potential among the local people for wildlife conservation should be explored and their knowledge utilized. A mechanism should be established to channel the revenue from a park to the local community for income generating activities. Also, the current user entry fee should be evaluated and a basis for future revisions established. Last, but not the least, while the Project activities are on going, it may be necessary to redesign and initiate a consensus building process involving all the stakeholders.

## **VI. SUMMARY AND CONCLUSION**

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Five major sources of park people conflict in the Royal Chitwan National Park of Nepal were analyzed. These conflicts are the reflections of attitudes of local communities and the park authority whose priorities and objectives largely diverge. The results indicate that people settled adjacent to the park were heavily dependent on its resources. Even in places where few alternative sources did exist, local people continued to trespass the park as these sources were inadequate to compensate the fulfilment of local people's resource needs. Illegal transactions of resources continued throughout the year. The local communities bitterly complained of crop damage and threats to their life and livestock.

The findings indicate that there is good potential for the coexistence of wildlife and local communities. Based on three distinct areas defined by their distance to the park, the complexities and dynamics of local communities' perceptions, attitudes and motivation towards wildlife conservation were analyzed. Although local communities disliked the restrictions imposed by the park authority curtailing the use of park resources, they take a positive attitude to wildlife conservation. Their active involvement in protection and conservation could, hence, be secured if due consideration is given to their needs as well, which would have to be addressed in the overall planning and management of the park.

Several options for establishing a buffer zone were explored. The local communities indicated fodder and firewood as the main criteria for its establishment, followed by flooding which was a major problem in the vicinity of the RCNP. Some examples in the study area illustrated that local communities had been capable of managing small parcels of forest and grassland. Thus, it was emphasized that local communities should be put in charge of managing the buffer zone. Bestowing the responsibility upon a high level authority is unwise, for the local communities would most probably perceive that as yet another restriction imposed on their traditional rights to use the Barandabar Forest. A small scale and less detailed buffer zone project having a long term support which relies on local initiative and strengthens extant institutional mechanisms to support related activities would be feasible. A preliminary buffer zone design is suggested, which is a matter for further exploration.

There were some earlier attempts to reconcile the conflicts by offering local communities different kinds of compensations, however, these were unsuccessful. The conflict in the RCNP has continuously undermined the objectives of the park and has even threatened its existence. The dilemma in wildlife conservation is that though there has been success in preserving certain endangered species, one has lagged behind in the race against hunger and



poverty of a rather large mass of people who have been bypassed or neglected while making decisions related to natural resource utilization or conservation, as it were. These people have remained in apathy or become averse to any systematic conservation efforts. Thus, achieving the ultimate objective of conservation in the RCNP is a difficult and complicated task which requires patience and strong commitment from the concerned authorities. The problems lie beyond the issues entailed in the scientific management of protected areas. A human ecological approach with a multi pronged thrust is essential as it is apparent that conservation issues are intricately related to the basic necessities and quality of life issues of the local communities.

Three interrelated issues arise from the discussion. The first relates to the question of resource use regulation and meeting the growing needs of the local people so that their antagonistic behaviors can be changed in favour of wildlife conservation. Law enforcement becomes necessary if certain illegal transactions of park resources need to be controlled, as they debilitate the actual sense of scarcity of resources and slow down the process of venturing into innovative activities by local people. The second issue is that of finding possibilities for the coherent integration of efforts by different organizations to direct people in joint endeavors for wildlife conservation and community development activities. The third issue is that of finding ways to explore the potential among local people for wildlife conservation efforts and include them in the planning and decision making process. Only with the resolution of these issues, the park - people conflict could then be resolved.

## *Chapter Seven*

# **STRATEGIES FOR REHABILITATION: THE CASE OF BICOL NATIONAL PARK, PHILIPPINES**

*by*

**Christina A. Lantican\***

## **I. INTRODUCTION**

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The majority of the protected areas in the Philippines have faced multifarious issues which have adversely affected biodiversity conservation. A combination of factors such as illegal logging, shifting cultivation, hunting, human encroachment and illegal collection of various kinds of natural resources have resulted in habitat destruction and decline in biodiversity. At least two thirds of the national parks in the Philippines contain illegal settlements and/or have been partly logged (MacKinnon, et al., 1986). Widespread poverty caused by the ever increasing population and declining resource base have added pressure on many national parks. Failure to seek livelihood in the urban areas lead the poor people to migrate to uplands and marginal areas, usually covered under dense forests. Illegal loggers proliferate in national parks, causing the depletion of good quality and premium species of forest trees. Hunting of different wildlife species for collection and sale poses big threat to the already dwindling population of many wildlife species. Though the country currently has 62 national parks, none of them are free of threats arising out of illegal logging, hunting, mining, encroachment and wildlife poaching, which are the common problems faced in the Bicol National Park (BNP) as well.

Protected areas also suffer from poor management owing to inadequate funding and manpower. The legal basis for national parks is complex as indicated by at least 262 enactments since 1900. In many cases, these enactments are overlapping or inconsistent and have not provided sufficient information for a protected area to be accurately delimited. There has been a marked tendency to issue amending enactments leading to further confusion. For example, the legal administrative status of the Quezon Memorial National Park can only be ascertained by reference to at least 13 enactments (DENR, 1993). None of the sites presently considered and proclaimed as a national park can meet the standards of the IUCN. All the national parks in the Philippines which are of biological importance and adequate size (more than 10,000 hectares) have human settlements within their boundaries.

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Tri B. Suselo. The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.

Development projects and environmental/ecological concerns sometimes require the involuntary resettlement of people from areas where they live and work to other location (Cernea, 1978). The resettlement of villagers, no matter how well planned often causes profound economic and cultural disruption to the families and individuals affected as well as to the social fabric of local communities. The establishment of a national park has often resulted in the displacement of people living inside it. Even at a later stage of park establishment, relocation of villages from within a national park boundary is often sought as a strategy to safeguard the integrity of the park. However, it also means disrupting the traditional life styles of people who had been living there for generations. While there are many cases of successful relocation, there are also some bad examples (Calhoun, 1991). As is often the case in the reserve forests in Thailand, the government authority in the Philippines did not confront the encroachers at an early stage for the fear of public protests. Often they are influenced by local leaders who encourage villagers to encroach upon public forests for popular support during local elections. It is ironic that even the government agencies provide various services and support to people residing illegally in the reserve forest. In due course of time, such settlements expand rapidly making it practically impossible to relocate later, should such a situation arise in future.

In the Philippines, protected areas inevitably contain human settlements and some form of subsistence economy. Owing to severe degradation of some protected areas, relocation of villagers has been sought as an alternative strategy to save protected areas from further ecological damage. This study is an attempt to evaluate the overall situation of the Bicol National Park with particular emphasis on the eviction of protected area occupants and squatters. It examines the socio-economic conditions of the relocated people and the roles played by various agencies in the eviction process. Some relevant management issues and conservation strategies are discussed as well.

This study is mainly qualitative, based on the field survey conducted in 1993 (Lantican, 1993). Both, primary as well as secondary data have been used. A total of 33 top and mid-level staff representing the central, regional and provincial offices of the Department of Environment and Natural Resources (DENR) were interviewed. This includes officials from the Wildlife and Protected Area Bureau in Quezon City and the Bicol National Park. Similarly, five respondents were chosen from two field based non-governmental organizations, namely, the Bicol National Park Foundation Inc. (BNPFI) and the Foster Parents Plan International - Bicol. A total of 15 respondents from among the relocated households were purposively selected for interviews, out of which ten household heads had volunteered to settle in the selected site while the remaining opted to reside in the existing villages outside the park. Secondary information was obtained from various accomplishment reports, project plan documents and manuals. Official memorandums also provided some valuable information. The 1991 inventory of forest occupants which consists of information from 738 households proved helpful in further analysis (DENR, 1991). Out of this list, 150 households were randomly chosen for information on their socio-economic condition before their eviction.

## II. THE PARK SETTING

The following information is based on the Management Manual Plan for the Bicol National Park (DENR, 1992a). The Bicol National Park is shared by two provincial jurisdictions, namely, Camarines Sur and Camarines Norte in the island of the Bicol Region. Established in 1934 with a land coverage of 4,225 ha, it was later extended to 5,201 ha covering some sections of the Basud and Mercedes towns in Camarines Norte and Lupi and Sipocot in Camarines Sur. In Camarines Sur, the park area is situated within the municipalities of Sipocot and Lupi, while in Camarines Norte, it is within the municipalities of Basud and Daet. Located approximately, 330 kms away from the Metro Manila, the Maharlika Highway runs north-south through the park. The park is bordered by the Tuaca River in the north, agricultural lands in the south, Pulantuna and Tuaca rivers in the west and public forests in the east. It covers more than 30 percent of the total lowland rainforest area remaining in the Philippines. Situated at an elevation of 536 meters above sea level, the topography in the park is mostly rugged with rolling hills and mountains. It is drained by five rivers and 11 creeks which flow towards the Bicol River. The climatic condition is characterized by a definite dry season, rainfall mostly occurring between November and January. Rainfall ranges between 128 mm in April to 648 mm in November while the temperature is between 26.2 °C and 27.4 °C.

As of 1987, forest cover in the park is categorized into virgin forest (741 ha), residual forest (1,321 ha) and planted forest (412 ha). Though the major portion of the forest cover has been removed, a considerable level of species diversity still exists in the park, as documented by the National Museum in 1991. The forest cover is dominated by Apitong (*Dipterocarpus gradiflorus*) with other species such as yakal (*Hopea Plagata*), white lauan (*Pentacme contorta*), bagtikan (*Parashorea plicata*), guijo (*Shorea guiso*), dalingdingan (*Hopea foxworthyi*), hagakhak (*Dipterocarpus warburgii*), narig (*Vatica mangachapoi*) and red lauan (*Shorea negrosensis*). Palm tree species include kaong (*Arenga pinnata*), takipan (*Caryota rumphiana*), pugalan (*Caryota cumingii*), palmera (*Chrysalidocarpus lutescens*), coconut (*Cocos nucifera*), limuran (*Calamus ornatus*), palasan (*Calamus merrillii*) and anahaw (*Livistona rotundifolia*). A wide variety of epiphytic plants such as ferns, mosses bromelides and orchids are found in the park. Among the epiphytes pakpak lawin (*Asplenium nidus*) and dapong tigre (*Phalaenopsis shilleriana*) are the most abundant. Vines such as hinggiw (*Urceola imberbis*) and nito (*Lygodium circinatum*) are widely distributed. The other premium species include dao (*Dracontamelon dao*), lamio (*Dracontamelon edule*), lisak (*Neonauclea bartlingii*), kamagong (*Diospyros philippinensis*), dungon (*Heritiera sylvatica*), molave (*Vitex parviflora*), dita (*Alstonia scholaris*), magabuyo (*Celtis luzonica*), malaikmo (*Celtis philippinensis*), almaciga (*Agathis dammara*), iloilo (*Aglaia iloilo*), anubing (*artocarpus ovata*), binunga (*Macaranga tanarius*), gubas (*Endospermum peltatum*), hawili (*Ficus septica*), balobo (*Diplodiscus paniculatus*), katmon (*Dillenia philippinensis*), malugai (*Pometia pinnata*), tibig (*Ficus nota*) and duguan (*Myristica umbellata*).

The most common wildlife species found in the park include Phil. field rat (*Rattus mindanensis*), Geoffroys' rousette bat (*Rousettus amplexicaudatus*), Malay civet owl (*viverra tangalunga*), palm civet (*Paradoxurus philippinensis*), Phil. dawn bat

(*Eonycteris spelaea glandifera*), Phil. macaques (*Macaca philippinensis*), Phil. brown horsoc bat (*Acedoron jubatus mindanensis*), red jungle fowl (*Gallus gallus*), painted quail (*Excalfactoria chinensis*), brahminy kite (*Haliastur indus*), green imperial pigeon (*Ducula aenea*), grass owl (*Tyto capensis*), black-naped oriole (*Oriolus chinensis*), chestnut mannikin (*Lonchura ferruginosa jagori*), snowy egrets (*Egretta nigripes*), giant south American toad (*Bufo marinus*), Phil. woodland frog (*Rana magna*), flat bodied house gecko (*Cosymbotus platyurus*), toko narrow disked gecko (*Gecko gecko*), and several species of snakes and lizards.

The park has been divided into virgin forest, grassland, heavily logged forest, cultivated fields and reforestation areas (Fig. 12). Between 1983 and 1987, the park lost 19 percent of the original forest cover, whereas cultivated area increased by 17 percent and open land by two percent (DENR-CENRO, 1988). About 741 ha of park lands is under original forest, 1,321 ha secondary forest, 412 ha forest plantation and 50 ha grassland. About 43 percent or 2,242 ha is under cultivation of which 230 ha is under permanent crops, 2,021 ha seasonal crops. The 1991 population census recorded 1,702 households with a total population of 9,802 living in the settlements adjacent to the park. The major population concentration is in Sooc, Villazar, San Pascual and Tuaca (DENR-CENRO, 1988; DENR, 1992b). The park has significant tourism, recreation, and scientific values. There are natural swimming pools, picnic areas, park and camping areas, natural trails, back country shelters, and botanical and zoological gardens. However, it suffers from illegal logging and firewood collection, charcoal production, and encroachment for cultivation.

Initially under the Bureau of Forestry, the management of the park was taken over by the Protected Areas and Wildlife Bureau. It is administered by the Community, Environment and Natural Resources Office in Daet, Naga and Sooc. The park is manned by three Conservation Officers, eight Park and Games wardens, one Biologist and the Head Parks and Games Warden. The Forest Guards of the Bicol National Park Foundation also provide additional manpower for safeguarding the park and hence to ensure that no illegal activities and further encroachment would occur inside the park.

### III. IMPACT ON THE BICOL NATIONAL PARK

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Although established in 1934, the BNP suffered extensive deforestation during the Second World War when people migrated from the nearby towns to its remote mountainous areas. Although designated as a national park, law enforcement was very weak, apparently due to jurisdictional clashes. The objective of having a national park was never clear as permits were issued in 1968 to cut trees inside the park which added to the already existing problems of human encroachment of park lands. The granting of a controversial Private Woodland Registration Permit to an influential individual by the then Bureau of Forestry (currently, the Forest Management Bureau) allowed clearing of trees in the Camarines Sur section of the BNP. This resulted in large scale exploitation of big timber stands with intensified human activities occurring within the BNP. As the permit was legally valid, no one could oppose the logging company and the government did not

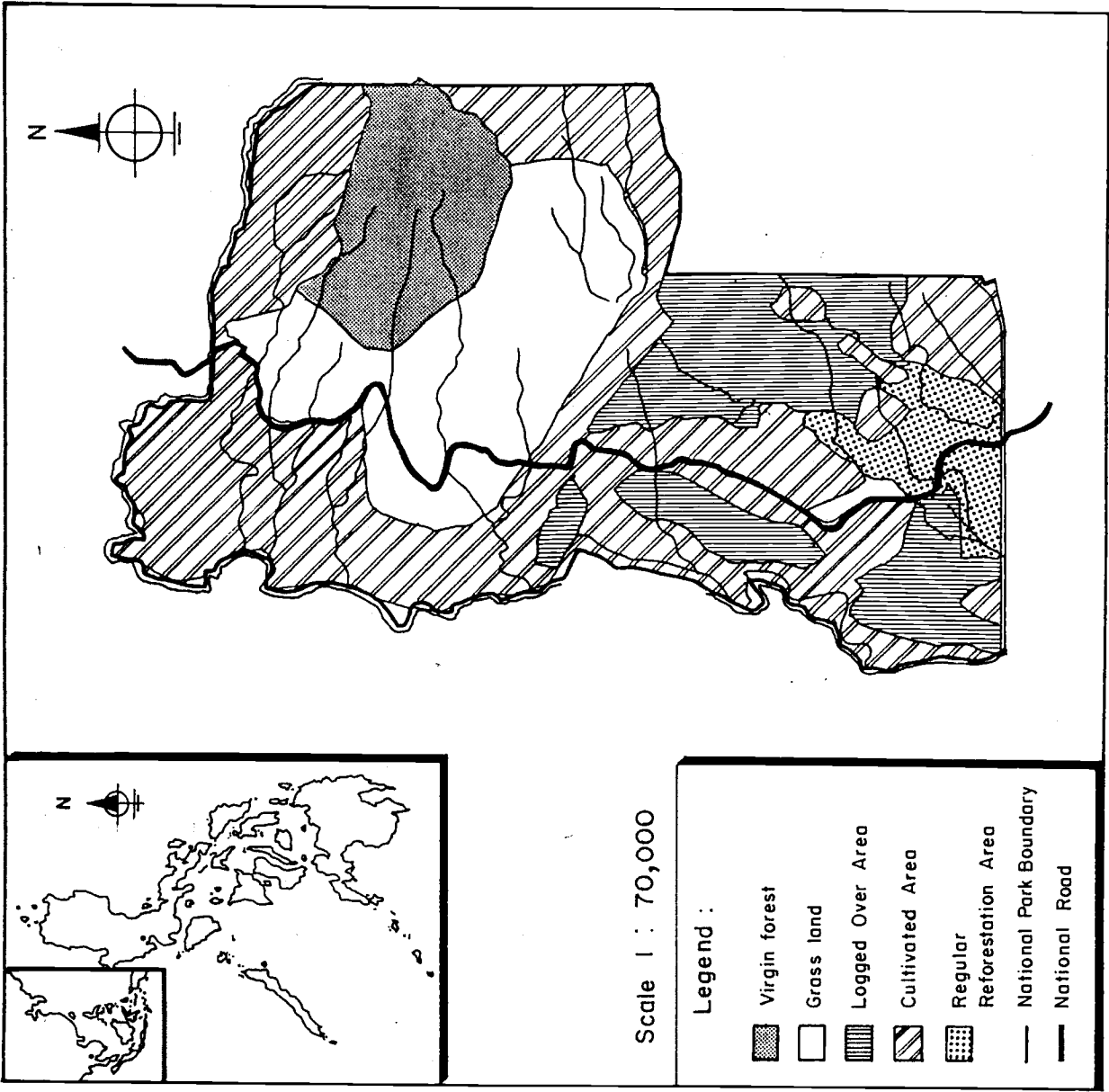


Fig. 12: The Bicol National Park and its Land Use

think that by issuing such a permit it had started the loss of valuable species and threatened the ecosystem of the park. The problems triggered when the Daang Maharlika Highway and a power transmission line were constructed right through the park in the early 1970s. As the demand for timber, which is roughly around 130,000 m<sup>3</sup>/year for the whole region is much higher as compared to the existing supply of 25,000 m<sup>3</sup>/yr, illegal logging had become a lucrative business in that region with the BNP being no exception, where the big timber merchants assisted the loggers by providing chainsaws and facilitating the operations. Flitches are hauled by carabaos day and night to specified loading points along the highway from where they are loaded onto 10-wheeler trucks and transported elsewhere. Arrangements with the check point guards are made in advance to ensure easy shipment. The flitches are then delivered either to nearby sawmills or to other places such as Benguet Mines in Camarines Norte or even to Manila. Such operation is well established which is extremely difficult to control owing to the operators powerful political connection or sometimes use of force as well. Once the land is cleared of big tree stands, it attracts the shifting cultivators and charcoal makers. Whatever remains after the logging operations is converted to agricultural land. In charcoal making, trees less than 2 ft. in diameter are cut, covered with soil, then burned. Charcoal are then packed in rice bags and eventually sold along the highway. When the Forest Management Bureau (FMB) campaigned against the charcoal and firewood transport, the buyers smuggled out these items by pretending that the bags are full of copra and not charcoal. The FMB in Daet had been fairly successful in its campaign against charcoal and firewood transport.

Much later, in 1988, it was realized that it had been a grave mistake on the part of the Government which took immediate action to cancel the permit and ordered the company to vacate the area. It was too late as many of the significant wildlife species had been lost by them. A significant portion of the Park area had been converted to cultivation area after the logging was stopped. Those who worked in the logging company settled in that area. As a result, some 64 percent of the park lands was transformed from a pristine forested area to a logged-over area and cultivation fields. While only a mere 5 percent of that area has been restored as a reforested area. Contract reforestation program covers another 26 percent of the area to be restored. The 1991 official record showed that there were 738 households residing inside the park, of which, 688 were living in Camarines Norte province while the remaining in Camarines Sur. These households depend on shifting cultivation, firewood gathering, charcoal production and timber cutting which have significantly depleted wildlife species and diminished the park's biological values.

The inefficiency of the government to act against the illegal occupants practicing agriculture inside the park have been the major factor for the ever increasing number of the occupants. The low political priority assigned to conservation by the government, lack of funding, equipment and trained staff have led to various management problems. Legal protection is rarely sufficient to guarantee the integrity of the park. The illegal occupants have seen the park as government-imposed restrictions on their traditional rights. Patrolling by the forest guards, boundary demarcation, and suit in courts did not deter them from agricultural encroachment. Illegal logging, charcoal making and gathering of forest products have been very difficult to control.

The change in the administration in 1992 at all levels of the DENR resulted in prompt action by the concerned agency to safeguard the value of the BNP. It had been realized that if proper action is not taken, it may no longer be possible to control the activities inside the BNP and, thus, it would eventually be transformed into a cultivation area. The new government was committed to biodiversity conservation. There was a general awareness that increasing number of population inside the BNP had, in fact, deteriorated the natural resources. A balance was sought to fulfill the immediate needs of the people residing inside the park while rehabilitating it to its natural conditions. With collaboration from various NGOs, public and private sectors, institutions and agencies at the local and provincial levels, the Protected Area and Wildlife Bureau with good support from the DENR started to plan for the relocation of the occupants from the BNP.

#### **IV. THE EVICTION OF HOUSEHOLDS FROM THE PARK**

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It was in the early 1980s that concern for relocating the households from within the park started. It did not materialize due to the lack of commitment from the then Ministry of Public Works and Highways (currently, the Department of Public Works and Highways), lack of adequate funding from the Ministry of Natural Resources (currently, the DENR) and strong resistance from the occupants with far reaching consequences. In 1987, a proposal was made by the Regional Executive Director of Region V to the DENR Secretary to convert certain sections of the park towards the Camarines Sur into a public forest. It was envisioned in the plan to relocate all the squatters from the Camarines Norte to Camarines Sur. The converted portion of the BNP would be replaced by an area formerly covered by the timber license of the Camarines Norte Mahogany Co. Inc., which is located at Basud and Mercedes in Camarines Norte. This plan was unanimously supported by all the high ranking officials of DENR Region V, however, the Central Office of the DENR did not approve it.

Several guidelines were issued for the conduct of census and registration of the occupants in a protected area (DENR, 1992c). It was envisaged that such a database would help in establishing management zones and buffer zones for the preparation of management programs including the identification of alternative livelihood opportunities. The census included actual number of occupants, the exact location and size of home/farm lots and confirming the period of occupancy. The census team comprised of three persons, each represented by the DENR, local government and non-government organization. The initial process involved scheduling meetings and dialogues with the occupants with coordination from the local government officials and NGOs. The main basis for occupant registration was the tax declaration made by the individual households not later than 1987. The other evidence was the census survey report of the Bureau of Forest Development, information available at the local Census and Statistics Office and the Commission on Election which was conducted not later than 1987. Absentee claimants and transient occupants were excluded. The occupants who had been residing within the boundary of a protected area for more than five years before the effectivity of the National Integrated Protected Area Systems (NIPAS) Act, 1992 were considered for registration while indigenous community would be automatically qualified to register as legal occupants. A



name list of the registered occupants were posted in public places. Any complaints regarding the list could be made within 30 days of the posting.

In November 1990, an inter-agency committee was formed to conduct the relocation of the households from inside the BNP. This committee included representatives from the Provincial Environment and Natural Resources Office (PENRO), Department of Social Welfare and Development (DSWD), Department of Agrarian Reform (DAR), Department of Local Government (DLG), Department of Health (DOH), Department of Justice - Commission on Human Settlements and Land Problems, Philippine Information Agency and PC-INP. The committee conducted series of meetings with the occupants and explained them the purpose of eviction until they were finally convinced and volunteered to be relocated to other areas outside the BNP. The resettlement site as identified by the committee was located in Labo in Camarines Norte and Mantilla in Camarines Sur.

In order to conduct the relocation successfully, the BNP Task Force was formed which included representatives from all the above mentioned agencies and the BNPFI, Philippine National Police, Philippine Army, Philippine National Oil Company, Provincial Engineers Office, National Irrigation Authority, and Department of Education, Culture and Sports. While the DENR staff conducted and oversee the demolition of the houses, the BNPFI assisted in the demolition of the houses. The police and army maintained peace and order and provided trucks. The DLG and DSWD provided food for the occupants and the demolition team and also provided trucks. Similarly, the DOH provided medical treatment for the team and the volunteers assisting in the relocation. The other agencies supported by providing trucks while the DAR provided the land for relocation site.

A total of 738 families were finally evicted from the park by the end of the third quarter of 1992. The majority of the houses were demolished by the BNP Task Force while a few households voluntarily demolished their dwellings. There were 50 families in the Camarines Norte who went to the resettlement site in Labo while only 18 families in the Camarines Sur went to the Mantilla resettlement site. Both relocation sites are located outside the park. The rest of the occupants opted to reside in other villages in adjacent barangays and some went back to their places of origin. The majority of the occupants were forced to leave their agricultural crops which were ready for harvest. Many of them had borrowed loans for the planting and harvesting period in that year, which they would not be able to pay as they had to leave the park empty handed.

## **V. SOCIO-ECONOMIC CHARACTERISTICS OF THE OCCUPANTS**

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Out of the 150 households randomly chosen from the inventory, the majority had come from adjacent villages while some had come from Albay and Quezon. Almost two-fifth had been living there for more than 11 years which indicates that the settlements had become more of a permanent type by the time the eviction finally took place. The majority of the households relied on agriculture for livelihood. They had cleared vast tracts of forest land and converted it into homestead gardens. The fruit trees in such homestead included citrus, banana, pineapple, jackfruit, mango, coconut, various root crops, corn and cassava.

Almost one-third of the sampled households earned their living from carpentry, opening a grocery store or by providing credits on high interests. The latter were usually the newcomers.

Almost 55 percent of the sampled households had land more than seven hectares while only 20 percent had less than three hectares. With their dependency on farming inside the park, the eviction posed a great difficulty as they were distributed only one ha of land each in the resettlement site. The weak law enforcement in the past had encouraged the occupants to clear more land for cultivation. Had there been strict law enforcement on encroachment, the occupants would have thought about alternative options to settle elsewhere. The majority of the households had an average of four to six dependent members. With this dependency, it is often difficult for the household head to be able to re-establish the family in a more stable condition in the shortest possible time, which is only possible when a regular source of livelihood is secured. The eviction has also disrupted the education of the children who tend to stay at home for some time as it is difficult to continue studies given the household circumstances. In 1992, almost half of the household had gross earnings between 10,000 - 15,000 peso (25 peso per U.S. dollar) per annum, most of which came from the sale of crops. About 20 percent of the households had income higher than 20,000 peso while those with less than 20,000 peso were also of the same proportion. With the relocation and the decline in landholding size, it is likely that they will have lesser income.

## **VI. THE RELOCATION SITES**

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As mentioned earlier, there were two relocation sites, one in Mantilla and the other in Labo. Out of the 738 households, only 68 volunteered to settle in the designated sites. There were 18 households in Mantilla and 50 in Labo. The majority of the other households preferred to settle elsewhere, in the vicinity of the park owing to the apprehension that the government would not fulfill its promise to provide adequate services and facilities in the designated sites. They were not satisfied with the location of the sites which was not easily accessible unlike the BNP. The land provided by the DAR in the relocation sites was limited to one hectare per household. There was a possibility that it could be increased to three hectares. The DSWD provided each household food supplies for three months after which the households had to find their own means of livelihood. The following actions were planned for the relocations sites:

- provision of employment in the BNP reforestation project;
- free poultry stocks and seeds to grow vegetables during the first year;
- provision of credit, for example, 11,000 pesos for purchasing one draft animal, one yearling cattle, and livestock insurance, and 10,000 pesos for inputs;
- free seedlings for coconut based intercropping farming system which includes coffee, cacao, banana, pineapple, chico and santol;
- continuous and timely supply of high quality planting materials;
- construction of public market facility;
- construction of two elementary school (grade 1 - 3) and one health post;

- public recreation facilities such as construction of a barangay hall and playground;
- multi-purpose cooperative for the sale and distribution of agricultural produce;
- other provisions such as drinking water and one free toilet bowl.

The present sources of income of the resettled people include operating a *sari-sari* (general) store, basket and other handicraft making, growing vegetables and root crops and some employment as laborers in the reforestation project. The eviction has been completed successfully, however, it remains to be seen how long it takes for the relocated people to adjust to their new homes. As the majority of the relocated households are still in the vicinity of the park, there is always the possibility that they will attempt to return to their original place if the conditions do not become favorable outside. Therefore, the government should ensure improved living conditions and continue to support them until they find alternative source of income and employment.

## VII. CURRENT CONSERVATION EFFORTS

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The BNP is now at a serious stage of rehabilitation. With the squatters gone, it is envisioned that the collaborative efforts of the DENR, various NGOs, public and private sectors will result in adequate restoration of the park. Several attempts have been made such as reforestation and entrusting local NGOs to conduct conservation related activities in the park.

### *Reforestation*

The main objective of the reforestation program is to rehabilitate the park, particularly in terms of woody vegetation. It is envisaged that the reforestation would help restore the park to its original state and enhance ecological balance. There are two types of reforestation activities being undertaken in the Bicol National Park. The first one is the regular reforestation project which is directly performed and implemented by the DENR-CENRO field workers. The second one is the contract reforestation project, wherein DENR executes contracts with other agencies such as non-government organizations, local government units, other government agencies and public and private sectors. Under the provision of the contract, the DENR pays these agencies according to their accomplishments and the financial plan stipulated in the contract. So far, the total reforested area is 1,661 ha (Fig. 13).

The reforestation efforts in the Bicol National Park include the introduction of exotic trees, establishment of nurseries, land preparation, planting and periodic weeding. Exotic trees are introduced because of their ability to thrive under local environmental stresses and potential economic value. The main tree species planted are yemane (*Gmelina arborea*), albizia (*Albizia falcataria*), bagras (*Eucalyptus deglupta*), mangium (*Acacia mangium*) and acacia (*Acacia auriculiformis*) which are fast growing species. These species are successional pioneers with adaptive mechanisms for colonizing open lands. Some mahogany (*Swietenia macrophylla*) and narra (*Pterocarpus indicus*) are also planted.

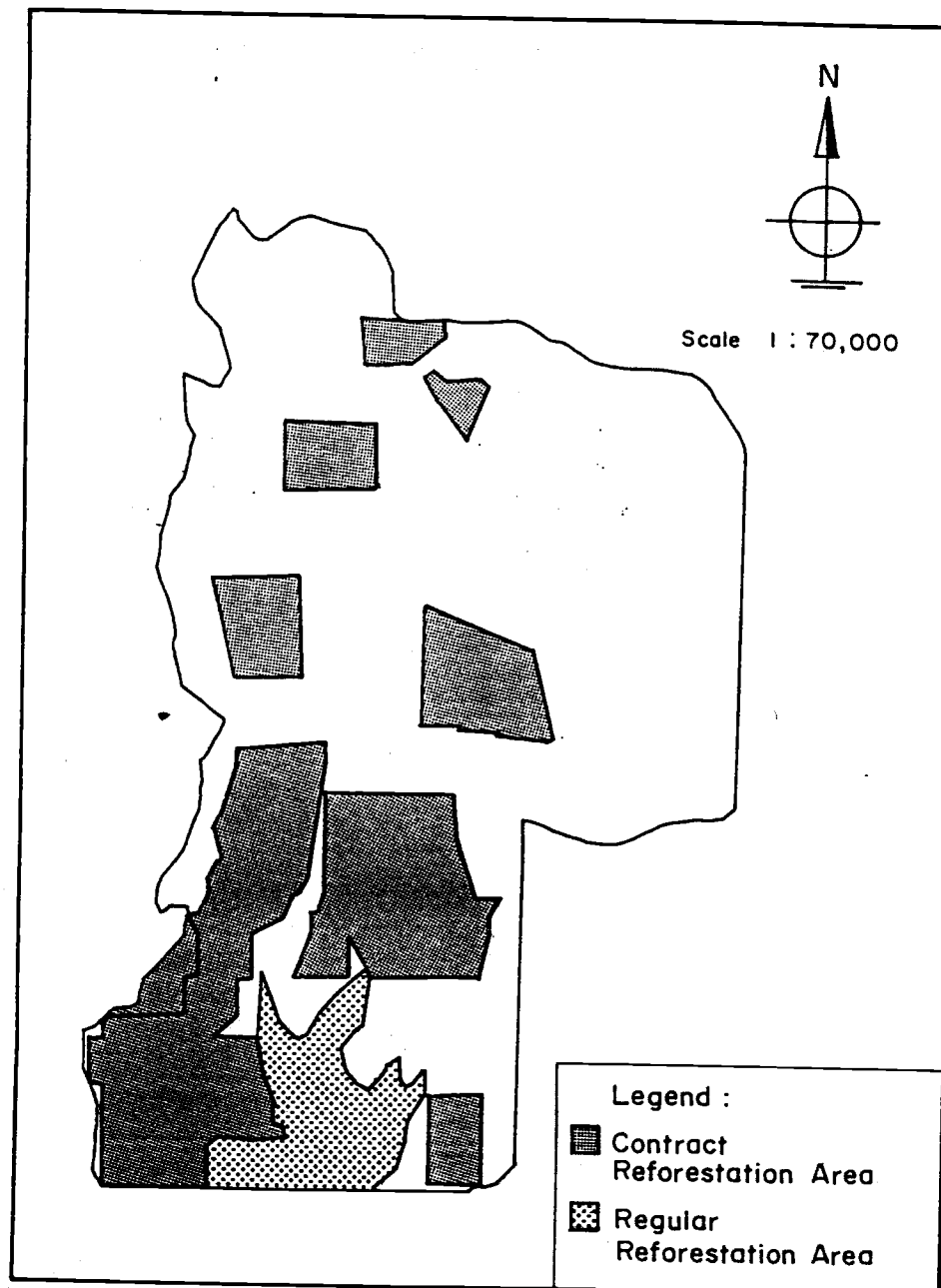


Fig. 13: Reforested Areas in Bicol National Park

### ***The Involvement of NGOs***

Two NGOs, namely, the Bicol National Park Foundation Inc. (BNPFI) and the Foster Parents Plan International - Bicol (FPPI - Bicol) have been entrusted the task of rehabilitation and adequate protection of the park as well as community development in the neighboring villages.

The BNPFI was established with support from the private sector, civic and religious communities in the provinces of Camarines Sur and Camarines Norte. Its primary aim is to preserve, protect, rehabilitate and develop the Bicol National Park. The Foundation was given the authority to act as the steward in the management, conservation and development of the BNP for a period of five years, based on a Memorandum of Agreement between the DENR and BNPFI in June 1990 (DENR, 1990). The responsibilities of the BNPFI include (i) providing the necessary, manpower, management and technical expertise, material and organizational resources needed for the restoration of degraded habitat and development of the BNP (ii) assisting in raising funding and material resources necessary to carry out a development plan for BNP, and (iii) assisting in the relocation sites as may be agreed upon on a case to case basis. The Foundation is expected to (i) give first priority to the protection and development of the remaining forests of the BNP, (ii) develop public appreciation with respect to BNP through symposia, training program, lectures, interpretive education and extension programs and other environmental awareness campaigns, (iii) undertake activities that will lead to the effective involvement of local communities immediately surrounding the park in the management and effective protection of the BNP, (iv) conduct research on the existing flora and fauna and assist other institutions in doing so, (v) protect and monitor activities within the BNP by assigning uniformed park and game wardens who are vested with authority to patrol and enforce law, rules and regulations on national parks and wildlife.

As the DENR had limited funding, the Foundation was able to receive funding support from the Haribon Foundation for the Conservation of Nature and World Wildlife Fund, U.S.A.. While the Haribon Foundation provided 50,400 Pesos, the WWF-USA provided 500,000 Pesos to implement planned activities and maintain protection programs in the park. The DENR provided funds only for the reforestation of 100 ha. of land and to monitor and evaluate 670 ha of existing reforestation projects. By the end of July 1991, there were 20 Forest Guards patrolling the BNP with funding from the BNPFI.

In March 1991, a memorandum of agreement was signed between the DENR and the FPPI - Bicol for the conservation and management of the BNP. The Plan aims to promote environmentally sound and sustainable alternative livelihood programs in selected communities around the BNP with cooperation from other NGOs and the targeted community. It provides necessary financial and material support to participating NGOs and communities for agreed upon projects and activities subject to the financial viability of the project. The Plan has committed about 2.7 million Peso to the BNP for the first year and aims to spend around 28 million Peso over three years to initiate a pilot conservation based community development project for those people who still wish to return to their

previous place inside the BNP. It intends to gauge the receptiveness of the project they have initiated and plan their activities accordingly in the years to come.

### **VIII. FUTURE DIRECTIONS FOR PARK MANAGEMENT**

The current trend of giving emphasis to protected areas by the government should be sustained, realizing the negligence of the conditions of the protected areas, particularly the national parks, in the past. Active involvement of the DENR personnel in the promulgation of the existing regulations on protected areas is essential for the successful conservation of the remaining natural resources of the country. In the Bicol National Park, to ensure a successful drive towards conservation and rehabilitation, the basic needs of the people who depend on it must be fulfilled. The efforts would be meaningless if the local community always have to struggle for their day-to-day existence at the expense of wildlife conservation. This would, indeed, result in local people's hostile attitude towards the BNP authority. Thus, the government with the cooperation from the NGOs should initiate some alternative livelihood programs for the people to uplift their socio-economic conditions. There should be more programs directed towards providing income and employment opportunities. The long-term participation of the NGOs must be ensured by the government by providing them various incentives and opportunities for their efforts towards rehabilitation and conservation of the BNP. The government policy should be in favor of NGOs and grassroot organizations.

It is important to fulfill the promises made to the relocated people to prove wrong the apprehensions of the households who opted not to reside in the relocation sites. The NGOs should extend community development activities to these areas. For the relocated people, a sudden change in their environment should be compensated by government support in terms of financial assistance, infrastructure and employment opportunities.

To regenerate the lost forest areas, a large scale reforestation program should be launched. Contract reforestation seems to hold good promise in the BNP. Strict enforcement of the monitoring and supervision within Bicol National Park can be made easier if forest guard posts are established at strategic locations. This will ease mobility and ensure maximum protection in specific locations. With the construction of quarters near the guard posts, the guards need not commute everyday to their houses, which are located outside the park. Communication facilities such as walkie-talkie should be provided to the forest guards to be able to report immediately any illegal activity inside the park. It also helps the forest guards to ask for prompt assistance in case of emergency. The areas which serve as good entry point for poachers, for example, along the highway, must have intensified patrolling and monitoring. Similarly, keeping a reliable information data base on existing resources in the BNP is fundamental to its effective protection and monitoring activities.

It is sensible to conduct a feasibility study for the establishment of a buffer zone. Similarly, public information, education, and awareness programs should be launched with support from the NGOs. A major barrier to the effective management of the BNP is the

lack of trained staff. Even at the central level, very few staff are trained in protected area management. Linking protected areas to community development is a new field for the majority of the staff who are either ecologists, biologists or foresters. Thus, in-service training in such field is absolutely necessary. The implementation of various conservation activities is impossible without adequate funding, equipment and facilities. In the BNP, the much delayed relocation of the forest occupants can be attributed to these factors. Therefore, external support should be solicited as much as possible while efforts should be geared towards mobilizing internal resources in a more effective way.

## **IX. SUMMARY AND CONCLUSION**

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The case of the Bicol National Park exemplifies a typical situation of the majority of protected areas in the Philippines. Inadequate legal provisions and weak law enforcement in the face of ever increasing demands for natural resources within the BNP have resulted in its severe degradation. While it is difficult to convince the local people to give up their current practices of natural resources utilization in the park, it is also crucial for the conservation authority to save the park and its biological resources. In such a situation, local people should be adequately compensated through various schemes aimed to provide them opportunities for better and sustainable livelihood.

The relocation of former occupants of the BNP has been successful. While some residents moved voluntarily, others had to be forced out through legal declarations. However, only few households chose to resettle in the designated sites while the majority opted to reside in other villages adjacent to the park. The social, cultural and environmental impacts of the park is not known yet. It is hoped that with concerted efforts from various local, provincial, regional and central government and non-government agencies, such impacts would be minimized. The government has assured the relocated people of better livelihood options and prospects of good future. It remains to be seen how far this commitment is fulfilled. Without any sincere attempt, any such relocation may bound to fail as there is always the possibility that the relocated people would return to their original place in the absence of alternative options of earning livelihood and inadequate law enforcement. There were some households who had been dissatisfied with the existing conditions of the relocation sites and future prospects. In order to ensure long-term support from the local people, it is essential that the benefits of nature conservation goes to them as well. Community development living of the distributed in the vicinity of the park is specially important in this context. Only by providing due compensation to fulfill the local people's immediate needs and simultaneously launching various short-term and long-term support programs, the BNP can be protected from future encroachment. For this, related organizations and protected area agency must strengthen their management capabilities and get into collaborative venture in integrated conservation and development activities.

## *Chapter Eight*

# **STRIKING A BALANCE: THE NEEDS OF LOCAL PEOPLE AND CONSERVATION PRIORITIES IN KHAO YAI NATIONAL PARK, THAILAND**

*by*

**Tippawan Chatchaiwiwatana\***

## **I. INTRODUCTION**

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The protected area system in Thailand has expanded to 95 units of which 63 are national parks covering some 33,687 km<sup>2</sup> (Wongpakdee, 1991). If the proposed national parks and wildlife sanctuaries are included, the total area increases to 83,630 km<sup>2</sup> or 16.3 percent of the total land area (Wongpakdee, 1991). The establishment of the protected areas in Thailand was mainly in response to the alarming rate of deforestation and subsequent loss of wildlife habitat. The successful establishment of the protected areas have been only partially successful as there are numerous reports of growing conflicts between park authority and local people, the latter viewing the imposition of the park as the government's attempt to infringe upon their territorial rights and way of living. An evaluation of national parks and wildlife sanctuaries reports that the relationship between local people and protected areas has become adverse, with park authority relying on solely law enforcement to protect natural resources; protected area officials and local people have become involved in numerous armed clashes which have resulted in antagonism and distrust between them (Kasetsart University, 1987).

The Khao Yai National Park (KYNP) was the first national park established in Thailand and is recognized today as one of the finest ASEAN heritage parks (Fig. 14) (Griffin, 1992). Although, it forms the core of the protected areas system of the country, the dense human settlements in its periphery continues to threaten its ecological stability and future viability. Apart from the various scientific and administrative issues, the core issue in its effective management is that of striking a balance between the needs of the local people and its conservation priorities. The local communities living inside and adjacent to the park have been heavily involved in encroachment of the park lands for the expansion of their agricultural activities, removal of forest products, wildlife poaching and illegal logging. These problems are intricately related to land ownership and quality of life issues including the demands for cultivable land by the landless and inappropriate farming practices. Recently, Khao Yai is under pressure from certain elite and influential people

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Howard J. Daugherty and Prof. Karl E. Weber.

The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.



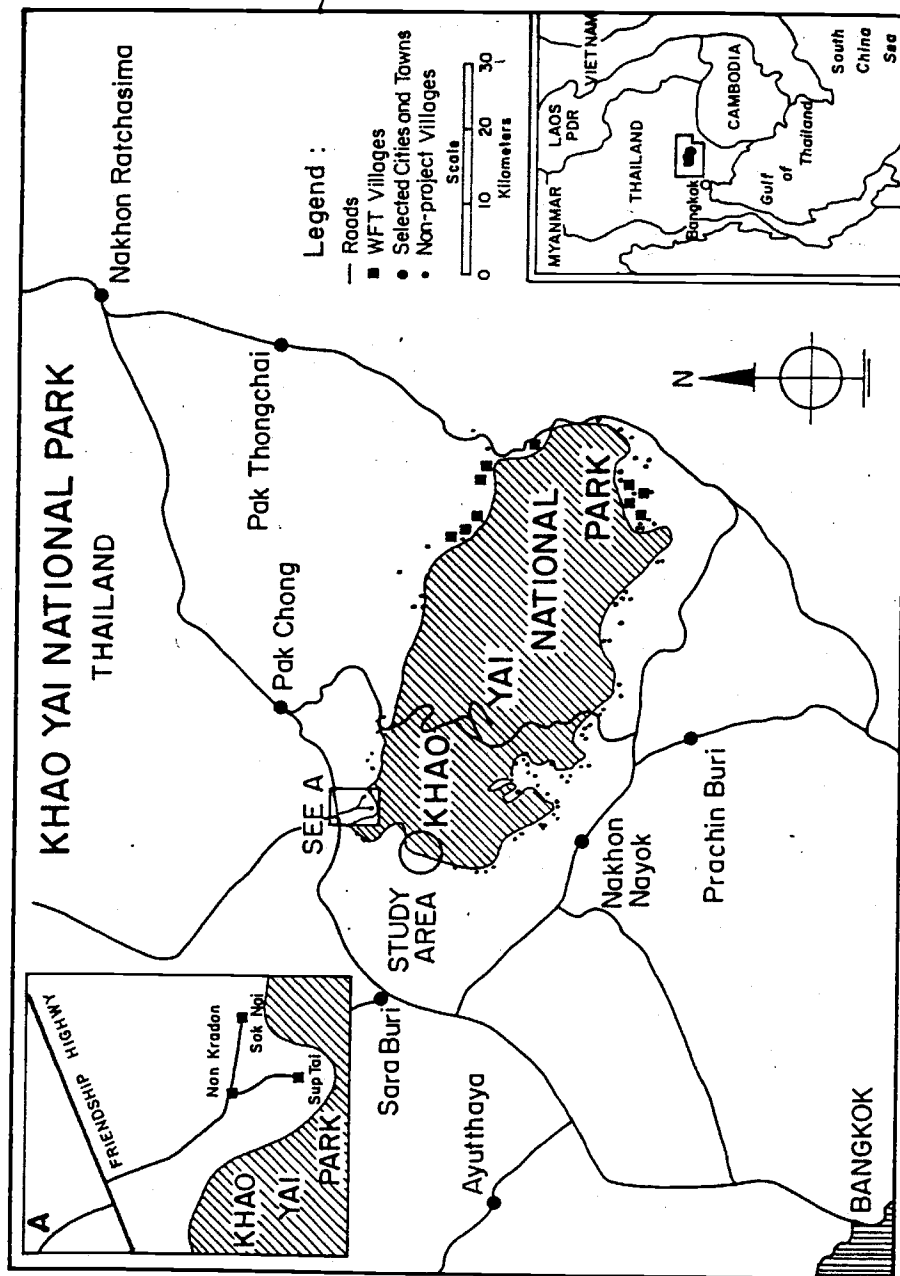


Fig. 14: Khao Yai National Park and its Vicinity

Source: Wells et al., 1992

for their various development schemes around the periphery of the park, which essentially jeopardize the ultimate objective of the park's ecological sustainability. These underlying issues clearly manifest that if KYNP is to remain viable in future, these problems have to be adequately addressed and prompt action must be taken for their resolution. The socio-economic issues in and around the park, in the past, were never considered important aspects to be studied by the park management and, thus, were never taken seriously into account in the overall park planning and management. In 1987, the Khao Yai Management Plan, the first management plan in Thailand, was launched with a view to improve the relations between the local people and the park management which acknowledged that promoting the well being of the surrounding community should be one of the fundamental aspects of its management. Yet, not much has been achieved mainly because of the inadequate understanding of the human ecology adjacent to the park. Realizing that clear understanding of the issues involved in strained park - people relationship is mandatory before searching for alternative courses of action, the socio-economic situation of the local communities living adjacent to the park, their dependency on the park resources and attitude towards conservation are analyzed in this paper. Furthermore, alternative strategies are explored and a plan of action is presented.

Field survey was conducted in 1991 in five villages of Tambon Cha-om, namely, Ban Karieng Kau Mah, Ban Mab Som, Ban Beung Mai, Ban Hin Tung and Ban Beung Tong Lhang which occupied land both inside and outside the park (Fig. 15) (Chatchaiwiwatana, 1991). Altogether, 200 households were interviewed, of which 100 households represented from inside the park. The other 100 households outside the park were included as the control group for comparison of their socio-economic status. The former group represents 40 percent of the total households living within the park in that area. Samples were drawn randomly using the name list obtained from the village headman.

Aside from a twenty-one page structured questionnaire used for interviewing the household heads, discussions were held with village headmen, teachers, extension workers, park officials based in KYNP and the National park Division (NPD). The major aspects covered in such interviews and discussions included the socio-economic status of the local people, provision of government services in the villages, local people's dependency on park resources, employment prospects in park related and off-farm activities, villagers' knowledge of rational utilization of natural resources and conservation, and their opinion towards the park management.

Drawing on the detailed findings of the study conducted earlier in 1991, this paper provides qualitative discussion of the major findings.

## **II. THE KHAO YAI NATIONAL PARK**

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The Khao Yai National Park covers a total area of 217,040 ha which includes parts of Saraburi, Nakhon Ratchasima, Prachinburi and Nakhon Nayok provinces. The park is located on the Dongrek mountain range extending between 14° 20' north latitude and 101° 31' east longitude at the southwestern edge of the Korat Plateau in northeast Thailand. The

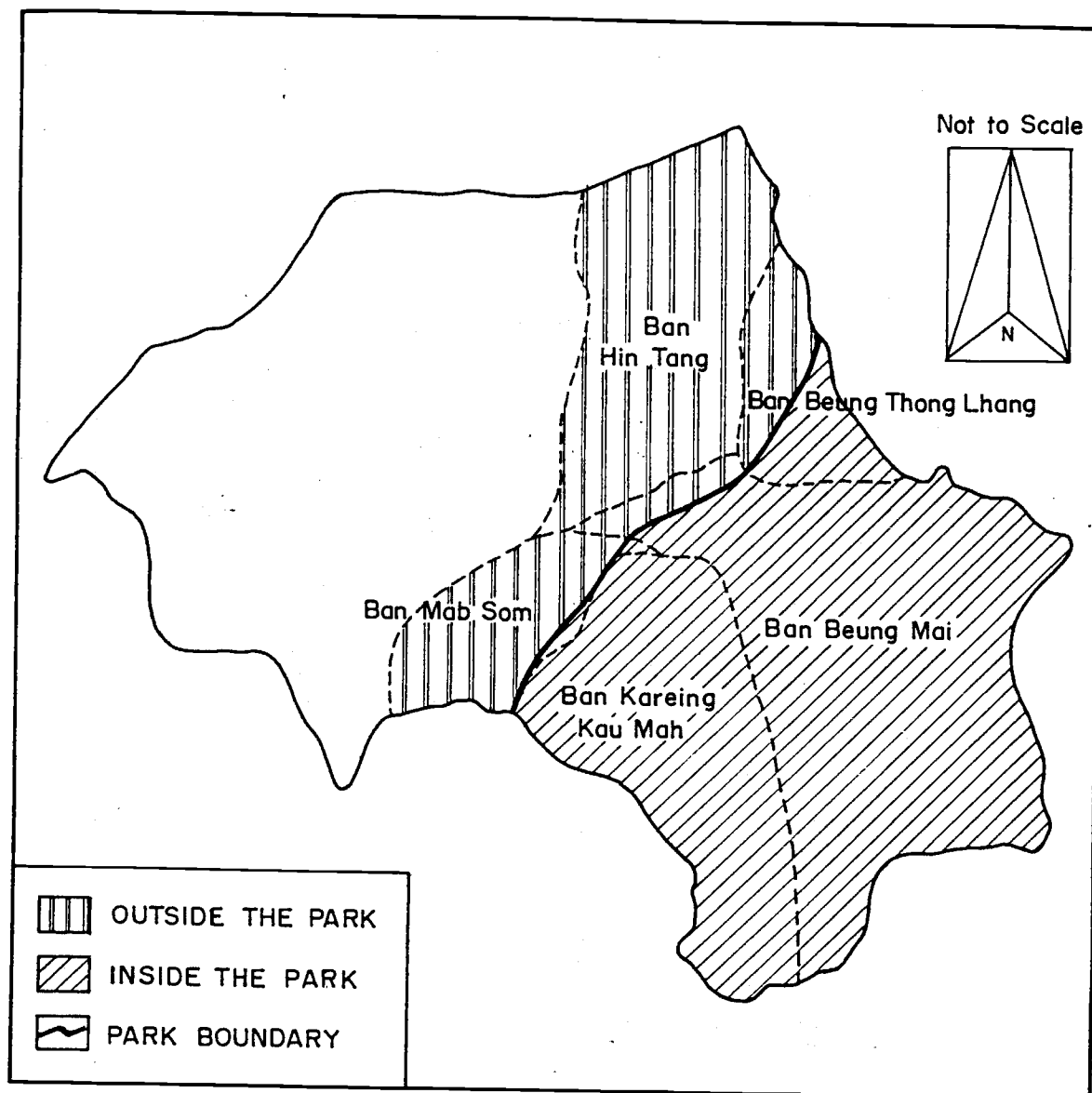


Fig. 15: Surveyed Villages near the Khao Yai National Park

KYNP being the first national park legitimized by a Royal Decree and the National Park Act, 1961 was formally established in 1962. The park, though characterized by lower elevation in the east, is mostly mountainous. The mountains fall gradually to the Mitraphap Highway towards the north while those in the south and west are characterized by steep escarpment which plunge abruptly to the plain outside the park. The northeast is bounded by a long range mountain, the Khao Kamphaeny. The mountains which start from western section of the Phanom Dongrek range include six dominant peaks of the park, namely Khao Laem (1,326 meters), Khao Rom (1,351 meters), Khao Khieo (1,292 meters), Khao Sam Yot (1,142 meters), Khao Fa Pha (1,078 meters) and Khao Kamphaeng (875 meters). Owing to the topography, climatic variation is obvious. The average rainfall is recorded between 1,600 mm and 2,270 mm, while the temperature ranges from 17°C in December and January to 28°C in April and May. The four major watershed areas are Nakhon Nayok, Prachinburi, Lam Takhong and Lam Phra Phloeng in addition to two minor watersheds such as Muang Lek and Huay Yai.

The park has been described as the highest priority site for plant conservation in Thailand and for many rare animal species, it one of the last remaining viable habitats (Wells et al., 1992). The vegetation in the park has been classified into five major categories (Enderlein and Maxwell, 1976). The dry mixed deciduous forest is found in the northwest between 400-600 m where major tree species include *Azelia xylocarpa*, *Zylia kerrii* and *Lagerstroemia Calyculta* and several grasses. The dry evergreen forests cover about 26 percent of the park, however, it is heavily logged. The forest occurs in the west, north and southern section of the park from 100 to 400 meters with major species of *Dipterocarpus alatus*, *Shorea roxburghii*, *Hopea odorata*, *Hydnocarpus ilicifolius* and *Aglaia* sp.. The tropical rain forest covers above 60 percent of the park which is found between 400 and 1,000 meters. The main species include *Dipterocarpus alatus*, *D. gracillus*, *D. costatus* and *Schima wallichii*, *Lithocarpus annamensis*, *Castanopsis acuminatissima* and *Quercus fleuryi*. The hill evergreen forest occurs on mountain tops above 1,000 m where dipterocarps are replaced by gymnosperms (*Podocarpus* sp. and *Dacrydium elatum*). *Lithocarpus* sp. and *quercus* sp. are the main epiphytes while the understoreys include *Olea maritima*, *Rhus succedanea* and *Adina polycephala*.

Grassland/ savanna originally formed by shifting cultivation and road construction include species such as *Imperata cylindrica*, *Neyraudia reynaudiana*, *Saccharum spontaneum* and *Themeda arundinacea*. Some common secondary tree species are *Hibicus macrophyllus* and *Tream orientalis*. The endemic plants of Khao Yai include *Bulbophyllum khaoyaiensis*, *Palaquium koratense*, *Manauthes prachinburiensis*, *Neolourya thailandica*, *Thismia mirabilis*, *Combretum quadratum* and *Embelia kerrii*. Some of the orchid genera found in Khao Yai are *Ione*, *Bulbophyllum*, *Thelasis*, and *Dendrobium* (Poonsward, 1991, NPD/RFD, 1987; Dobias, 1986 as cited in Chatchaiwiwatana, 1991).

Khao Yai conserves diverse fauna which includes mammals of 16 carnivores, one proboscidian, seven artiodactyls, three insectivores, five primates, one lagomorph, six rodents and at least 25 chiropterans. The fauna in the park is high in species diversity but relatively low density for each specie. The dominant species are Indian elephant (*Elephas*

*maximus*), gaur (*Bos gaurus*), sambar deer (*Cervus unicolor*), common wild boar (*Sus scrofa*), barking deer (*Muntiacus muntjak*), great mouse deer (*Tragulus napu*). The number of elephants in the park has never been properly estimated but is believed to be about 200 to 300 (Lekagul and McNeely, 1977, Lair, 1991 as cited in Chatchaiwiwatana, 1991). Serow or liang pha (*Capricornis sumatraensis*), one of the nationally preserved species, is also found on high mountain peaks, rocky cliffs and steep slopes of the park. The dominant predators in the park are tiger (*Panthera tigris*), leopard (*Panthera pardus*), Indian jackel (*Canis aureus*), Asiatic wild dog (*Cuon javanicus*), Civets, linsangs, weasel, mongoose and cats. Two gibbon species, namely, white handed gibbon (*Hylobates lar*) and pileated gibbon (*H. pileatus*) are found in the park. Pig-tailed macaques (*Macaca nemestrina*), slow loris (*Nycticebus coucang*), long-tailed macaque (*Macaca fascicularis*) and several other small animal species are also present in the park.

More than 295 birds species in Khao Yai is recorded, of which about 198 species nest in the park. The families of *Fringilidae*, *Ploceidae*, *Zosteropidae*, *Dicaeidae*, and *Nectariniidae* usually inhabit the secondary growth forest, the mixed deciduous forest and the top canopy of the dry evergreen forest. Many species of subfamilies of *Timaliinae*, *Sylviidae* and *Muscicapinae* occupy the grassland and savanna habitats, while the areas along the streams and around the ponds are the home of ruddy crake (*Porzana fusca*), white breasted water hen (*Amaurornis phoenicurus*), and many kinds of kingfishers, herons, egrets and bittles. The ponds and swampy lands are often occupied by migratory waterfawls. Four major species of hornbills, namely, great hornbill (*Buceros bicornis*), brown hornbill (*Ptilolaemus tickellii*), Indian pied hornbill (*Anthraceroceros albirostris*), and wreathed hornbill (*Rhyticeros undulatus*) can be found in the tropical rain forest of the park. Among the amphibians several reptiles and Indian cobras (*Naja naja*) and king cobras (*Ophiophagus hannah*) are seen in the park. Green tree vipers (*Trimeresurus albolabris*), banded kraits (*Bungarus fasciatus*), reticulated pythons (*Python reticulatus*), and several species of lizards are also common.

The park has six management zones which include intensive use zone (39 km<sup>2</sup>), outdoor recreation zone (260 km<sup>2</sup>), strict nature reserve zone (945 km<sup>2</sup>), special use zone (25 km<sup>2</sup>), recovery zone (92 km<sup>2</sup>) and primitive zone (1,707 km<sup>2</sup>). The outer sections of the primitive zone is bordered by intensive economic activities of local communities. The park has no areas designated as buffer zone. Khao Yai attracts 250,000 to 400,000 domestic and foreign visitors annually who spend about 150 million baht (US\$ 6 million) on admission, lodging fees, transportation, food and other services in the park (Dixon and Shermann, 1990, as cited in Wells et. al., 1992).

About 53,000 people live in 150 villages adjacent the park boundaries and many of them illegally occupy the reserve forest. Encroachment has resulted in hostility and armed clashes between park personnel and local people (Wells et al., 1992). There are 146 communities in and around the park which include three villages consisting 256 households completely enclosed by the park. The communities residing inside and adjacent to the park depend on the park for many of their necessities. The illegal activities of collecting forest products, poaching and encroachment through agriculture extension are major threats to the park. However, the community development activities initiated by the Environmental

Protection Society (EPS) in the surrounding communities have built congenial relationships between park and the people.

Recognizing the need to address the park-people issues, the Population and Community Development Association (PDA) and Wildlife Fund Thailand (WFT) began working together at Sup Tai village in 1985, just outside the park boundary. The Sup Tai Project sought to find ways to conserve the park's natural resources while promoting income-generating opportunities in the village. The project provides low interest loans to the environmental protection society members from a revolving fund. The Environmental Awareness and Development Mobilization project (TEAM) initiated by the WFT in 1987, and PDA's activities are based on Sup Thai model which incorporate several activities such as nature trekking for tourists, establishing cooperative stores and community forestry, environmental education, tree planting and agricultural extension and training (Wells et al., 1992).

The park management consists of 15 ranger stations along the park boundaries headed by the central office, the park headquarters. Each station contains a station chief, two permanent rangers and ten temporary rangers. The central office is structured with administrative, protection and management, construction and maintenance, extension, and technical sections. The head of each ranger station reports to the park superintendent. The park management fall under the jurisdiction of the National Park Division of the Royal Forestry Department (Trisurat and Sangtoangrow, 1994).

### **III. SOCIO-ECONOMIC CHARACTERISTICS OF THE LOCAL PEOPLE**

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The majority of the household heads both inside (56%) and outside (60%) the park had migrated from Nakhonnayok Province while few others migrated from Saraburi Province. During the field survey, it was estimated that the earliest migrants, approximately ten households, had settled there for more than 40 years. Some of them used to work in logging concessions near the KYNP. After the concessions ceased, they occupied the land and settled. The number of households had increased over time, even after the establishment of the park which was confirmed by the household statistical records in Tambon Cha-om. In fact, villages such as Ban Hin Tong and Ban Beung Tong Lhang were created only recently, in 1989, for administrative reasons as the number of households in that area had increased dramatically. Not much difference was observed in the total population inside and outside the park; in the former, there were 506 people while in the latter, there were 483. The average household size in both locations consist of five members. It should be noted that at least 50 percent of the total population in each location constitute the economically active members (14-44 years old). Furthermore, there were are at least ten times more younger people (less than 14 years old) than the older ones (over 55 years) who would be potential laborers in the near future. Assuming that they would easily accept change and innovation, if proper strategies are planned and implemented for this target group, there is a possibility that they could be easily motivated towards the conservation of the park. Education in Thailand has been made compulsory until primary level, however, usually, villagers find it difficult to send their children to

school after the primary level due to various reasons. The household level of education in both locations were similar in that the majority had education only up to the primary level. This might reflect their less priority for higher education. Among the household heads, only two percent had education above primary level.

Excluding household members under the age of 14 years old, almost half of them in both locations were found to be engaged in agriculture while 20 percent of them worked as hired laborer. Very few were employed in government jobs. While some were employed in cottage industries, others rented out their land. Four percent inside and seven percent outside the park were unemployed mainly because of their old age. A rather skewed distribution of landholding was observed in both locations. A little over fifty percent of the sampled households had land less than 15 rai each while ten percent inside and 20 percent outside the park had more than 50 rai (1 ha = 6.25 rai) each. There were more households inside the park having less than three rai of land which might suggest that in the event of loose protection of park lands, the chances of land expansion for cultivation are fairly high. In fact, three households inside the park had landholding sizes of 200 rai each. Although, the land distribution outside the park was skewed, it was fairly better as compared to inside the park.

### *Size of landholding*

Size of landholding is a good indicator of the owners' socio-economic standing in the village. On the basis of size of landholdings, six different categories of households were identified. The first category is that of households having less than three rai of land each. These were among the poorest in the village who rented their neighbor's land for cultivation or got it free and supplemented their income working as hired laborers. The second category of households had landholdings of three to 15 rai each. Most of them rented land from others or got it free for cultivation during certain cropping seasons. The land rented was less than 20 rai. Farming was totally dependent on household members who had to supplement their income from other sources, usually, working as hired laborers. The third category is composed of households having landholdings between 16-30 rai each. The households in this category may or may not have been self-sufficient depending on the type of land they cultivated. They hired laborers for cultivation and work as hired laborers themselves (approximately, five to seven days a month for each member). The fourth category of households had 31-50 rai of land each. Villagers in this category were self-sufficient and hired laborers for farming. The fifth category is that of households having 51-100 rai of land each who were self-sufficient and hired many laborers to work on their farm. Some of them had rented out their land. The households in the last category of having more than 100 rai and in some cases more than 200 rai of land each were usually among the elite and the influential people. The majority in this category confiscated land from their loanees who had been unable to repay the debt. Instead of renting out their land they hired laborers in large number for agricultural activities. The villagers inside the park own more land than those outside, possibly, an incentive for the latter to move inside the park. The majority of the big land owners were living away from the KYNP area who had rented their land to villagers and allowed some of them to use small parcels of land free for

cultivation in return for having taken care of their land. This situation is different inside the park where majority of the tenants had rented land from their neighbors.

### ***Agriculture Land Use***

Nearly eighty-four percent of the households were found to be engaged in various agricultural activities. The total land under cultivation was 4,708 rai of which 2,358 was inside the park. Banana plantation was the most dominant economic activity in areas adjacent to the KYNP followed by cultivation of rice, corn, vegetables, fruit trees and bamboo plantation. In fact, banana was the catalyst in the rapid conversion of park lands into plantation areas which occupied 67 percent of the total cultivable land of which 35 percent was owned by only three households. It was also planted together with bamboo at the ratio of 10:1. If the three households are excluded, the average household banana plantation would be about 18 rai. Banana plantation was also the main economic activity even outside the park. Two households owned plantation on 8.5 percent of the cultivated land. If this is excluded, the banana plantation would be on 35 percent of the total cultivated land with average household plantation of 19 rai. The cultivated land inside the park was more extensively used for banana plantation than outside mainly because the topography inside the park is slopy which is very suitable for plantation. There, many villagers had expanded their land uphill. One of the main factors for land encroachment for banana plantation is the high market price. Villagers could earn much more if they planted banana instead of any other crops in a given piece of land. In the vicinity of the park, Tambon Cha-om was found to be the biggest supplier of banana in Saraburi from where it is finally supplied to Bangkok.

Paddy occupied twice as much cultivated land outside the park as inside, mainly because the land there is level, suitable for paddy cultivation. The proportion of land under fruit orchard was higher outside the park, which might be the reflection of land security as it requires high initial investment. Most orchards, however, were newly established.

### ***Household Income***

The household income is calculated on the basis of gross cash earnings during the preceding year (May 1990 - April 1991). The average annual household income in both locations indicate that almost 50 percent had income less than Baht 30,000 (US\$ 1,200) while only a quarter of them had income exceeding Baht 60,000 (US\$ 2,400). No significant difference was observed between the two locations. However, the gap between the lowest and the highest income group was found to be wider inside the park. The annual average income which is Baht 59,000 was higher as compared to those living outside the park. Considering that the majority earned less than Baht 30,000 the average income is greatly affected by the very high income of few households. When the income is calculated excluding those households having income more than Baht 70,000, the average of Baht 31,300 inside the park becomes slightly lower as compared to that of households outside the park which is Baht 33,200. Apparently, the income distribution is highly



skewed, which is more pronounced inside the park. Big farmers had controlled vast amount of land and earned much more than the average farmers.

Selling banana was the main source of income for 51 percent of households inside and 44 percent outside the park. The income of five households, three inside and two outside, distorts the average income from selling banana who earn 53 and 18 percent of the total income from banana. When they are excluded, the average farm income becomes Baht 27,600 and 29,500 inside and outside the park, respectively. Income from livestock rearing was higher inside the park owing to large number of livestock raised as compared to outside. While in the former case, easy access to fodder and grazing land were the main reasons for large number of livestock, in the latter, scarcity of water during dry seasons was the main obstacle in successful livestock rearing. The income from bamboo was also higher inside the park. As most of the fruit plantation inside the park were recently established, comparing income from this source between the two locations doesn't make sense. Comparing the other sources of income in both locations, one finds that the majority of households earn working as hired laborers. Trading was one of the major source of income in both locations, however, it was limited to less than 15 households each. Wage labor was the source of income for the majority. More villagers inside the park earned from selling forest products which may be an indication of their dependency on park resources, however, the average income from this source was less as compared to outside the park. According to the KYNP statistical records, people outside earned more from the sale of wood products and wild animals while people inside the park mainly earned from non-wood products. The average farm income and off-farm income both were higher outside the park, 52 and 62 percent of the total income, respectively. The average income inside the park was Baht 16,700 while outside, it was 20,700.

### ***Credit***

Among the sampled households, 57 percent inside and 53 percent outside the park borrowed from various sources such as the Bank for Agriculture and Agricultural Cooperatives (BAAC), relatives, neighbors, traders and commercial banks. The majority of the villagers in both locations borrowed from BAAC followed by neighbors, however, inside the park, the average amount borrowed was highest from relatives while it was commercial banks outside the park. BAAC had granted loans even to villagers who did not have land title while only rich and influential people had been able to borrow from commercial banks. This may well explain why there were only three households who borrowed from the latter. Only one household from inside the park had obtained a modest amount of loan from a commercial bank.

### ***Overall Living Condition of the Households***

Almost 39 percent of the households living inside the park considered themselves to be better off at the time of field survey as compared to five years ago, whereas, 34 percent thought the situation had become worse. This was 36 percent and 37 percent, respectively, outside the park. The remainder in both locations indicated no significant change during that period. The household status in terms of accumulated assets such as a small truck,

pick-up car, motorbike, television set, gas stove, radio-tape set and bicycle was examined. It was found that more households inside the park had acquired such items. This may be another indication that people living inside the park were actually getting richer than those living outside and that their reported income as discussed earlier does not truly reflect their economic status.

### ***Migration***

The status of migration including in-migration, out-migration, seasonal migration and temporary migration during the last five years (1986-1991) was examined in both locations. The frequencies of all types of migration were higher inside the park. While 34 percent inside and 30 percent outside the park had migrated elsewhere permanently, temporary migration was the most common phenomena in both locations. The majority had migrated to Bangkok in search of jobs and some to Keang Koi District to work in cement factories. There were few cases of in-migration, mostly outside the park which is probably due to strict park regulation which does not allow new settlers inside the park. Almost 43 percent among the population who had education above primary level had migrated while only ten percent had migrated who did not have any formal education. There was, indeed, significant difference in the degree of out-migration between households having various levels of education, those with higher education migrated more. The insecurity of land tenure inside the park had motivated people to migrate elsewhere. There was significant difference in the degree of out-migration between villagers who were living within park lands without land certificates and villagers outside the park who had land ownership. Migration was more common in the former (Chatchaiwiwatana, 1991).

## **IV. LOCAL PEOPLE - PARK RELATIONS: THE NEGATIVE SIDE**

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There was tremendous pressure on park resources from the local communities living in the periphery of the park. While park encroachment had occurred earlier and had been controlled to some extent, rampant poaching for collection of forest products and wildlife had not been under control. This section discusses the main impacts caused by local people in and around the KYNP.

### ***Park Encroachment***

The park was formerly a national forest reserve which were largely open access properties; villagers living in the surrounding area had the tendency to encroach upon them for expanding their agricultural land. Even after the establishment of the KYNP, the encroachment had continued, though at a slower rate. Although, encroachment was brought under control to a certain extent, potential encroachment in future poses a major threat to the park as demands for more land seem to be the likely scenario. Today, shifting cultivation adjacent to park is considered as the main scourge for forest destruction (NPD, 1987). In 1980, roughly 900 villages were cultivating corn and cash crops and 1,670 villages cultivating rice in the park (NPD, 1987). By 1980, the total deforested area inside the park had increased to 92.4 km<sup>2</sup> or 4.3 percent of the park land. The increasingly

difficult access inside the park had been a set back for the encroachers which could be a major reason for the declining incidence of park encroachment (Griffin, 1992). There is also a controversy whether the park has been really encroached. Villagers claim that they had occupied the land even before the establishment of the park which could be valid given the fact that some villagers, indeed, hold legal land certificates issued by the provincial government.

### ***Poaching for Wildlife and Forest Products***

Poaching by villagers living inside and in the periphery of the park was the main illegal activity. Many forms of illegal offenses were recorded by the park management during the period of 1986 - 1988 (Table 13).

The table below is hardly the reflection of the intensified poaching occurring in the KYNP. For example, Dobias (1985) found several poaching camps with "remnants of elephants bear, sambar, silver pheasant, white handed gibbons, pig tailed macaques, great hornbills and others." Brockelman (1988) reported that the proportion of poachers actually caught or seen by guards may not be higher than ten percent (Griffin, 1992). Similarly, Climo (1990) during her field survey in the KYNP encountered poaching signs everyday and noticed that even in the most suitable habitat, certain species were less in numbers. She reported that among the forest products, the most heavily poached tree species was "sisiat" (*Pentace burmanica*). There is hardly any patrolling in the interior of the park, where the most number of offenses could be recorded (Griffin, 1992).

Table 13: Main Illegal Offenses Recorded in KYNP, 1986-1988

Offense	Number of apprehensions	Percentage of total apprehensions
Flower collection	267	26.5
Wood collection	218	21.6
Orchids and honey collection	94	9.3
Hunting gear	61	6.1
Wildlife poaching	35	3.5
Littering	31	3.1
Carrying out activity for personal benefit without permission	29	2.5
Livestock grazing	11	1.1
Gun fire	9	1.0
Others	240	24.4
Total	1,008	100.0

Source: Dobias et al., 1988 as cited in Griffin, 1992.

The principal wildlife species taken by poachers include pheasants (*Lophura spp.*), pigeons, hornbills (*Buceros bicornis*), wild boar (*Sus scrofa*), sambar (*Cervus unicolor*), barking deer (*Muntiacus muntjak*), gibbons (*Hylobates lar* and *H. pileatus*) and leaf monkey (*Presbytis spp.*) (Griffin, 1994). Most of the wildlife species were supplied to the provincial markets and restaurants such as in Pak Chong, Prachantakham, Kabin Buri, Muak Lek, Kaeng Khai, and Saraburi (NPD, 1987). Similarly, the main forest products

that were poached include firewood followed by bamboo, bamboo shoots, rattan, fragrant wood such as mai hom (*Aquilaria crassna*) and other wood products for construction posts and agricultural tools. Rattan is one of the primary forest products which has been collected at an increasing rate and sold in local markets. The intensified poaching of mai hom trees such as *Aquilaria crassna*, *Pierre ex H. Lec* and *A. malccensis Lamk.*, has resulted in villagers cutting younger tree species which indicate the depleted stock of mature trees (Griffin, 1992). Three other tree species which now are rare inside the park and suffer heavy illegal logging because of their high commercial value include *Dalbergia Cochinh Scinensis*, *Hopea Odora ta*, and *Afzelia Xylocarpa*.

The number and purpose of households from both locations trespassing the park differed markedly in that while more households inside had encroached the park, there were far less number of households outside who had collected firewood and bamboo. The other wood products were equally collected in both locations, however, a higher proportion of households outside had more earnings from the sale of the forest products obtained from the park. Fodder collection was reported by only four households inside and one outside the park. Livestock grazing was reported by 30 percent of the households inside the park whereas outside, only two reported. The assumption was made that the higher the household income, the lower the dependency on park resources. There was no significant difference in the degree of dependency even when the income level varied. The degree of dependency could rather be related to poor land use practices, crop failure, food shortages, lack of credit and almost non-existent job opportunities. Villagers tendency was to ignore the legislation. They would seek excuse that they did not realize they had been trespassing the park as there was no clear boundary demarcation. In most of the cases, such an excuse was not valid as poaching had occurred even far inside the park.

## V. POTENTIAL FOR CONSERVATION: PEOPLE'S PERCEPTIONS AND ATTITUDE TOWARDS PARK MANAGEMENT

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Farmers had long believed that the National Reserve Forest (NRF) is public property which they could encroach upon whenever they needed land for cultivation as there was abundant forest area. The former NRF areas, currently out of park's control, had been completely converted to agricultural land which has expanded even to marginal hilly areas. Even when trespassing is considered a violation, people still continued to do so as the forest resources inside the park had always played vital role in their livelihood. Realizing that the perceptions of park and its conservation values may differ greatly between the park management and the local community, it was considered an important aspect to be explored in this study.

At the outset, it should be borne in mind that the majority of the respondents had received education only at the primary level. Thus, the foregoing discussion here is the reflections of their perceptions of natural resources conservation and park management. The majority of the households recognized the direct benefits of the park in terms of food, fuel, and other raw materials for home consumption and to a lesser degree for additional income. They also perceived indirect benefits such as protection from soil erosion and

flooding and watershed conservation. Deforestation was perceived by the majority as a serious problem, however, a small minority expressed that it was mainly the result of indiscriminate tree felling by big logging companies. Some had the notion that deforestation no longer exists because several forest plantations had been launched elsewhere and most of the villagers had been relocated from the forested area. A slight difference between inside and outside the park was that there were more households outside accepting the fact that deforestation had occurred, indeed. The majority of the respondents, more inside the park, expressed that the main causal factors for widespread deforestation were landlessness and poverty. All respondents outside and the overwhelming majority inside identified shortage of fuelwood, timber, fodder and thatch grass as the worse effects of deforestation. The other effects include water shortage, flooding, soil erosion and loss of wildlife habitat. Comparing the household responses on negative impacts, it was found that the respondents perceived the effect of illegal logging as the major factor for deforestation than encroachment for agriculture. Over 90 percent of the respondents perceived forest conservation as the sustainable use of forest for long-term benefit of the local people. The majority inside the park considered that impact on forest should be the major consideration in dam constructions while outside many more disagreed to this opinion. The majority of the respondents inside the park indicated their interest to participate in the planning and management of the park resources and disagreed that it is the responsibility of the park authority only. Only one third viewed it as the sole responsibility of the concerned authorities. The majority of the respondents inside the park indicated their ignorance of the present park boundary. There were only few respondents who believed they had, in fact, encroached the park land. The overwhelming majority in both locations expressed that if it not were for the establishment of the park, they would not have seen the natural forest as it exists today.

The majority of the respondents in both locations had realized the potential of the KYNP for nature education. Almost one third believed that the park was protected mainly to promote tourism and generate revenue. Almost half of the respondents, mainly outside the park, expressed that community development around the park had never been launched. With reference to park law and regulations, some respondents expressed that cultivation within the park land is not a violation as it was there even before the park was established. Also, collection of forest products mainly for home consumption was viewed as a recourse which could not be prevented. The respondents did not know the distinction between the national park law and the forest reserve law. The majority of the respondents were satisfied with the performance of the park officers, who normally did not patrol the interior of the park and expressed that if strict control and patrolling is not done, they would always sneak into the park land. Some of the respondents blamed that park officers had been corrupt. Almost half of the respondents inside and one-third outside the park expressed the view that they had not been able to get along with the park officials who had problems in communicating with the villagers. Over 80 percent had never consulted with the park officers for any problem, whatsoever, while only a few had asked for suggestions for using park resources indicate that 53 percent of the respondents maintained positive attitude, 44 percent expressed negative attitude and three percent indicated indifference. Household income was the main determinant of the varying attitudes, i. e., those having higher income had maintained positive attitude.

## VI. TOWARDS IMPROVING LOCAL PEOPLE - PARK RELATIONS

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The traditional way of responding to illegal activities by enforcing strict control measures were hardly unsuccessful as they did not adequately address the scope of conflict which were mainly rooted to problems such as landlessness, poverty, low level of education and lack of support activities. Moreover, villagers had perceived the park legislation detrimental to their well-being which further alienated them from the park (Brockelman, 1988). The park management had to break the symptomatic cycle by addressing the underlying issues. The management plan in 1987 addressed for the first time the issue of well-being of the local communities (NPD, 1987) and geared efforts towards expanding community development activities and improving rural education and public relations programs. The study conducted by the Wildlife Fund of Thailand concluded that "when the basic needs of the villages are satisfied and there is prosperity in the village, the exploitation of the national park is surely the incidence of the past" (PDA, 1989 as cited in Griffin, 1992).

In 1985, the PDA and WFT started a community development project in Ban Sup Tai, a village on the park border. This project sought to find ways to conserve the park's natural resources while promoting income generating activities (Wells et al., 1992). The project established the EPS, which enabled villagers to make decisions and, eventually, to become financially and organizationally self-sufficient and independent from the project. The most important activity, to date, has been the provision of credit to the Society members from a revolving loan fund, in return for commitments to abide by park regulations. So far, the loans have been fully repaid. Other project related activities were soil conservation, livestock and fish raising, fruit tree cultivation, cooperative stores, improved sanitation, and health practices and a small park trekking program for tourists. Education programs were designed to improve environmental awareness and to inform villagers of park regulations. Trees were planted in the hills above the village to mark the boundary (Wells et al., 1992). In 1987, WFT initiated the TEAM project which focused on conservation education programs in fifty villages. The former project was expanded to five more villages by 1991. The NPD had very little involvement in these projects. The Sup Tai project brought major changes in the village and attracted national and international attention which resulted in development of other activities. As a result, the economic condition in the villages improved.

Although, the project brought significant changes in the economy of the project villages and improved villagers relations with park officials, the overall goal of strengthening protection of the KYNP has not been achieved because illegal activities continue throughout the park. A significant achievement was that agricultural expansion around Sup Tai ended after trees were planted to demarcate the boundary. The loan programs did not make a big impact on local villagers so as to make them independent of the middlemen. There was little evidence that the villagers perceived the planned connection between the availability of the credit through EPS and reduced illegal activities. The other economic benefits from the project were difficult to identify and measure, however, EPS was recognized as a viable institution. Villagers expressed their desire to become its members.

Despite of the widespread and favorable attention to the projects around the KYNP, there are no signs of replication of this approach in the near future. The NPD does not seem to have the capability or experience to launch such projects. In addition, it lacks the jurisdiction to operate outside the park boundary. The KYNP has an extension program to educate rural people about the park and its objectives which has proved effective when conducted (Griffin, 1992). The park management, however, has taken a passive approach and conducts such programs only when requested. A comprehensive approach to park management is required in order to improve relations with local people. Attitudinal change on the part of officialdom as well as changes in local people's behavior are essential in establishing an effective two-way communication between them. Also, the KYNP together with the cooperation of other related agencies should gear efforts towards creating jobs with direct links to the park, establish a mobile extension unit for conservation education programs, promote community development activities which could be fashioned after the earlier projects, and, most importantly, establish buffer zones. Only when concerted efforts are made in these directions resolution of conflicts could become possible.

## VII. ACTION PLAN FOR RESOLVING CONFLICTS IN THE STUDY AREA

Although, various efforts were made around the KYNP to resolve conflicts and subsequently reduce the impact on the park ecosystem, no such efforts had been made in the study area. The earlier discussions revealed that three major issues had to be resolved urgently, park encroachment, rampant poaching and lack of public support and involvement in conservation programs. To resolve these issues, an outline of an action plan is presented with emphasis on the prevention of park encroachment through clear demarcation of the park boundary, relocation of some settlements from inside the park and the establishment of a buffer zone with assorted complimentary measures (Table 14).

Table 14: Action Plan for Resolving Conflicts

Activities	Agencies/Groups involved	Remarks
The revision of existing park boundary including:		
Draft map of the existing conflict area.	RFD/NPD/FLMD	Critical areas and villages selected for relocation need to be clearly defined.
Establishing a committee for the boundary demarcation with representation from various local and provincial government offices, and the villages.	The Implementation Committee	Responsible for the recommendation of activities for implementation.
Preliminary ground trotting and boundary marking as agreed by the local community and park officials.	DCDO/RFD/DFO/Villagers	Land suitable for permanent agriculture should be outside the park boundary.

Field survey and mapping based on the results of the preliminary ground trotting and marking.	RFD/NPD/FLMD with the assistance of TCC in surveying and LDD/MPD in mapping.	
Legal process for the new boundary.	RFD/NPD National Park Committee/Cabinet and Parliament	
Final demarcation.	NPD/TCC/ Volunteers/ Villagers	Extensive use of concrete posts and strips of bamboo or Catechu ( <i>Acacia polyacantha</i> ) which would provide some benefits to the villagers.
The relocation or removal of settlements from inside the park including:  Provision of suitable land for agriculture for those participating in the scheme.	RFD/LDD	The following are possible options.  - New land created after land reform. - Forest Village Project in Nakhon Ratchasima Province. - Forest Village Project in Prachin Buri Province.
The assessment of adequate compensation for relocation and lost income and property from dislocation.	RFD/LAD/ OAE/DAEO/ DLO	The compensation should be adequate so as to enable villagers to maintain their living standard.
The removal of villagers and voluntary withdrawal.	RFD/NPD/FLMD Thai Military First Army Area	Voluntary withdrawal by those villagers not willing to participate in the government supported relocation program.
Ecosystem rehabilitation program.	RFD/NPD/FMD/ PFO/TCC/DFO/ Volunteers	Regeneration of broad leaf tree species, fire control methods and weeds suppression.
Community development activities		
Land reform and provision of land title.  Appropriate compensation to those who donot get a fair deal.  Provision of permanent water supply for agriculture and other use.  Promotion of sustainable agriculture with reduction in production cost.	ALRO/PALRO/ DALRO/DLO/TCC PAEO/DAEO/ BAAC/PCDO/DCDO/ PNEO/PPHO/ CPD/ACD/NGOs/ WFT/PDA/TCC	Land distribution should be based on the availability of land and suitable landholding size in proportion to the previous holding.  Agriculture and occupation development  Small scale water reservoir development  Provision of agricultural extension services



<p>Provision of alternative means of livelihood with increased income and employment opportunities.</p> <p>Build villagers capacity to avail of various support services.</p>		<p>Development of small scale and cottage industries</p> <p>Agricultural cooperatives</p> <p>Community development projects related to health and sanitation, and infrastructure and market development</p> <p>Short term and long term loans from revolving fund.</p>
Buffer Zone Management		
<p>Assess the needs and concerns of the local villagers regarding buffer zone activities.</p> <p>Create awareness among villagers regarding the benefits of buffer zone and build their capacity to manage it.</p> <p>Establish the Buffer Zone Management Committee (BZMC) and Advisory Committee at the local level.</p> <p>Extension programs related to environmental education, and training and demonstration on natural resources conservation.</p> <p>Buffer zone related ecotourism and development of existing recreation area.</p>	<p>RFD/NPD/FLMD/ PFO/DAEO/DCDO TCC/DFO/NGOs/WFT /Other relevant agencies at the local level</p> <p>RFD/BZMC/PFO/ DFO/NGOs/WFT/ PDA</p> <p>RFD/NPD/TAT</p>	<p>The objective is to create a buffer zone which provides benefits to local villagers and strengthens conservation programs.</p> <p>Sustainable harvesting of buffer zone products.</p> <p>Natural resources conservation and environmental education programs for the local people.</p> <p>Overall responsibility of the buffer zone management is with the BZMC, assisted by the Advisory Committee who will coordinate with other agencies if certain solutions are beyond the capability of BZMC.</p> <p>Forest fire protection, soil and water conservation, tree plantation in school and temple yard, nature education for youth, community forestry and agroforestry.</p> <p>Plantation of Bamboo and other local tree species towards the inner edge of the buffer zone while growing fuelwood trees towards the outer edge.</p> <p>Park related employment opportunities for local villagers.</p> <p>Channel revenue generated from the park for community development.</p>

To achieve the objectives as outlined in the action plan, a cooperative network of the National Park Division and other related agencies is essential (Fig. 16). The focal point of this network is the Implementation Committee which is the responsible body for coordinating the activities of the various agencies involved in the network and making recommendations to the concerned implementing agencies. This committee should be represented by the heads of five main agencies, namely, Agricultural Land Reform Office, Royal Forestry Department, Land Development Department, National Park Division and the governor of Saraburi Province who would delegate their responsibilities to their respective officials based near KYNP. The National Committee and the Sub-committee for the protection and maintenance of the forest and wildlife resources is represented by heads of various national and provincial agencies (Chatchaiwiwatana, 1991).

## VIII. SUMMARY OF FINDINGS

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This research addressed three major issues related to villagers' socio-economic condition in two locations adjacent to the park, their interaction with the park and their perceptions of natural resources conservation and attitude towards the park management. There was no significant difference in the living conditions between households living inside the park and outside. Migration was more common inside the park, however, in-migration frequently occurred outside. The higher was the education level, the greater was the tendency to move elsewhere. Also, the insecurity of land was a major factor in out-migration from inside the park. The average size of landholding was smaller, however, few farmers owned more land. The distribution of land was less skewed outside the park where the land was utilized for diversified production. Banana plantation dominated the cultivation inside the park, which gave higher return than other crops. The average farm income was higher outside mainly because most of the banana plantation and fruit orchard were created long ago, which were new enterprises inside the park indicating the possibility of higher income for the villagers there in the near future. The capacity to borrow in some way reflects the villagers' confidence in their investment. The majority of the small and medium farmers, particularly, inside the park borrowed from BAAC while the big farmers borrowed larger amount of money from commercial banks. The majority of the households inside the park were satisfied that their living condition was improving.

Encroachment and poaching for forest products and wildlife were the main impact on the park. Most of the offenses went unnoticed as poaching had been rampant deep inside the forest and not along the boundary of the park where most patrolling was concentrated. The forest products were mainly used for household consumption while wild animal products were supplied to the local markets. The majority of the villagers thought that the large scale deforestation was mainly the result of indiscriminate logging by big companies with commercial interests. Although they realized the value of nature conservation, their immediate concern for basic necessities took precedence over the former, hence, the poaching. This holds true particularly in the case of villagers living inside the park. The findings indicate a likely implication that the villagers living inside the park and deriving various forms of benefits had realized the conservation values of the KYNP more than those living outside the park. The villagers did not like the strict protection of the park by

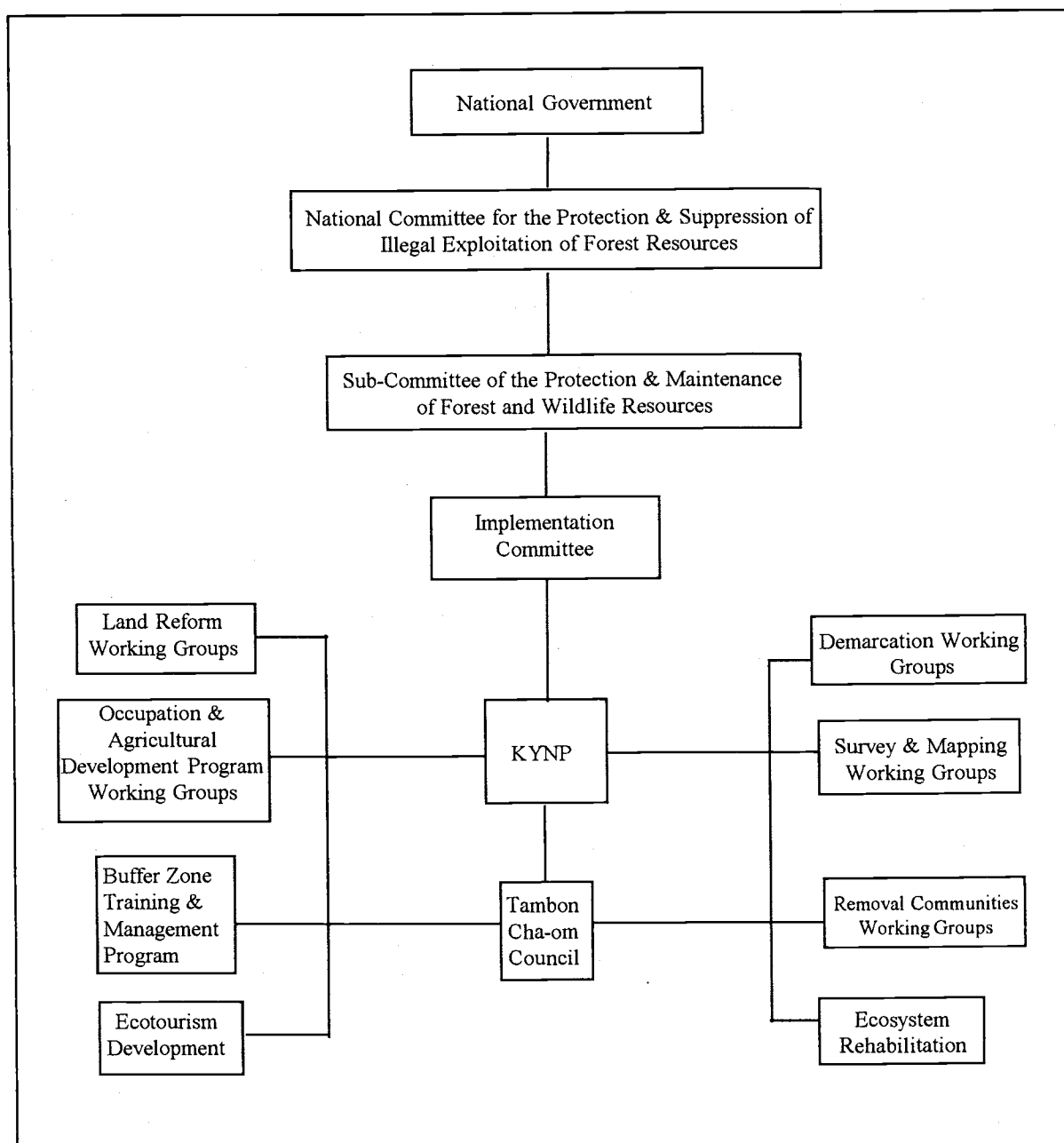


Fig. 16: The Inter-Agency Cooperative Network

the officials and always found excuses for sneaking inside. Only half of the respondents indicated that conservation and management of the park was their responsibility too.

The problems of the KYNP are multifaceted. Because the local people view the park as an infringement upon their territorial rights, they get involved in all kinds of illegal activities. The situation becomes worse when these people have to rely on the park for many of their necessities so as to improve their general living conditions. The past management had mainly resorted to strict protection and control methods. Although, they have identified the root cause of poaching and encroachment, no systematic effort has been geared towards the remedy of the problems which have to be addressed in a comprehensive planning framework. The past community development projects in certain villages achieved limited success which indicate the need for a clear linkage between their activities and park's objectives. Despite the many positive impacts of community development projects, it is less likely that people would stop poaching the park. In the study area, if conflicts between the park authority and local people were to be resolved, complete halt in park encroachment and gradual reduction in poaching are essential. This may mean clear boundary demarcation and removal of certain settlements from inside the park, which, however, depends on effective land reform and provision of various support programs, mainly, at the community level. Also, a buffer zone is urgently required for additional protection of the park and the villagers well-being as well.

The findings of this study indicate many significant policy implications for the protected areas system in Thailand. It clearly indicates that land use conflicts along the protected area borders should be resolved using an inter-disciplinary and multi-sectoral framework in which all related agencies give their full support and sincere commitment to improve relations between the park and the local people. The boundary needs to be clearly defined and villagers should be well informed of it. The new demarcation of protected area boundaries should be carried out with active participation by the concerned villagers and agencies at the community level. The land use conflict between protected areas and people must be considered on a case by case basis. If the areas where conflict is intensified are ecologically sensitive, the existence of communities can cause tremendous negative impacts. In such situations, it might be better to have the local communities relocated from that area. If the area is not critically impacted by the local communities, it should be demarcated outside the park boundary. The establishment of buffer zones is urgently needed as there may be no option for buffer zones in the future owing to the scarcity of land. People's participation is a key factor in the management of buffer zones which should have a built-in mechanism for strengthening local people's capacity to manage it, although, initially, external support may be required. Buffer zone management policies must be formulated at the national level ensuring that conservation is linked to development. The Buffer Zone Management Office should be established under the RFD. Well trained Buffer Zone Management Officers have to work with the communities around the protected areas, mainly, coordinating community development and conservation activities while ensuring that natural resources are not depleted by such activities. The development policies at the national level should give priority to support communities along the protected area borders without whose involvement, protected areas in Thailand will barely survive in future. Urgent studies are required for determining the needs of the local people

living in the vicinity of the protected areas so as to assess the kinds of government support required to fulfill their needs and to build mechanisms for self-reliance and local authority. Last, but not the least, protected areas management should be oriented towards working with local communities, various public interest groups, NGOs, and local governments as well.

## *Chapter Nine*

# **RESOLVING CONFLICTING USES: GIS AND REMOTE SENSING APPLICATIONS IN THE PHU RUA NATIONAL PARK, THAILAND**

*by*

**Yongyut Trisurat\***

## **I. INTRODUCTION**

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National park zoning is a management device applied in response to priority determined goals, objectives, resources analyses, use potential and use capacities to confirm the extent of use or non-use of park lands (Kun, 1979). It helps to identify the kind of management actions appropriate for a specified area and formulate guidelines for effective management programs. For example, in areas near human settlements, a park may have a management priority for balancing the non-confirming uses by the local people while in the pristine areas where human disturbance is absent, management action may be oriented towards preservation of the natural resources and conducting scientific research.

Theoretically, there are six management zones for national parks in Thailand (Table 15).

Table 15: Management Zones for National Parks in Thailand

Zone	Designated Contents
Intensive Use Zone	The zone in which buildings for the lodging of visitors and staff are located.
Outdoor Recreation Zone	Area is larger than the Intensive Use Zone, serves sightseeing and rest. The zone calls for a core area lest it be devastated by trespassing.
Primitive Zone	The zone is retained in its natural state as botanical resources are abundant. The zone also serves as a resource of agricultural water to irrigate the plains.
Strict Nature Reserve Zone	The most important resource of the national park where abundant plants exist, including easily damaged, beautiful and rare plants. The zone also serves as a water source.
Special Use Zone	The zone in which various activities have been carried out even before the area was designated as a national park, and to conform to the purpose of administering and operating the national park.
Recovery Zone	Although nature has been ravaged, there is either some forests left or other environmental conditions are such that nature can be restored and where recovery of nature is necessary.

Source: National Parks Division, 1987

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\* Author of the thesis on which this chapter is based, produced under the supervision of Dr. Apisit Eiumnoh. The version presented here is written by Sanjay K. Nepal and Karl E. Weber incorporating major modifications and additional evidence.

In 1989, the Royal Forestry Department undertook a zoning project on forest reserve lands to establish long-term targets for conservation efforts and to determine the availability of intact forests for declaration as protected areas. This project was limited to the assessment of the national forest reserve lands, hence, did not include any existing protected areas, which, so far, do not have any management zones (MIDAS, 1993). The majority of the parks in Thailand lack baseline data for their potential use in identifying land use suitability and formulating a management plan. In the absence of such information, the management plan tends to be *ad hoc*, lacking clearly stated objectives and long term programs, which make the management virtually ineffective.

Two of the most pressing problems park managers in developing countries such as Thailand face are a lack of reliable information and insufficient financing and processing what information is available (Yonjon et al., 1991). To overcome these problems, planners need tools for analyzing and updating spatial information quickly and efficiently. Remote sensing and Geographic Information Systems (GIS) are very useful tools for the comprehensive data collection and manipulation of information on natural resources at the national, provincial and district levels. While remote sensing is a tool for primary resources survey and inventory of up-to date geographic data, GIS enables to manipulate the data objectively. The zoning and management of a park is one of many appropriate remote sensing and GIS applications.

This study demonstrates the use of remote sensing and GIS in identifying various management zones for the Phu Rua National Park. The basic procedures in the development of a zoning model are discussed and the suitable areas for each zone are identified. With the overlay analysis facility of GIS, the final management zones are delineated. Also, some guidelines for effective management programs are suggested. The following are the specific objectives:

- collection of primary data on soil, vegetation types and wildlife habitat using aerial photographs and Landsat Thematic Mapping (TM) image;
- creation of a bio-physical spatial data base for easy retrieval and updating;
- developing a zoning model based on land cover, wildlife habitat, topography, and water and road networks;
- use of park zoning model in identifying five management zones, namely, Intensive Use Zone, Outdoor Recreation Zone, Primitive Zone, Strict Nature Reserve Zone and Recovery Zone;
- recommendation of management programs as related to the protection of the natural resources, vegetation restoration, tourism and interpretation, administration, integrated conservation and development, and research and monitoring.

## II. THE PHU RUA NATIONAL PARK

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The Phu Rua National Park (PRNP) was established in 1979, covering 12,084 ha of land area. The park is located in Loei Province in the northern Thailand adjacent to the border with Laos (Fig. 17). Mountains are the dominant topographical feature of the park

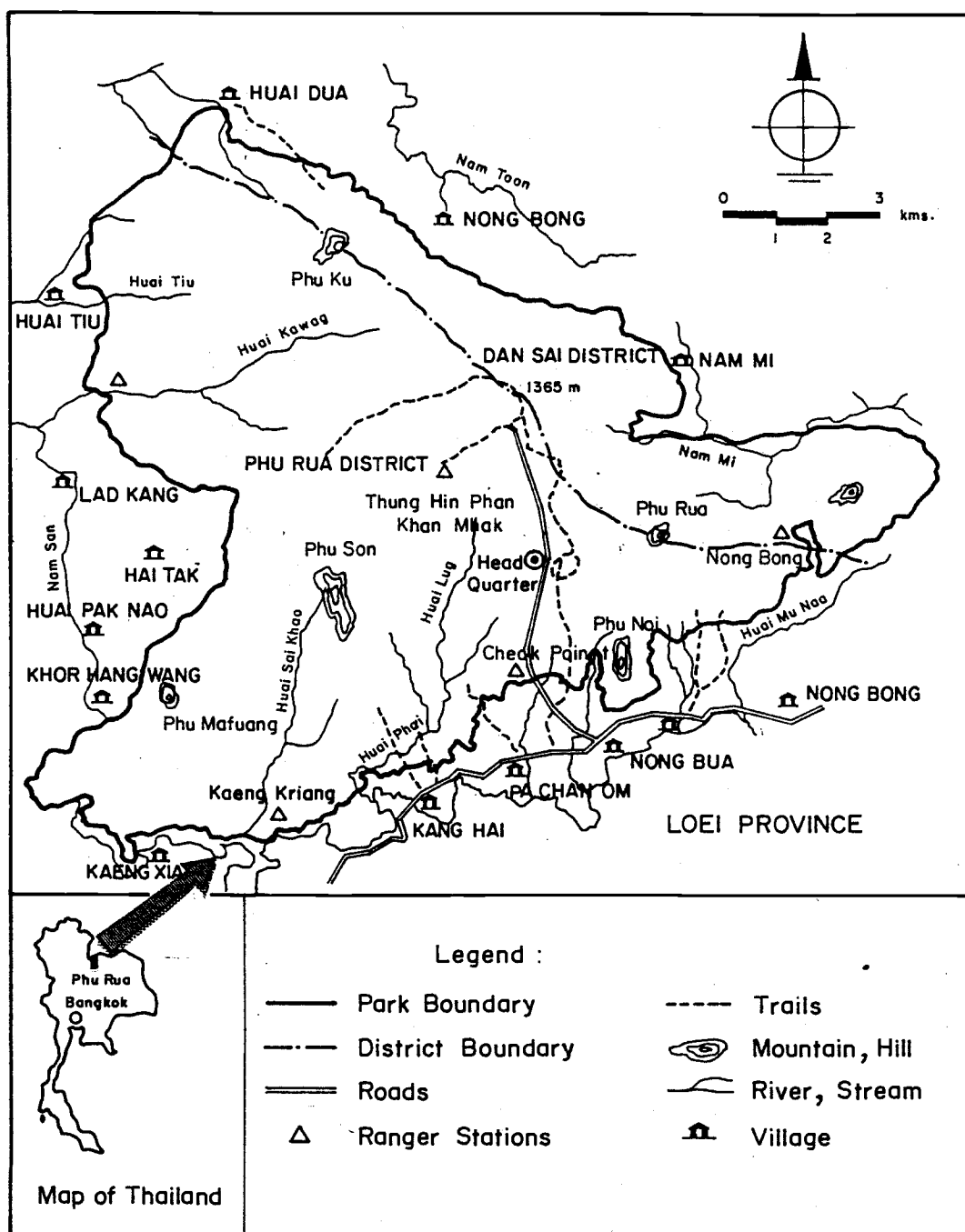


Fig. 17: The Phu Rua National Park and its Main Centers



which rises abruptly from the north escarpment of the Korat Plateau covering the northeastern region of Thailand (Ward and Bunnag, 1975). The area resembles a triangle or Cadaliu leaf. The park is situated between 17° 30' north latitude to 101° 36' east longitude. Its altitude ranges between 380 meters and 1,365 meters above mean sea level. The climate of the park is affected by northeast and southwest monsoon with average annual rainfall of 123 cms and average temperature 28° C.

The vegetation cover of PRNP is dominated by the Hill Evergreen Forest followed by dry dipterocarp forest, mixed deciduous forest, pine forest associated with grassland and disturbed forest. Once alive with barking deer, wild pig, pheasant and other animals, Phu Rua's wildlife has declined in the recent past. Twenty-six bird species probably exist in the park. They include the crested serpent-eagle, green-billed malkoha, greater coucal, Asian fairy bluebird, refescent prinia, white-rumped munia as well as several species of babbler, barbet, bulbul and drongo (Graham, 1991).

There are 19 villages covering five Tambons situated adjacent the park which has a total population of 6,908 individuals. Above 95 percent of the people around the park are dependent on agriculture, cultivating corn, upland rice and temperate fruits. According to the park survey in 1985 there were about 52 families inside the park depending on agriculture. However, the number is believed to be increasing. The local people living in and around the park are heavily dependent on park resources such as forest products and wildlife. Threats to the park have been intensified with booming land market for horticulture and settlements linked with road networks.

The majority of the villagers are educated up to primary level only. The average household income is roughly 16,000 Baht with Ban Kaeng Kriang being the poorest and Ban Kok Pho Rim San the richest village. Agricultural land extends towards the park boundary. Villagers had practiced shifting cultivation on the land presently within the park boundary. In 1985, villagers living in high altitudes within the park boundary were relocated outside. The 1987 Kasetsart University study found that the relationship between the inhabitants of the 16 surrounding villages and the park authority were largely adversarial (Graham, 1991). Illegal tree cutters had been able to earn 20 times higher the income from agriculture. There had been no efforts towards increasing awareness among the local villagers who viewed the park as detrimental to their well-being. With little wildlife species remaining outside the park boundary, villagers had been involved in poaching, religious holidays being popular times for poaching since little other work was done on those days. While such external threats continue to undermine the basic objective of resource conservation in the PRNP, the problems arising due to internal management such as inadequate manpower and expertise to deal with complex issues, shortage of management mandates, and conservation objectives in specific locations of the park make the whole task of park management very ineffective.

The PRNP is under the National Park Division within the Royal Forestry Department of the Ministry of Agriculture and Cooperative. Its administration is centralized, however, the park superintendent seeks cooperation from the other provincial and district level offices. The annual budget was roughly 650,000 Baht in 1990. The park has three main

objectives: preserving biodiversity; promoting recreation and tourism; and providing opportunities for scientific research. The day-to-day management is supervised by the park headquarters with four ranger stations located in the center and along the park boundary. Each ranger station has one or two rangers and eight temporary workers. Despite its relatively small size, the park attracts large number of visitors which has steadily increased from 1,532 in 1981 to 33,825 in 1989. The total revenue in the year 1989 was Baht 245, 364.

### **III. RESEARCH METHODOLOGY**

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This study is based on primary as well as secondary data and information. While the primary data is based on field visits in 1990, the secondary data was collected from maps, aerial photographs and satellite image (Trisurat, 1990). The primary data include information on vegetation, soil, wildlife habitat and slope while the secondary data include geology, elevation, surface water, road network, and existing recreation sites and visitor facilities.

A topographic map (R.F. 1:50,000) dated 1969, Sheet Nos. 5243 I and 5244 II prepared by the Royal Thai Survey Department and a geology map of the Phu Rua National Park (RF: 1:50,000) from the Mineral Resource Department were obtained. A false color composite LandSat TM image with bands 2,3,4, (1:50,000), taken on 19/12/1989 was obtained from the National Research Council. Aerial photographs (RF 1:15,000) dating 14/12/82 were obtained from the Royal Forest Department. A digital tape of LandSat TM bands 2,3,4 dating 19/12/1989 was also acquired from the National Research Council. The GIS packages used was ARC/INFO while IDRISI and ERDAS were used for digital elevation model. Hardware included a IBM compatible PC with digitizing table, plotter and mirror stereoscope.

From the geology map prepared by Chairangsri (1989) of the Mineral Resources Department, four classes of mapping units were distinguished which include the Phu Phan Formation, Sao Khua Formation, Phra Wihan Formation and Phu Kradung Formation (Trisurat, 1990). The information on elevation derived from the topographic map was classified into four categories such as less than 700 meters, 700 - 900 meters, 900 - 1,100 meters and greater than 1,100 meters. The slope map was prepared using the topographic map. Firstly, the contour lines from topographic maps were digitized using the ARC/INFO software. Secondly, the digitized line coverage (vector system) were converted into grid format (raster system). Thirdly, slope map was prepared using the Digital Elevation Model (DEM) of the IDRISI software, showing six classifications based on FAO system. Finally, the grid format of slope map was converted into an ARC/INFO coverage. The river network was derived from the topographic map while seasonal streams were mapped based on the aerial photographs taken in 1982. The buffer distance is divided into three classifications: 50 meters from seasonal streams and 100 meters from main streams; 50 - 100 meters from seasonal and 100 - 200 meters from main streams; and greater than 100 meters from seasonal and 200 meters from main streams. Similarly, accessibility was determined from the topographic map which was updated using the

information available from the satellite image. Three categories of accessibility was distinguished. The distance of 50 meters from a road and 20 meters from a trail was classified as easily accessible; 50 - 150 meters from a road and 20 - 100 meters from a trail as moderately accessible; and greater than 150 meters from a road and 100 meters from a trail as having difficult access. The information on existing sites and recreational facilities was obtained from the park headquarters and field observation as well. For delineating the Outdoor Recreation and Intensive Use zones, a buffer distance of 100 meters is used.

The soil mapping involved satellite image and aerial photo interpretation, field survey, laboratory analyses and map compilation. The satellite image of the park provided a synoptic view to determine the landscape, land use pattern and geomorphology. For greater accuracy, aerial photographs were also used while the topographic map was used as the base map. Field observation and samplings were conducted to examine the actual soil types and land use patterns. The information recorded at each sampling site include soil depth, color, texture, pH, and other soil attributes. The soil samplings were grouped according to the texture. Representative samples were analyzed in the laboratory which determined the soil particle size distribution (sand, silt and clay content) and their spatial distribution, on which basis the soil classification was determined. The satellite image and aerial photographs provided the basis for identifying the soil boundaries which was adjusted after the field survey and laboratory analysis. The boundary was then overlaid on the topographic map for final soil classification map.

The mapping of vegetation distribution was based on visual interpretation associated with digital image processing of Landsat TM imagery. The combination of bands 2, 3 and 4 is considered suitable for vegetation interpretation. The first step in the interpretation procedure was to draw the park boundary onto the transparent sheet at the scale of 1:50,000. This was then followed by correctly aligning a false color image and tracing the discernible boundary between the land-cover types within the park by considering pattern, tone and size. The result was verified by field visit. Mapping accuracy was enhanced by the use of aerial photographs. The wildlife habitat mapping was based on identification of wildlife species within the park during the field survey, discussions with park officers and local people, and available literature (Lekagul and McNeely, 1977; Wildlife Conservation Division, 1978). Habitat was classified on the basis of distribution of rare, common and abundant species.

#### **IV. PARK ZONING MODEL**

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The park zoning model is based on the weight and ranking score of eight bio-physical attributes including vegetation, geology, soil, slope, elevation, water, accessibility, and wildlife habitat and their various characteristics (Table 16). The rating indicates the suitability of each characteristic for a specified zone which is classified into three: suitable, moderately suitable, and unsuitable. For example, under the broad category of Vegetation types, the Hill Evergreen Forest is unsuitable for the Intensive Use and Recovery Zones (Table 16). The rating is based on subjective judgment.

Table 16: Suitability of Various Bio-Physical Characteristics for Zoning

Factor	IUZ	ORZ	PZ	SNRZ	RZ
<b>VEGETATION</b>					
Hill Evergreen Forest	1	2	3	3	1
Dry Deciduous Forest	1	2	2	2	1
Mixed Deciduous Forest	1	2	2	2	1
Pine and Grassland	1	3	3	2	1
Secondary Growth	3	1	1	1	3
Agriculture Area	2	1	1	1	2
<b>GEOLOGY</b>					
Phu Phan Formation	1	3	2	2	1
Sao Khua Formation	3	2	2	2	2
Phra Wihan Formation	1	1	3	3	2
Phu Kardung Formation	2	2	3	2	3
<b>SOIL</b>					
0-50 cm SL with gravel content	1	2	3	3	3
80-100 cm SL	3	3	2	2	2
0-50 cm SCL	1	2	3	3	3
100-150 cm SCL	2	2	2	2	2
80-100 cm LS, SL surface soil; SCL subsoil	3	3	2	2	2
80-100 cm L, CL surface soil; CL, C subsoil	1	1	3	3	2
<b>SLOPE</b>					
0 - 2 %	2	3	1	1	1
2 - 6 %	3	3	1	1	1
6 - 13 %	2	2	2	1	2
13 - 25 %	1	2	2	2	2
25 - 55 %	1	1	3	3	3
> 55%	1	1	3	3	3
<b>ELEVATION</b>					
< 700 m	3	1	1	1	1
700 - 900 m	2	1	2	1	2
900 - 1100 m	2	2	2	2	3
> 1100 m	1	3	3	3	2
<b>PROXIMITY TO WATER</b>					
Stream      Gully					
0 - 100 m    0 - 50 m	2	3	1	1	3
100 - 200 m    50 - 100 m	3	2	2	2	3
> 200 m        > 100 m	1	1	3	3	2
<b>PROXIMITY TO ROADS</b>					
Road      Trail					
0 -50 m    0 - 20 m	3	3	1	1	3
50 -150 m    20 - 100 m	2	2	2	2	3
>150 m        > 100 m	1	1	3	3	2
<b>WILDLIFE HABITAT</b>					
Rare species	1	1	3	3	1
Common species	1	2	3	2	2
Abundant species	2	3	2	1	2
Not habitat	3	1	1	1	3

Note: 1 - Unsuitable    2 - Moderately Suitable    3 - Suitable  
 LS - Loamy Sand    SL - Sandy Loam    SCL - Sandy Clay Loam  
 CL - Clay Loam    C - Clay

Approximately 70 questionnaires were distributed to the experts in forestry, ecology, soil science and tourism of which 40 responded. The majority of the respondents were foresters. They were asked to assign weights to various attributes based on a scale ranging between 1 and 10. Vegetation was found to be significant for the Primitive, Strict Nature Reserve and Recovery zones while geology was significant only for Outdoor Recreation Zone. Similarly, soil was found to be significant for recovery Zone only. Slope was found to be significant for the Intensive Use and Outdoor Recreation zones while elevation and water were significant only for the Intensive Use Zone. Accessibility was significant for Intensive Use and Outdoor Recreation zones and wildlife habitat only for the Strict Nature Reserve Zone (Table 17).

Table 17: Weighted Score for Various Bio-Physical Attributes

Attributes	Zone			
	ORZ	PZ	SNRZ	RZ
Vegetation	6.2	7.7	8.7	8.5
Geology	6.1	7.0	4.2	5.5
Soil	6.7	6.0	4.0	7.0
Slope	8.7	8.2	5.2	4.5
Elevation	7.5	6.9	4.2	4.0
Water	9.4	7.5	4.1	5.7
Accessibility	9.7	8.2	2.6	4.6
Wildlife Habitat	5.0	8.0	8.1	8.1

The Linear Combination Method is used where the weight score for each attribute in each zone is multiplied by the average rating of each characteristics. The cumulative score for each zone was further classified into three levels of suitability. The suitability for each zone is expressed as:

$$IUZ = 6.2r_1 + 6.1r_2 + 6.7r_3 + 8.7r_4 + 7.5r_5 + 9.4r_6 + 9.7r_7 + 5.0r_8$$

$$ORZ = 7.7r_1 + 7.0r_2 + 6.0r_3 + 8.2r_4 + 6.9r_5 + 7.5r_6 + 8.2r_7 + 8.0r_8$$

$$PZ = 8.7r_1 + 4.2r_2 + 4.0r_3 + 5.2r_4 + 4.2r_5 + 4.1r_6 + 2.6r_7 + 8.1r_8$$

$$SNRZ = 8.2r_1 + 4.5r_2 + 3.7r_3 + 4.7r_4 + 4.2r_5 + 3.0r_6 + 2.1r_7 + 9.6r_8$$

$$RZ = 8.5r_1 + 5.5r_2 + 7.0r_3 + 4.5r_4 + 4.0r_5 + 5.7r_6 + 4.6r_7 + 8.1r_8$$

where  $r_1$  is the average rating for vegetation,  $r_2$  for geology,  $r_3$  for soil,  $r_4$  for slope,  $r_5$  for elevation,  $r_6$  for proximity to water,  $r_7$  for proximity to road and  $r_8$  for wildlife habitat (refer to Table 16).

All variables except slope were digitized using ARC/INFO software. Each map contained point and line attributes and polygons with label corresponding to mapping units listed in Table 16. The eight map layers were integrated into one. The overlay was done step by step, i.e. one overlay of two sets at one time. Therefore, all thematic map data including soil, vegetation, geology, elevation, slope, wildlife habitat, buffered water

network, and road accessibility were intersected into one layer (Fig 18). The overlaid map was then reclassified into the five management zones. Each map shows three suitability index, suitable, moderately suitable and unsuitable. As some sections of the five preliminary zones would overlap, it is revised based on two criteria such as the zone suitability and zone priority. The highest suitability was selected, for example, if an area is identified as suitable for Intensive Use Zone but moderately suitable for Recovery Zone, the former is selected. With respect to zone priority, preference is given to the SNRZ, followed by ORZ, PZ, IUZ and RZ as the management objectives of the park are to protect rare species, provide outdoor recreation opportunities and preserve water recharge area. The preliminary management zones may have certain pocket areas too small in size to implement any effective management program. Also, the location may not be suitable, for example, a small recreation site located in the center of the Strict Nature Reserve Zone. In such cases, the map was revised based on field visits and expert suggestions. Several copies of the preliminary management zones were distributed to park professionals and experts whose suggestions were duly incorporated when adjusting the final zone boundaries.

## V. RESULTS AND DISCUSSIONS

The following sections briefly describe the findings of the map and image interpretations and their use in the identification of management zones.

### *Land Cover Classification*

The interpretation of the Landsat image and aerial photographs combined with ground trotting estimated area under each land cover category (Table 18). The vegetation types were determined based on the floristic composition and the structure of the plant community. The land cover can be classified into hill evergreen forest, dry dipterocarp forest, mixed deciduous forest, pine forest associated with grassland, disturbed and secondary growth forests, and agricultural area (see Appendix A, Fig. A1).

Table 18: Land Cover Classification in the Phu Rua National Park

Land Cover Type	Area (km <sup>2</sup> )	Percentage
Hill Evergreen Forest	34.02	28.1
Dry Dipterocarp Forest	13.47	11.1
Mixed Deciduous Forest	17.76	14.7
Pine Forest and Grassland	3.48	2.9
Secondary Growth and Disturbed Forest	22.09	18.3
Agricultural Area	30.10	24.9
Total	120.92	100.0

The hill evergreen forest is the dominant land cover type occupying about 28 percent of the total area of the park. Found above 900 meters where the precipitation is high and the temperature normally cool, it is characterized by species such as *Quercus sp.*, *Castanopsis sp.*, *Lithocarpus sp.*, and *Rhododendron sp.*, mainly along the rivers and

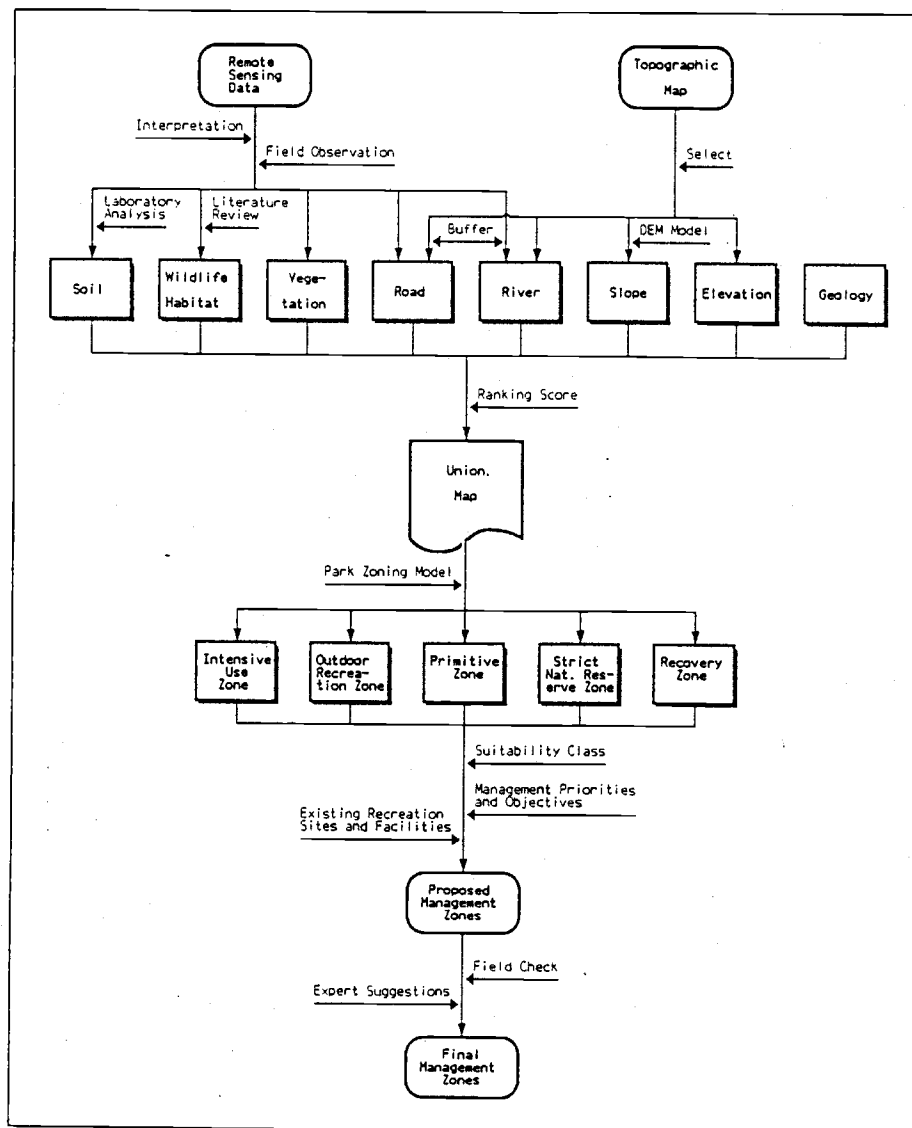


Fig. 18: Flowchart Showing Procedures for Creating Management Zone Maps

streams. With a high soil moisture, the crown cover is usually between 75 - 85 percent. The forest floor is dense with small seedlings, shrubs and climbers. Mosses and ferns are widely distributed covering the rocks and tree branches and stems. The dry dipterocarp forest with the dominant species such as *Shorea obtusifolius*, *Shorea obtusa*, and *Shorea siamensis* has a crown density of 60 - 65 percent. Tree stands of over 30 cms breast height are less owing to intensified illegal logging. The ground floor is composed of bamboo and various grass species. The mixed deciduous forest is a transition community between the above mentioned two forest types. The plant composition and structure are more complex than the dry dipterocarp forest, however, are less dense than the hill evergreen forest. The dominant species include *Lagerstroemia calyculata*, *Afelia xylocarpa*, and *Pterostroemia macrocarpus* which are of good commercial value. The pine forest and grasslands occupy less than three percent of the park land with species such as *Pinus merkusii*, *Adinandra integerrima*, and *Zizyphus attopoensis*. The crown density is less than 50 percent with less complex species composition and floral structure. The grass cover is composed of various species such as *Nosema cochinchineses* and *Entina lakshakarae*. The secondary growth and disturbed forests is the result of intensive logging resulting in its transformation into grassland vegetation. Large stand of trees are rarely found. The dominant species include *Imperata cylindrica*, *Chrysopogon aciculatus*, *Saccharum spontaneum* and several species of bamboo. About 25 percent of the park land is under agriculture, particularly in the southern sections where the soil is deep and moist, and other flat areas of the park. The main crops under cultivation are corn, upland rice and cotton. After the harvesting period, the land is covered by *Imperata cylindrica* and Siamese weed.

### Soil Classification

The results of image interpretation and sample soil survey determined six soil mapping units based on soil texture and soil depth (Table 19).

Table 19: Soil Classification

Mapping Unit	Soil Texture	Soil Depth (cms)	Area (km <sup>2</sup> )	Percent
1	SL	0-150	3.54	2.9
2	SL	80-100	33.64	27.8
3	SCL	0-50	11.31	9.4
4	SCL	100-150	28.18	23.3
5	LS to SCL	80-100	22.47	18.6
6	CL to C	80-100	21.78	18.0
Total	-	-	120.92	100.0

Note: C = Clay, CL = Clay Loam, LS = Loamy Sand SCL = Sandy Clay Loam, SL = Sandy Loam



The first soil category consists of sandy loam which is mainly found on the peaks of Phu Rua and Phu Ku. Soil depth is shallow (20-50 cm) to very shallow (0-20 cm). It is found in the well drained gentle to moderate slopes. Nutrient content is rather low. This soil is under pine forest and grassland vegetation. The second category is that of moderately deep sandy loam soil in gentle to steep slope areas. The hill evergreen forest is the dominant vegetation on high altitude while it is dry dipterocarp forest in the lowland. The texture is dark brown to black on the surface and yellowish red in the subsoil. The nutrient content is moderate to high. There are two types of sandy clay loam soil. The shallow sandy clay loam soil is mainly found on steep slope and cliff in the northern and northeastern sections of the park. This soil is shallow, moderately drained and less fertile. The parent material mainly includes sand and silt stones which is covered by mixed deciduous forest. The deep sandy clay loam soil is found in the undulating and rolling areas of the park. The soil is improperly drained, with moderate to high soil nutrients. Its color varies from dark brown on the surface to reddish brown in the subsoil. Suitable for cultivation, it is mostly under secondary growth and disturbed forests. The moderately deep loamy sand to sandy clay loam soil covers the western section of the park. Loamy sand dominates the surface soil while sandy clay loam is dominant in the subsoil. The hill evergreen forest and mixed deciduous forest are the main vegetation, however, some areas have been cleared for cultivation. Soil is moderately drained, dark reddish brown on the surface and red in the subsoil with some gravel content. Fertility is moderate to low. The sixth soil category of moderately deep clay loam to clay occupies low altitude areas where the slope gradient is less than six percent. The surface soil is characterized by dark yellowish brown clay loam whereas the subsoil is dark reddish brown clay. It is poorly drained with high nutrient content.

### ***Wildlife Habitat***

Because of the present land use pattern and intensified human encroachments, the existing wildlife in the park are those which require a small home range. Most of the big mammals such as Sambar deer have suffered due to habitat disturbances. Based on field observation and discussions with park officers and villagers, 13 representative species were selected to draw the habitat boundaries (see Appendix A, Fig. A2). The species were grouped into three classifications, namely, rare, common, and abundant species. The rare species include silver pheasant and big-headed turtle, while the common species are barking deer, Asian wild dog, Asiatic jackel, slow loris, and fishing cat. The abundant species include wild pig, hog badger, Burmese hare, red jungle fowl and palm civet.

The habitat distribution showed that rare species are generally found in the hill evergreen forest and associated vegetation types along the streams on high altitude. The habitats for common species are the pine forests and grasslands as well as lower areas of the hill evergreen forests and transition zones. The habitats for the abundant species is ubiquitous including cultivated areas. The cultivated field adjacent to the villages and roads are identified as suitable habitat for wildlife as well. The area coverage of the habitats for the above classified species indicate that while almost 40 percent of the area is suitable for abundant species, only a little over six percent is suitable for rare species (Table 20).

Table 20: Wildlife Habitat Distribution

Wildlife Habitat	Area (km <sup>2</sup> )	Percent
Rare Species	6.32	5.2
Common Species	27.67	22.9
Abundant Species	47.45	39.2
Unsuitable	39.49	32.7
Total	120.92	100.0

### *Slope Classification*

Based on the digital elevation model developed using the IDRISI software, six slope categories are identified (Table 21). This classification is based on the FAO system. Areas with slope gradient between 13 and 25 percent is the most common type which occupy approximately 48 percent of the park land followed by the slope gradient between 6 and 13 percent.

Table 21: Slope Classification

Class	Slope (%)	Area (km <sup>2</sup> )	Percent
1	0-2	7.17	5.9
2	2-6	8.30	6.9
3	6-13	27.92	23.1
4	13-25	58.26	48.2
5	25-55	18.73	15.5
6	> 55	0.53	0.4
Total	-	120.92	100.0

### *The Management Zones*

The overlay analysis of the above mentioned eight bio-physical attributes resulted in the delineation of the five management zones, namely, Intensive Use Zone, Outdoor Recreation Zone, Primitive Zone, Strict Nature Reserve Zone, and Recovery Zone (see Appendix A, Figs. A3 to A7). The individual zone maps show the three classes of low, medium and high suitability, based on the subjective ranking and cumulative score calculated using the linear combination method (Table 22).

Table 22: Suitability Class and Area Coverage of Management Zones

Zone	Score	Suitability	Area (km <sup>2</sup> )	Percent
IUZ	0-85	Low	18.04	14.9
	85-130	Medium	96.07	79.5
	> 130	High	6.81	5.6
ORZ	0-95	Low	33.68	27.8
	95-125	Medium	79.88	66.1
	> 125	High	7.36	6.1
PZ	0-70	Low	28.53	18.8
	70-95	Medium	64.51	53.4
	> 95	High	33.68	27.8
SNRZ	0-60	Low	28.53	23.6
	60-85	Medium	77.61	64.2
	> 85	High	14.78	12.2
RZ	0-85	Low	15.91	13.2
	85-110	Medium	75.50	62.4
	> 110	High	29.51	24.4

The highly suitable areas for the Intensive Use Zone are along the park boundary and close to road and water bodies which represent only 5.6 percent of the park land. About 80 percent land is moderately suitable for this zone while 15 percent is unsuitable. About 66 percent of the park land is moderately suitable for the Outdoor Recreation Zone while only 6 percent is highly suitable. The highly suitable areas are under the pine forests and grasslands on the ridge and Phu Ku peak. The less suitable areas are under cultivation fields. The highly suitable areas for the Primitive Zone are under the hill evergreen forest, pine forest, and grasslands, as well as other areas with steep slope. This covers about 28 percent of the park land. The areas under disturbed forest and secondary growth are moderately suitable while the low suitable areas are the agricultural land. Only about 12 percent of the park land is identified as highly suitable areas for the Strict Nature Reserve Zone, which mainly occupies habitats for rare species such as big-headed turtle and silver pheasant. The remaining forest areas and the transition zone between forest and cultivated fields which combined cover approximately 64 percent of the park land are moderately suitable. About 24 percent of the park land is not at all suitable for this zone. The suitable areas for the Recovery Zone is mainly identified as areas of old clearings, under *Imperata cylindrica* and agricultural fields which cover about 24 percent of the park land. About 13 percent of the park land can not be rehabilitated.

The five management zone maps mentioned above were superimposed one above the other to identify areas for specific zones based on their suitability index, and conservation and management priorities of the park. The existing outdoor recreation sites and facilities were also considered in the zoning. Thus, the location of the individual management zones were identified and their areas estimated (Table 23).

Table 23: Preliminary Management Zones and Estimated Area

Management Zone	Area (km <sup>2</sup> )	Percent
Intensive Use Zone	6.48	5.4
Outdoor Recreation Zone	7.08	5.9
Primitive Zone	58.46	48.3
Strict Nature Reserve Zone	14.27	11.8
Recovery Zone	34.63	28.6
Total	120.92	100.0

Certain areas of the preliminary zones as identified through the overlay analysis are unsuitable. Any management action cannot be implemented given their small size and improper spatial distribution. For example, there are many pocket areas of the Intensive Use and Outdoor Recreation zones indicating the potential construction of roads, trails, and infrastructures in or near these areas (Fig. 19). Such activities will, indeed, disturb the wildlife and easily damage the natural resources. It is sensible to concentrate service areas in not more than two or three areas. Also, several recreation sites are closer to the Strict Nature Reserve zone which is not desirable as it is important to have a buffer zone, essentially, a Primitive Zone between the Outdoor Recreation or Intensive Use zones and the Strict Nature Reserve Zone. This means the management zones need to be revised so as to protect the park from conflicting uses in various zones. The revisions are based on expert opinion, park officials' suggestions and field verification as well. The final management zones, thus, have a slightly different layout and area coverage compared to the preliminary zones (Table 24).

Table 24: Final Management Zones and Estimated Area

Management Zone	Area (km <sup>2</sup> )	Percent
Intensive Use Zone	5.09	4.2
Outdoor Recreation Zone	4.93	4.1
Primitive Zone	63.33	52.4
Strict Nature Reserve Zone	10.33	8.5
Recovery Zone	37.24	30.8
Total	120.92	100.0

The boundary adjustment indicates a reduced area coverage for the Intensive Use, Outdoor Recreation and Strict Nature Reserve zones, and increased coverage for the Primitive and Recovery zones. The Intensive Use Zone is the second smallest zone, covering only 4.2 percent of the park land. It is located in the southern, southwestern and eastern sections of the park and also appears in an elongated shape in the upper central section towards the southeastern border (Fig. 20). These areas are mainly the existing development areas which include campsites, park headquarters, accommodation facilities, visitor center, parking lots, ranger stations, and access roads and buffer strips. Most of them are located on low slope gradient. As the present access to this zone is good, there is no need to build additional access roads, which means that the potential impact on the remaining forest is less. The Outdoor Recreation Zone which is the smallest unit as identified through the analysis mainly covers the existing recreation sites, and the plateau of Phu Ku mountain. This zone consists of waterfalls, viewpoints, some pine forests and grasslands with natural trails.

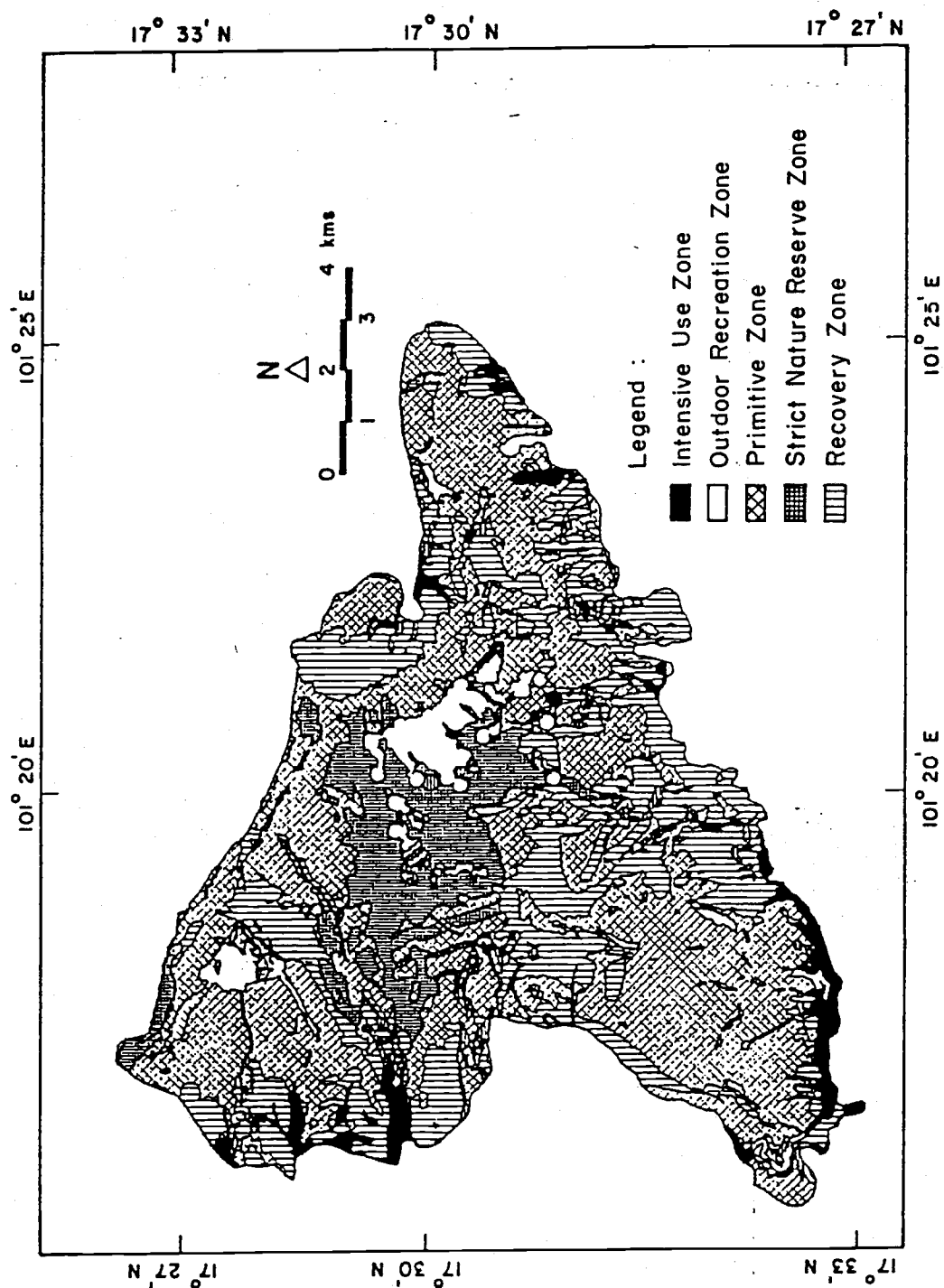


Fig. 19: Preliminary Management Zones

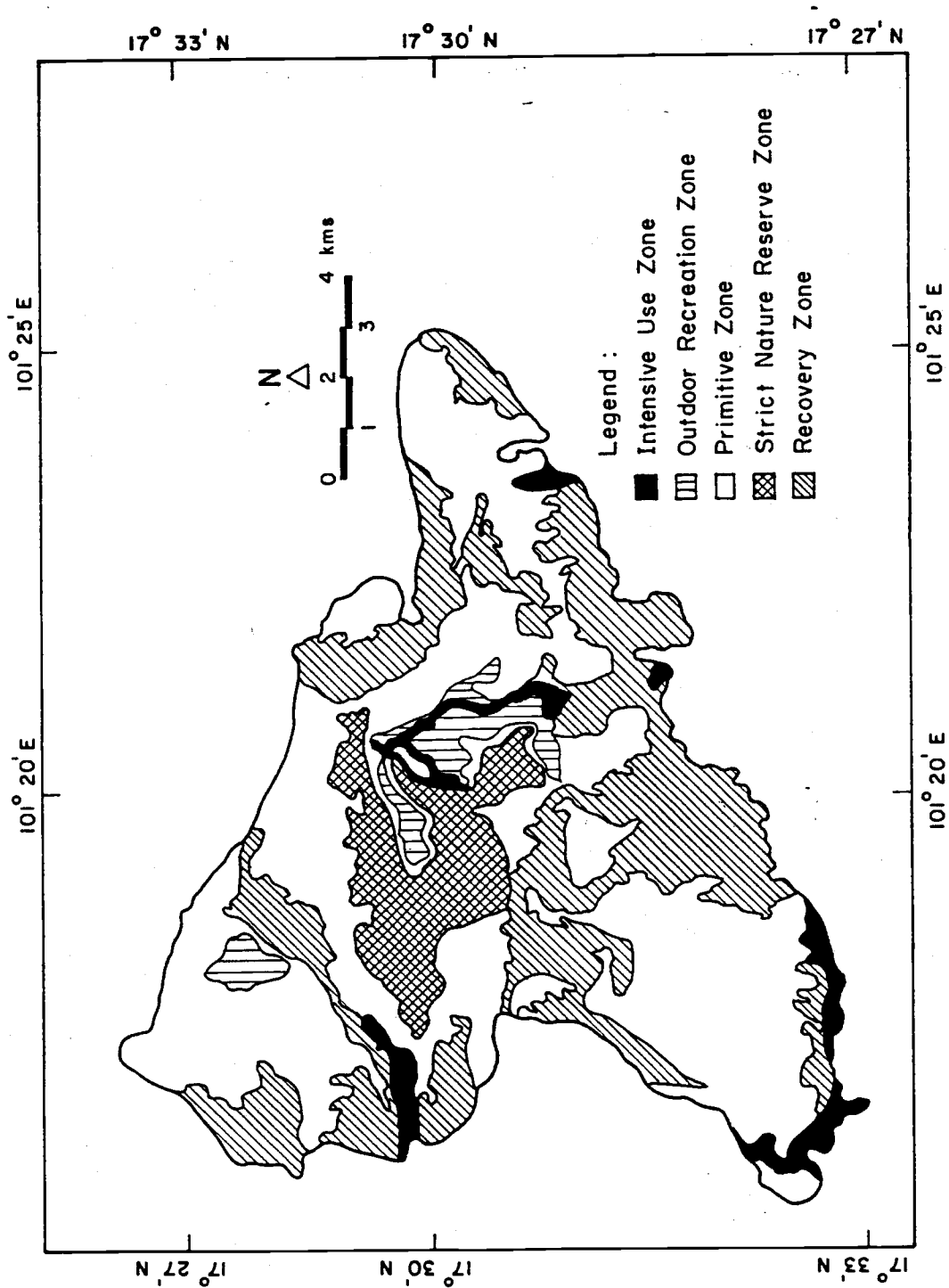


Fig. 20: Final Management Zones

The Primitive Zone is the largest unit covering approximately 52 percent of the park land. This zone contains the remaining forests excluding the habitat for rare species. The disturbed and secondary growth forests on steep slopes where recovery is difficult are also included in this zone. It has nature trails, mainly used by field researchers and limited picnic sites.

The Strict Nature Reserve Zone mainly covers the mountainous areas, the habitat for rare species. It is located in the center of the park which includes the upper watershed areas. Visitors are prohibited and some trails exist for park official's use. Scientific study is allowed when appropriate.

Most of the agricultural area and certain section of secondary growth forest are under the Recovery Zone. About 1,000 rai or 1.6 km<sup>2</sup> has been reforested with native species such as *Pinus merkusii* and *Pinus kaseya*. The potential for rehabilitation is good.

## VI. RECOMMENDATIONS FOR MANAGEMENT PROGRAMS

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Based on the conservation priorities of the various management zones, certain management program are recommended with a view to overcome some difficulties in conserving biological diversity within the park, and, at the same time, improving relationship with the local people through community development activities. The specific management programs include protection, restoration of vegetation, visitor interpretation and education, administration and inter-agency cooperation, integrating conservation and community development activities, and research and monitoring.

### *Protection*

The survival of the PRNP largely depends on the enforcement of the National Park Act, 1961. The construction of new paved roads along the western section of the park will certainly induce more encroachment, poaching, and illegal land acquisition. Therefore, it is necessary to establish more ranger stations to increase patrolling frequency in that area. Both, permanent as well as temporary guard stations should be constructed. Temporary guard stations should be set up immediately after the harvesting period from November to January, as this is the time for more intensifying activities within the park boundary (Trisurat, 1989). A permanent station should be located between Ban Nong Bong and Ban Huai Dua in order to preserve the remaining forest in the northwestern section of the park.

There should be increased frequency of patrolling, especially, in the Strict Nature Reserve Zone and other vulnerable areas. Radio communication equipment should be made available so as to facilitate communication among guards and stations, and between guards and stations. The maintenance of boundary in all directions and especially along the adjoining villages is essential. The previous boundary demarcation signs have been destroyed or removed. It is suggested that the park should mark the border using concrete posts and other signs.

### ***Restoration of Vegetation***

Restoration is a method to retain the park ecosystem and improve wildlife habitat. As mentioned earlier, nearly 31 percent of the park land is suitable as a Recovery Zone. Restoration should mainly be done by way of introducing agroforestry so as to resolve land use conflicts. It could serve as a buffer zone between the park land and agricultural area, thus, conserving biodiversity as well as providing economic benefits to the local people. The *Taungya* system of agroforestry is suitable in that area with plantation of *Pinus merkusii* and upland crops. When restoring the degraded areas, care should be taken not to damage the existing trees. The pine tree is a fast growing native species which can grow to about 30 cms in the first year. Where improvement of wildlife habitat is important, such as in the Phu Ma Fuang Mountain, native fruit trees including *Cephalotaxus graffithii* and *Mangifera longipetiolata* should be grown which attract a large number of birds and monkeys.

The park authority should implement the restoration program with support from the Tam Mun Noi Reforest Station in the Phu Rua District. Since 1989, it has reforested 1,000 rai of land. The park had proposed to reforest 1,000 rai of land every year beginning from 1990 until 1994, while the Reforest Station will recover 500 rai every year. This means that almost 35 percent of the Recovery Zone will have been restored by the end of 1994.

### ***Visitor Interpretation and Education***

The visitor number in the park is rising every year together with the increase in potential threats from negative impacts. Owing to the water shortage during the dry season and the short visitor stay, usually, one day, there is no need for additional accommodation facilities. The existing bungalows and campsites are sufficient for the overnight visitors of which sixty percent stay for one night only. However, the visitor facilities require maintenance and improvement. As garbage disposal is becoming a serious problem, its adequate management is essential. It is recommended that visitation should be closed from March to May when there is shortage of running water. Also, the park personnel need to pay more attention to increasing incidence of poaching, encroachment, and forest fire during that period.

As all the roads within the park are unpaved, park officials and visitors face difficulty in transportation during the rainy season. It is recommended that road from the park entrance to the headquarters should be paved, however, the width should not exceed 6 meters. The road from the headquarters to the view point on the peak and to campsites should be upgraded and well maintained, particularly, by constructing drainage ditch. The trails from the headquarters leading to Huai Phai Water Fall, campsites, and to the peak require regular maintenance, especially, during the peak visiting season. The trails in the Strict Nature Reserve Zone or the other routes that facilitate access to poachers should be eliminated and vegetation restored. A new recreation site on the Phu Ku plateau should be established if the number of trekkers and hikers is high. The existing trail from the Lad



Khang Ranger Station should be upgraded for hiking. The park should have more exhibits and displays along the trails and picnic areas.

The scope of the interpretation and education programs in the PRNP should include visitors and local people as well. Visitor interpretation techniques should include distributing brochure and leaflets, self-guided trails, and slide presentations. Topics such as the park's flora and fauna, park establishment objectives, places of interest and importance and proper visitor behavior should be discussed. The interpretation and education program must also be extended to the local villagers with the cooperation of other agencies such as the district level agricultural extension office and other non-governmental organizations. It is desirable to have mobile units and outreach programs. Making slide and poster presentations, and holding group discussion in the villages, villagers' awareness of the park could be increased. There should be exclusive program for the youth groups who, in turn, will help in conservation activities at the grassroots level. Similarly, conservation education aimed at children should be developed (Sakornsintu, 1992).

### ***Integrating Conservation and Community Development***

It is strongly recommended that the community development program initiated in Ban Sup Tai be replicated in this area (TDRI, 1987; Wells et al., 1992). The majority of the local people in the neighboring villages cultivate corn which rapidly depletes nutrients and cause decline in fertility. It has a low market value (Trisurat, 1989). The consequence is that farmers have the tendency to seek expansion of their agricultural land. The climatic and environmental conditions in Phu Rua District is suitable for growing temperate fruit trees, and sweet tamarind which have a higher market value while the incidence of soil erosion is less. The fruit trees can be harvested within five to six years. The farmers may also intercrop varieties of other crops. The fruit tree seedlings should be provided by the park and the Tam Mun Noi Reforest Station, with technical support from the District Agricultural Extension Office. This can be achieved with low investment, however, requires patience as the benefits can be reaped only after two years. Meanwhile, other short-term strategies should be planned.

The restoration program as discussed earlier requires manpower. Thus, there is potential employment opportunity for local villagers in this scheme. It is estimated that the restoration work may require as many as 150 persons. Some local villagers should also be hired as park guards, on a temporary basis, though. The income from such opportunities is potentially higher than the current average annual household income in some villages. After the harvesting season, farmers are free for two to three months from November to January. This period is also the peak tourist season. With the support at the grassroots level, villagers should be encouraged to produce souvenir goods based on local raw materials. Necessary support should be extended by the concerned authorities. Some villagers could also be hired as tourist guides provided they are adequately trained by the park authority.

### ***Administration and Inter-Agency Cooperation***

The park is centrally administered by the National Park Division, under the Royal Thai Forestry Department. It is recommended that the management authority be delegated to the park personnel in Phu Rua which will avoid the delay in decision making and implementing various activities. Currently, due to the absence of delegation of authority, the park superintendent has to spend much of his time in the Division for routine matters.

At present there is only one qualified official who is working as the superintendent. Although the park has six permanent rangers and about forty temporary guards and laborers, the majority lack the basic knowledge and skill to conduct the day-to-day operations. The superintendent is responsible for almost all kinds of technical and non-technical matters. It is necessary to have additional officers, one for resource conservation and management programs and the other for improving relationship with the local villagers, who shall be responsible for coordinating with other field based agencies for community development activities.

The park superintendent should collaborate with the Forestry Protection Station, Provincial Nature Conservation Committee, and Regional Forestry Office for resolving problems related to poaching and encroachment. The superintendent should also seek cooperation from other district and provincial level agencies, institutions and NGOs to support various development activities in the neighboring villages. The park rangers and guards should be trained in the field of resource protection and management, law enforcement and public safety and community relations. They should be made aware of the various park regulation and the legal processes. The staff working in the visitor center should be trained in interpretation programs.

### ***Research and Monitoring***

The management of the PRNP and the developmental activities carried out in its adjacent areas require adequate understanding of ecological processes and socio-economic conditions which are vital information for park planners and decision makers. Any scientific or academic research conducted by a non-park personnel is subject to the park superintendent's permission (NPD, 1987). So far, only one research has been conducted on community involvement in biodiversity conservation (Trisurat, 1989). It goes without saying that the emphasis on research is very little as compared to some other national parks such as Khao Yai. There is tremendous scope for research some of which may include a systematic collection of plant and animal species of the park for public display, and compilation of a comprehensive list; studies on plant ecology, succession and growth rate of tree plantation in the Recovery Zone; identification of suitable species for improving ecological conditions in the plantation area; studies on habitat improvement for principal wildlife species; studies on land use change and socio-economic conditions of the villagers living in the vicinity of the park; villagers attitude towards the park; and exploring alternative employment opportunities in the adjacent villages.

## **VII. SUMMARY AND CONCLUSION**

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The zoning of a park is one of many remote sensing and geographic information systems applications. Though, the National Park Division in Thailand has classified various management zones, none of the protected areas have designated such zones. This study is undertaken to identify and delineate potential areas for various zones in the Phu Rua National Park. It is based on primary as well as secondary data. While primary data include vegetation, soil, wildlife habitat and slope, secondary data consists of geology, elevation, surface water, road network and existing recreation sites and visitor facilities.

The primary data was obtained from the field survey as well as acquisition of a latest Landsat Thematic Mapping Image. The secondary data was mainly derived from topographic maps, and aerial photographs. The software used for the analysis are ARC/INFO, IDRISI and ERDAS. The overlay analysis is done using ARC/INFO while digital elevation model is constructed using the IDRISI software. ERDAS is used for digital image processing. The above mentioned eight bio-physical attributes were used in the park zoning model. The Linear Combination Method is used in which weights are assigned to each biophysical attributes and individual characteristics are rated to be suitable, moderately suitable or not suitable for certain zones. The weight and rating are based on subjective judgment. Intersecting the layers of the five individual zones, potential management zones are identified in the union map. These zones include the Intensive Use Zone, Outdoor Recreation Zone, Primitive Zone, Strict Nature Reserve Zone and Recovery Zone. The preliminary management zones are further adjusted to suit the real situation and park objectives.

Some management programs are suggested with respect to protection, vegetation restoration, visitor interpretation and education, integrated conservation and community development, administration and inter-agency cooperation, and research and monitoring.

The results and discussions in this study has indicated the potential of remote sensing and GIS applications in park planning and management. It is essential that management programs are tailored to zone-specific goals and priorities. Zoning helps to implement site specific management programs. While it helps ensure the protection of certain sections of the park, it also provides development opportunities in another sections, for example, recreation and research. Balancing the specific needs of a particular zone with the overall objective of the park, conflicts in land use can be resolved. It is strongly recommended that such studies should be conducted in other protected areas as well and any future conservation and management plan based on the objectives of specific zones.

## *Chapter Ten*

# **MANAGING RESOURCES AND RESOLVING CONFLICTS: NATIONAL PARKS AND LOCAL PEOPLE**

*by*

**Sanjay K. Nepal and Karl E. Weber**

## **I. INTRODUCTION**

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The concern for the state of the environment has become ever stronger since the 1960's and early 1970's. This has been mainly in response to the ever more apparent extent and severity of global environmental problems, which prompted various international agencies and national governments to search for a rational approach to the conservation of natural ecosystems. The establishment and management of national parks has perhaps become one of the most important ways of ensuring that the world's natural resources are utilized in a sustainable manner. During the 1970's, many national parks and wildlife sanctuaries were established all over the world, and by the early 1980's there were more than 2,600 protected areas worldwide covering nearly four million square kilometers, established in 124 countries (MacKinnon et al., 1986). Currently, more than 9,832 natural areas meet the internationally recognized criteria of a national park or protected area. These areas cover some 926 million hectares in 169 countries (IUCN, 1994).

National parks are areas characterized by Protected Area Categories I, II and IV established by the Commission on National Parks and Protected Areas (CNPPA) of the International Union for the Conservation of Nature and Natural Resources (IUCN, 1984 as cited in Hales, 1989). According to the current definition adopted by the IUCN, national parks are legally designated areas wherein natural or cultural phenomena of national significance are protected from exploitation for private gains so that they can be enjoyed by the public (Hales, 1989). Representing certain vulnerable ecosystems of the world, national parks today protect vast areas of diverse natural landscapes which are significantly rich in biodiversity. Many benefits of national parks have been identified which far exceed the costs incurred in managing them (McNeely, 1990).

## **II. THE PARADOXICAL SITUATION**

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The Yellowstone National Park in the United States created in 1872 was the first national park ever established in the modern world (Shafer, 1990). National parks in the developing countries, particularly in Asia, were established beginning in the second quarter of this century (Mishra, 1991). The goal of the North American park systems was the preservation of scenic beauty and the protection of natural wonders so that people can

enjoy them (Harris and Eisenberg, 1989). The concept that 'natural' parks should "represent the vignette of primitive America" laid emphasis on 'setting aside' certain 'special' places to protect them from the ravages of ordinary use (Hales, 1989). The 1972 Second World Conference on National Parks in Grand Teton, Wyoming, U.S.A. exclusively focussed on the 'traditional' concerns of national parks. The general perspective was that of "standing on the boundary of a park looking inward" (Hales, 1989). Parks were considered as the places for conserving biodiversity and public recreation, and they were to be protected by the highest national authority.

In contrast to the North American park system, the British system recognized human beings as integral component of the natural landscape and incorporated the principles of ecodevelopment, sustainable resource use and rural development. The British authorities have promoted agriculture within the national parks and expressed concern when the population engaged in agriculture within the parks declined (Harmon, 1991). Similar park models can be found in France and South Korea, where a variety of land uses such as agriculture, forestry, fisheries and other developmental activities have been accommodated (Beede, 1991; Woo, 1991). The management policy in the U.K. system is one of 'multiple-use' as against the 'preservation' philosophy of the North American system (Hough, 1991c). Thus, there was an apparent distinction in the concept of national parks between these two systems. While the North American parks were based on a romanticized vision of primitive areas, the British parks were conceived through a pragmatic approach.

The Third World countries have widely adopted and applied the aspects of the early North American parks. Over the years, the establishment of national parks has had severe, adverse impacts on local traditions and beliefs or cultures as such, in some instances resulting in disastrous side effects. Some indigenous people and their customary rights were largely ignored, and many cultures, which otherwise could have been valuable in reinforcing conservation, vanished gradually. Relocation, obsolescence of cultural values, social disintegration, economic dependency, unsustainable harvesting and severe conflicts over resource use are some of the major negative impacts of the establishment of national parks.

A striking example, where relocation of the native population for the creation of a national park resulted in the total breakdown of a tradition and culture, morale and social system is that of the Ik tribe in Uganda. The displacement of this traditionally hunter-gatherer society changed their life-style making them dependent on a sedentary farming system which they were incapable to adopt. The Ik, previously living in clusters of some 100 households each, now were grouped together to a size of more than 400 households. The resettled land was unsuitable for agriculture, constraining them to produce only three crops every four years. A long drought resulted in starvation. Previously collaborative Ik, then, became solitary hunters for survival, not letting other members of their community know about hunting grounds and opportunities. This resulted in suspicion among them, eventually leading to social disintegration and collapse of their culture (see Calhoun, 1991).

Once the traditional practices and customary rights of indigenous people were restricted severely by regulations laid down for the establishment and management of national parks, they violated these regulations by indulging in then illegal activities like hunting, poaching and logging. Far worse, the case of the Bisa in the Central Luangwa Valley in Zambia illustrates that native people can be manipulated to engage in extensive wildlife hunting for the benefit of outsiders (Marks, 1991).

The Western concept and its various approaches to nature conservation have been widely criticized in the Third World, where realities are so different. Nature conservation is not a new concept to most of those people who have upheld certain principles or rules of natural resource utilization, though often enforced by an absolutist central authority. By and large, local people overtly resent the new laws which curtail their customary use of natural resources. Although decrees and sanctions have imposed severe restrictions, impacts of spontaneous actions have continuously threatened national parks in the Third World. The increase in population and the necessity of growing more food for survival have led to the exploitation of resources within the parks. In certain other cases, parks have been encroached either by farmers for field crop cultivation or livestock grazing, or by influential persons to exploit rare natural resources or even establish estates such as recreation resorts, golf courses and country clubs.

The governments of developing countries, largely restricted by a rural subsistence economy, realized in the mid-seventies that the conservation strategy must be variously tempered in their particular situation, if the park projects were to be successful. They realized that the concept of strict protection is ill-suited to the needs and problems of local, often native people, and thus remains largely an inappropriate Western concept. For the first time, the Third World Congress on National Parks held in Bali, Indonesia in October 1982 focussed its attention on the relationship between protected areas and human needs and stressed the relevance of integrating protected areas with other major development issues (Mishra, 1991). Several national parks were established in line with this approach. Some successful examples include the Dumoga-Bone National Park in Indonesia, five newly established national parks in Sri Lanka, and an extensive system of protected areas in Indochina, which were all directly linked to the development of water resources (McNeely, 1987 as cited in Mishra, 1991). This concept was further reinforced by the MAB/UNESCO Biosphere Reserves Action Plan adopted at a meeting held in Minsk, Belarus in 1984 (Sayer, 1991). The orientation had been changed resulting in a new emphasis on diverse pragmatic approaches to solving resource conflicts. It was debated whether the focus should reach beyond the park boundary, or whether any park boundary should exist at all. These deliberations indicated the necessity to demonstrate the direct relevance of nature conservation to human beings, if any conservation attempts were to be successful. The sentiment was commonly expressed that protected areas must not be regarded as 'isolated islands' due to the fact that they eventually will become surrounded by land uses modified greatly by humans (Wilcox, 1983 as cited by Hales, 1989). This was reiterated during the Fourth World Congress on National Parks and Protected Areas held in Caracas, Venezuela, which called for innovative programs of integrated planning and cooperative

management at the bio-regional level that will support the roles of protected areas and directly involve the local residents and resource users (IUCN, 1993).

### **III. THE PARK - PEOPLE CONFLICT**

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The expansion of the protected area network in the Third World has laid the heaviest burden on local communities, indeed, which has proven to be a gross disincentive to effective conservation (Wells, 1992). The harsh reality of an ever more rapidly growing human population, largely living in poverty and need of using natural resources to an ever greater extent has threatened the integrity of national parks. The local communities living adjacent to national parks bitterly complain that their interests and values are pushed aside, giving virtually exclusive preference to wildlife protection instead. This perception has resulted in hostile attitudes towards wildlife which have fuelled open and intense conflicts between local communities and conservation authorities. Such conflicts are common in protected areas throughout the world. In a sample of 100 parks from 49 countries, Machlis and Tichnell (1985) identified 1,611 specific threats to parks (McNeely, 1989). The fundamental issue of these conflicts is the customary right of use of park resources by local people, which has raised basic questions of humanity and survival. These conflicts have caused severe damage to park resources and jeopardize the accomplishment of set objectives to be met by park administration and management (Neumann and Machlis, 1989). These conflicts are varied in nature and highly interactive, multidimensional, strongly biased, belief ridden, value based, and plainly objective, the repercussions of which contribute to the generation, escalation, and persistence, yet also the resolution of related conflicts (Bowonder, 1985-86).

As the majority of the protected area related conflicts are deeply rooted to issues of poverty and overpopulation, the solutions of which is rather a lengthy and complicated process, it might be necessary to think of 'conflict management' rather than 'conflict resolution.' Varied in nature, though, the majority of the conflicts have certain common characteristics such as involvement of a large number of stakeholder; conflict management or resolution largely beyond the control of protected area managers which are influenced by several institutional, legal, political and economic factors; conflicts often complicated by scientific uncertainty and by tension between scientific and local, indigenous knowledge; and shortage of funding which inhibit protected area manager's ability to deal with conflict situations (Lewis, 1994).

Local people who once were enjoying free access to areas henceforth covered by parks and were able to meet their needs from "inside" resources, now no longer have legal access. They have seen the park as an attempt by the government to curtail their access to their traditional rights of resource use. As a result, illegal activities such as hunting and poaching have intensified, and there are many cases of confrontation between park officials and local people. Moreover, several species of wild animals of national parks have caused losses by damaging agricultural crops and predating on livestock, which has further aggravated the problem.

The Cahuita National Park in Costa Rica was established as a national monument by an executive decree in 1970, with no consultation of the local residents. The residents' access to natural resources was infringed upon, which resulted in an escalated conflict to the extent that the working relationship broke down (Kutay, 1991). Similar conflicts have occurred in the Amboseli National Park in Kenya. There, changing land use, attitude change and dwindling open spaces have compressed large mammals into the confines of small parks, where they are subject to harassment by an ever increasing number of visitors (Western, 1982). Wild animals and cattle herds of Masai pastoralist have competed for grazing. The cattle herds have also relied on the swamps during the dry season which have been the foraging ground of the wildlife as well. Obviously, the Masai have given priority to their herds, which has afforded them a good reason to hunt the wild animals. The wildlife seasonally migrated beyond the confines of the park boundaries onto land owned by the Masai. This has led to the killing of wildlife such as rhinoceros (Fitter, 1986).

A study of game reserves in Nigeria concluded that the main social problem in wildlife management was the location of the 21 hunting settlements around the periphery of the reserve (Osemeobo, 1988). This resulted in three main constraints in wildlife conservation, namely, cattle grazing, poaching, and farming. This was further compounded by the lack of trained manpower to staff the game reserves and insufficient budget allocation. The impact on wildlife of forest clearing linked to subsistence agricultural systems, which are under stress from rapid population increase, has caused conflicts in some countries of the Pacific Basin (Pernetta and Hill, 1984; Berkmuller et al., 1990).

Conflicts arise not only out of ecological malpractice but are also the reaction to cultural and social interventions from outside (Jefferies, 1982; Weber, 1991). Indigenous people had evolved certain forms of coexistence with wildlife around them which permitted both to survive. The recent transposition of conservation strategies directly from industrialized countries, however, has ignored and foiled those survival strategies. This has had a negative impact on such ecosystems, and conflicts in securing rights to the use of available resources have often resulted in the loss of wildlife (Lusigi, 1981; Kwapena, 1984). In Nepal, regulations issued by the Sagarmatha National Park authority provoked much resentment among the indigenous Sherpas, and ever more frequent conflicts between park authority and local people in the vicinity of the Royal Chitwan National Park have continued to jeopardize the integrity of the park (Weber, 1991; Nepal and Weber, 1993). In the latter, the principal causes of conflict were loss of crops, livestock and human life, illegal hunting and fishing, and prohibition of livestock grazing, firewood collection and grass cutting (Milton and Binney, 1980; Mishra, 1982; Lehmkuhl et al., 1988; Sharma, 1990; Nepal and Weber, 1993).

Conflicts over resource use have not been limited to protected areas only but have also occurred in formerly densely forested areas in countries like Indonesia, the Philippines, Thailand and Malaysia. There, conflicts escalated when logging rights were given to concessionaires disregarding the customary rights and traditional practices of utilization of the resident people and the impact of commercial, large-scale and mechanized logging on their source of livelihood (Mishra, 1991). Similarly, when the formerly forested areas in



Kalimantan, Sumatra, Sulawesi and other parts of Indonesia were opened for human settlements under the transmigration scheme, conflicts occurred due to crop raiding by elephants whose habitat was encroached upon (Fitter, 1986).

The issue of conservation entails conflicts embedded in people's attitudes and inequalities of resource allocation. The magnitude of the problem has become much greater than had been anticipated few decades ago. There is a growing recognition that protected areas or parks must be dealt with through a human ecological approach due to the fact that the existence of a native population in any place involves complex interactions of ethnic, social, economic, political, historical and biological kinds (Mares, 1986 as cited in McNaughton, 1989; Lusigi, 1984b as cited in Shafer, 1990; Western, 1989). Concepts based on intellectual or aesthetic values have little meaning to local villagers who have to struggle day-in day-out for their existence. The crucial matter then becomes how to maintain a harmonious relationship between a national park and communities in its surrounding area. This is rather a difficult task, given the varied nature and complexity of the problem.

#### **IV. APPROACHES TO RESOLVE CONFLICTS**

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Four main principles in resolving conflicts about protected areas have been identified which include (i) focussing the underlying issues, (ii) addressing the procedural and substantive dimensions of the conflict, (iii) including all significantly affected stakeholders in arriving at a resolution, and (iv) understanding the power that various stakeholders have and taking that into account when trying to resolve the conflict (Lewis, 1994). Similarly, most of the conflict resolution strategies have a combination of several elements such as (i) addressing the procedural interests, which mainly entails involvement of various parties interested in the conflict resolution, (ii) addressing the substantial issues, which means providing local communities with benefits from the protected area or mitigating its adverse impacts, (iii) enforcement to prevent or respond to illegal activity, (iv) education or public relations efforts, and (v) research for the development of substantive solutions to the conflicts (Lewis, 1994).

Four key mechanisms for systematically addressing protected areas and solving conflicts with local people have been identified. These include interactive planning, holistic social impact assessment, synergistic multicultural interaction and mediation, and negotiation and joint problem solving (Bidol and Crowfoot, 1991). Various resolution strategies have been developed fitting particular situations. The varied nature, magnitude and intensity of conflicts in various parts of the world indicate that each case must be carefully analyzed and the resolution be tempered to the respective situation. Throughout the years of protected area establishment, these techniques and strategies have gone through many trial and error approaches.

The social impact assessment (SIA) method is considered useful for predicting and mitigating impacts of protected areas on local people. SIA is a tool that, through the systematic gathering and analysis of social data, can be used to assist in predicting the

impacts of alternative courses of action on local societies (Hough, 1991b). It may also identify options and provide feedback that could lead to the resolution of conflicts. The systematic way of data gathering for SIA may include direct observation, interviews with local people and leaders, questionnaire surveys, and collection of demographic and economic statistics (Bidol & Crowfoot, 1991). In the planning of the Lake Malawi and Kakadu national parks, SIA mitigated certain undesirable effects which, otherwise, could have been detrimental to the local population. Some sort of SIA was also applied in the planning for the Annapurna Conservation Area Project in Nepal and the Mount Kulal Biosphere Reserve in Kenya (Lusigi, 1984a as cited in Hough, 1991b). In these cases, the outcome of SIA provided guidance in finding new alternatives beneficial to both the protected area authority and local people. SIA can be very effective in mitigating anticipated conflicts, if done prior to the establishment of a park. However, even if a park is already established, it could play a major role in offering solutions and assisting in the implementation of new alternatives. Thus, SIA becomes more of a tool of mitigation than a solution to park-people conflicts.

The co-management or joint management approach has been considered as effective in mitigating any potential or existing conflicts. The principle of co-management refers to the resolution of conflicts according to the local social and land use circumstances. Emphasis is laid on local control, self-determination and true power sharing with the central authority (Goodland, 1991). The rationale of putting emphasis on co-management is rooted in the long history of inequality in the use of resources and influence in the decision-making process controlled by local leaders and elites, who would usurp projects for their own benefit, thus hindering the socio-economic development of the poor, in particular. Co-operative relationships with local residents in and around protected areas are of utmost importance as well in understanding the dynamics of the natural environment of a park and the effects of resource use. The resolution of conflicts in resource use should be based on an agreed framework, where the park interests and satisfaction of the local community converge. Conflicts can be settled congenially only if park authority and local people are convinced that agreement is possible, although such conflicts exist. A resolution can then be institutionalized through regulations, public participation, general education and environmental mediation (Bowonder, 1985-86). One very good example of successful co-management is the case of the Wood Buffalo National Park in Canada, where there is a long tradition of resource harvesting by the native population (East, 1991). The hunters and trappers have been recently involved in resource management decisions. Efforts have been made to create consultative structures through the establishment of the Wood Buffalo Park Hunters and Trappers Association for the management of trapping using the Group Area System. This system gives the members of the association effective control over trapping in specific areas. A wildlife advisory board to advise the minister on aspects of management of traditional areas was established, where the majority of the voting members are from the association. They also have the 'Rights of First Refusal' on economic activities which might be promoted in the area of traditional interest. However, there was confusion as how power should be shared (East, 1991). Similarly, the cases of Coburg and Kakadu national parks in Australia illustrate that there can be very little real power-sharing in

management decisions, although the basic elements of co-management seem to exist (Weaver, 1991).

The Michiru Mountain Conservation Area in Malawi and the Annapurna Conservation Area Project in Nepal may serve as good examples of the application of top-down and bottom-up approaches, respectively (Hough and Sherpa, 1989; Hough, 1991a). Both projects emphasize the co-ordination of activities rather than control. The failure to devolve real power to the local level resulted in lack of people's participation in Michiru. In contrast, local people were entrusted with considerable power in Annapurna (Hough and Sherpa, 1989). The top-down approach was unsuccessful as the benefits did not trickle down to the poor. The bottom-up approach emphasized institution building to foster conservation efforts and was able to establish village level institutions. Although not the best technical solution, it was, socially acceptable and sustainable, indeed.

The future of the national parks depends much on the support by the local communities living in adjacent areas. There is uncertainty that local people will have any regard for a park, owing to their heavy dependency on natural resources in the area demarcated off-limits and their subsistence mode of living. Restricting their access to traditionally used resources will not only jeopardize their occupational means, but may have a high potential for catastrophic side-effects (Hough, 1988). Local people tend to become hostile and aggressive if benefits do not accrue to them. The acceptance of the park by the local people is essential to formulating any management program. People's negative or often malevolent attitudes can be dispelled by involving them in decision making regarding the ownership of resources and park related aspects of planning and management. There may be no better way of accomplishing this than by encouraging a feeling of belonging and a sense of responsibility through the active involvement of local people in the establishment of protected areas (Reti, 1985). Thus, a participatory approach which emphasizes local people's involvement in park-related activities is indispensable for the long-term success of conservation (Ishawaran and Erdelen, 1990; Buschbacher, 1990; Bosworth, 1982; Jefferies, 1982).

Local people can perform many kinds of park management roles depending upon their aptitude, interests, as well as formal education and training offered and received. The Mapimi Biosphere Reserve of Mexico clearly demonstrated that it is possible to involve the local population in research and conservation. The formal integration of the local people in policy-making has initiated their support, which has become the impetus for direct participation in the activities of the reserve. The local people have also been instrumental in achieving the conservation goals of the reserve. This success can mainly be attributed to the continuing involvement of local peasants and policy as well as decision makers, who have become partners in the management team (Halffter, 1981). Likewise, the planning, management and administration of the forest parks in New Zealand explicitly involve the local community, thus becoming a model for the South Pacific countries (Holloway, 1985). Similar success was achieved in the Amboseli National Park where, through various forms of local participation in the planning and management of parks, the landowners were successfully entrusted with the task of

wildlife conservation. In East Africa, participation became feasible by diverting benefits from the town population to the Masai, the traditional subsistence herders (Western, 1982).

The varied nature of park ecosystems in many countries indicates that broad, cooperative and integrated approaches to park management have to be developed. This means that a single authority can not solve the resource problems which are the major sources of conflict. There are some examples where an integrated planning approach to resource conservation and development was applied. In Rwanda in eastern Africa, efforts are geared to establish an integrated regional approach to conservation based on the MAB concept (Gilbert, 1988). This approach includes plans for developing an integrated database for various sectors including forest, soil, water, wildlife and human population, and strengthening the institutional capabilities. The regional landscape is considered as an essential component in park planning.

In the last few years, the concept of integrating conservation with development is gaining popularity in the conservation of protected areas. Known as the integrated conservation and development projects (ICDP), attempts have been made to link biodiversity conservation with local, social and economic development (Wells and Brandon, 1993). The ICDP approach is based on the premise that the successful management of protected areas ultimately depends on the cooperation and support of local people in the design, establishment and management of protected areas. This management philosophy reflects the position, embraced at the 1992 World Parks Congress in Caracas, that it is neither politically feasible nor ethically justifiable to exclude people with limited resource access from parks and reserves without providing them with alternative means of livelihood (Brandon, 1995). Such projects range from a small and simple initiatives to large and complex rural development schemes implemented in varied local site conditions. In Africa, examples include Air-Tenere National Nature Reserve in Niger, Amboseli National Park in Kenya, Beza Mahataly and Andohahela Reserves in Madagascar, Bururi Forest Reserve in Burundi, East Usarubara Mountain in Tanzania, Nazinga Game Ranch, Burkina Faso, South Luangara National Park in Zambia and Volcanoes National Park in Rwanda. In Asia, noteworthy are the Annapurna Conservation Area and Royal Chitwan National Park in Nepal, Khao Yai National Park in Thailand, Dumoga-Bone National Park and Gurung Lenser National Park in Indonesia; while in Latin America Central Selva, Peru, Monarch Butterfly Overwintering Reserves, Mexico, Osa Peninsula, Costa Rica, Sian Ka'an Biosphere Reserve, Mexico and Talamancas Region, Costa Rica (Wells et al 1992).

The ICDP projects have expanded considerably and the approach now attracts a significant proportion of the international funds available for biodiversity conservation projects. However, the majority of the projects have been practically very limited in terms of eliciting local participation. An evaluation of 23 such projects indicate that the approach is challenging and complex, as it is essential to have a clear understanding of the socio-economic context of each project and elicit local participation, which is apparently a lengthy process requiring patience and long-term commitment. The study also revealed that promoting social and economic development in remote rural communities is difficult and

that the government protected area management agencies' capacity to participate in such activities is very limited (Wells et al., 1992).

## **V. CONFLICT RESOLUTION STRATEGIES**

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Several conflict resolution strategies have been proposed, which mainly focus on providing benefits to the local human population living in and around the national parks, i.e., "managing protected areas to support the overall fabric of social and economic development; not as islands of anti-development, but as critical elements of regionally envisioned harmonious landscapes" (McNeely, 1985). This can be understood as urging park planners and managers to "look beyond the park boundary". It emphasizes the need for socio-economic development of the surrounding communities and stresses the vital importance of profound knowledge of and experience with the human ecology lying beyond the park. The conflict resolution strategies as discussed hereunder are mainly based on the premise that making people within the ecosystem the recipients of economic and social benefits created by the park is perhaps one of the best ways to ensure a harmonious relationship between park and local people.

### ***Sharing Benefits***

The future of protected areas largely depends on the conditions and standards of living of the local people. As long as the local people remain poor, they will not appreciate the aesthetic values of conservation. Programs based on revenue generated by or through national parks have positive impacts on the local people, which not only offer employment opportunities but also develop in them positive feelings towards national parks (Ishwaran and Erdelen, 1990). Jobs and small business opportunities, government incentives and policies to enhance rural employment within and outside national parks are of considerable significance in securing benefits from the national parks (Nelson, 1987; Lehmkuhl et al., 1988). The absence of any benefits may make the people become detached or even hostile towards conservation efforts. A study carried out in Natal, South Africa revealed that those people who were relatively affluent and benefitted from the park's activities had positive attitudes towards the park (Infield, 1988). This highlights the necessity to integrate conservation areas within local economies.

There are many successful examples where people were supportive of the park that provided them benefits. In Kenya, where land and wildlife are seen as commodities and not as a resource base for recreation, a new wildlife conservation approach was worked out, in which considerations are given to providing employment and similar benefits to the local people (Lusigi, 1981). In the Amboseli National Park, conflict was greatly reduced by enabling the local people to benefit from tourism (Fitter, 1986). It was demonstrated that wildlife conservation benefits exceed their costs by means of annual monetary compensation to the Masai for any losses suffered in terms of cattle from migratory wildlife. Western (1982) estimated that wildlife tourism could generate as much revenue as 18 times the annual income of a commercial and fully developed beef economy (Shafer, 1990). Several other economic incentives such as

provision of a grazing compensation fee or employment in the park were also provided to the local people. They were motivated to support the park and abandon their unsustainable practices of shifting cultivation and forest produce harvesting by demonstrating that the total park net return amounted to US\$ 40 per hectare compared to 80 cents per hectare under the most optimistic agricultural return expectation (Hanks, 1984). Similarly, local people became strong supporters of wildlife conservation efforts once they benefitted from the game reserve of Zambia's Luangwa Valley and the Chirisa Wildlife Reserve in Zimbabwe. In Luangwa Valley, a Wildlife Conservation Revolving Fund was created, where incomes came from the harvest of hippopotamus and from the auctions among safari companies for the right to hunt in the Lower Lupande Game Management Area. Sixty percent of the income generated were spent on wildlife management and forty percent on community development projects (McNeely et al. 1990; Balakrishnan & Ndhlovu, 1992). The fund was also used to hire local residents as village scout guards against poachers. The safari companies had to hire a minimum number of local people (WWF, 1988 and 1989 as cited in Shafer, 1990). This scheme initiated the villagers' support for the National Park and Wildlife Service Management efforts. Similarly, in the Chirisa Wildlife Area, the Operation Windfall scheme provided benefits to the local people by cropping surplus elephants (Fitter, 1986). The revenue derived was channelled back to the local economy. Likewise, when jobs were provided to the aboriginal, they became valuable assets in the protection and management of the Kakadu National Park in Australia. They perceived themselves as guardians of a valuable national heritage and worked in cooperation with the Australian National Park and Wildlife Service (Orington, 1984). In contrast to these examples, the local people turned hostile if their interests and needs are not taken into consideration during the initial phase of the establishment of the Mapimi Biosphere Reserve (Halffter, 1981). The park authority in the Royal Chitwan National Park provided some economic benefits to the local people by allowing them two weeks of cutting grassland products inside the park, which helped only a little, though.

### ***Establishment of Buffer Zones***

Buffer zones are regarded as one of the suitable strategies for resolving any conflicts caused by firewood, fodder and grazing pressures. A buffer zone is an area of controlled and sustainable land use, which separates the protected area from direct human pressures and provides valued benefits to neighboring rural communities (MacKinnon et al., 1986; Orsdol, 1987; Ishwaran and Erdelen, 1990). More recently, a buffer zone has been considered an area where "restrictions placed upon resource use or special development measures are undertaken to enhance the conservation value of the area" (Sayer, 1991 as quoted by Wells and Brandon, 1993). Orsdol (1987) has discussed several case studies on various forms of agroforestry buffer zones that had been implemented. These studies underline the necessity to incorporate some key design elements for the successful implementation of agroforestry buffer zones around protected areas.

An integrated approach to the buffer zone concept emerged from the 1982 National Parks Congress in Bali, Indonesia. It was realized that natural resources cannot be 'locked away' from the surrounding population, as protected areas actually represent

problems of integrating their management with the development needs of the local population. A recent study has indicated that there has been much confusion about the buffer zone concept regarding its purpose, location, management, and criteria to determine the area, shape and permitted uses (Sayer, 1991 as cited by Wells and Brandon, 1993). Although several definitions of buffer zones have been proposed, there are hardly any realistic and convincing models. In practice, very few buffer zones have been successful in meeting their objective. Some which were established are almost non-functioning, and there appears a wide gap between buffer zone planning and reality, which is partly attributed to lack of legal authority of protected area agencies over these zones (Sayer, 1991 as cited in Wells and Brandon, 1993). The mega buffer zone projects often failed to incorporate local knowledge and pursued objectives that were inconsistent with local people's needs (Sayer, 1991). In contrast, those buffer zone projects whose design adequately included local, indigenous knowledge were able to mobilize local initiatives. Although their overt and immediate impact has been less spectacular, they have been proven to be sustainable, rather than the bigger projects which sought to bring about rapid changes (Sayer, 1991). These examples stress the necessity of exploring local people's preferences for and know-how about matters necessary for and conducive to buffer zone establishment.

### *Indigenous Methods of Conservation*

Understanding the profound knowledge that the members of a local community possess may, indeed, be valuable for management decisions on the park so as to facilitate settling a conflict (Baines, 1984; Kwapena, 1984; Orington, 1984; Swem and Cahn, 1983; Hill, 1983). The vast array of the knowledge of the local people, their beliefs, attitudes and values if directed properly, may bring positive results, which otherwise could also be potentially coercive and devastating (Messerschmidt, 1985).

There is a growing realization that local people's traditional methods of conservation were sustainable, indeed. Examples of traditional methods of conservation are found throughout the world. In Asia, these include the sacred forests in India, community forest management among the Sherpa of Nepal, and hunting rituals in Burma, Thailand, Cambodia and Indonesia (Mishra, 1991). Similarly, there are many examples of mythical and spiritual relationships with plants and wildlife throughout South and Southeast Asia (see McNeely and Wachtel, 1990). The Yanomani and Kayapo Indians of Brazilian Amazonia had long ago discovered the secrets of sustainable use of forest resources, which indicate that their indigenous methods vitalized and rejuvenated the forest, adding not only to its diversity but also increasing the population of wild species (Nations, 1988). The Tukanoan Indians in the Amazon region have been practicing sophisticated and complex indigenous agricultural systems which can serve as models of sustainable agro-ecosystems and conservation (Dufour, 1990). Houseal discovered that indigenous methods of resource utilization in Central America were highly productive and sustainable (Houseal et al., 1985 as cited in McNeely, 1990).

### ***Change in Local People's Attitude***

To understand the interrelationship between park and local people, it is vital to become familiar with the perceptions and attitudes of the local people, with the ultimate objective of conflict resolution. It is necessary to explore the potential among local people in making decisions on how local people should be motivated for conservation.

Public perception of wildlife conservation varies greatly from one group to another. Some may have a positive conservationists attitude, others may have a negative attitude, and still others may be indifferent to conservation values (Kellert, 1985). Farmers' attitudes towards the Prespa National Park, Greece was found to be hostile, as a result of exacerbating conflicts over land use (Pyrovetsi and Gerakis, 1987). Therefore, some training of local farmers in using conservationally sound land use practices was recommended. Villagers showed strong support for wildlife preservation in Mt. Kinabalu, mainly due to the improvement of transportation and development of new schemes concomitant with the establishment of the park (Jacobson, 1991). Household affluence and attitudes towards conservation showed a positive correlation in a study carried out in Natal, South Africa. More of those household heads who had directly benefitted from the conservation area were positively inclined than among those who had not given any importance to allowing local people access to wildlife resources and building a mechanism to integrate conservation areas into local economies. The positive attitude in the community tended to intensify with the level of education (Infield, 1988). Thus, level of education and standard of living seem to be the major determinants of a positive attitude towards nature conservation.

### ***Conservation Education***

One essential requirement for and basis of local people's involvement in park planning and management is conservation education to widen and deepen their perspectives. The significance of education for the understanding and implementation of conservation and sustainable development is stressed in the national conservation strategies of many countries. Little is stated, however, about the roles of parks and protected areas in promoting awareness and creating the required knowledge and skills (Nelson 1987). While local people might be aware of the environmental degradation they are causing, their immediate concern for maximizing profit makes them dismiss or suppress their awareness.

Environmental education has been considered as an effective tool in achieving conservation goals, provided their long-term benefits are highlighted (Miller, 1982). The mass media could play a significant role in environmental education. Likewise, NGOs have high potentiality in creating public awareness (Meyers and Meyers, 1983; Brinck et al., 1988). Any grassroots level environment education program tackling real problems and finding solutions will have, in all likelihood, an immediate impact on its participants. The acute shortage of concrete problem solving approaches might imply that the education process is largely closed off from its surrounding conditions, thus remaining of limited practical effectiveness.



The Mapimi Biosphere Reserve demonstrated that the involvement of local people in park management and resultant changes in their attitudes are feasible by means of focused environmental education and conservation programs. There, local people have become instrumental in attaining the conservation goals of the reserve (Halffter, 1981). Formal and non-formal environmental education may both become effective in a big way provided they include the distribution of notices and posters, slide presentation or film shows in villages, holding discussions with neighborhood land user or farmer groups, and holding fora at local venues that offer an opportunity for exchanging information (MacKinnon et al., 1986).

### ***Increasing Financial Assistance***

Adequate financing of environmental conservation programs in developing countries has been a major problem. Not only do local people give low priority to conservation efforts, but government agencies are strapped by tight budgetary constraints. These might be eased by seeking international financial and technical assistance. If protected areas in developing nations are to remain viable in the future, a great deal of support should be extended by international organizations. They can facilitate and support conservation efforts of developing nations in many ways (Ramos, 1988).

Several funding mechanisms at national and local levels that have been identified include charge entry and other fees to national parks; charge for ecological services, for example, in watershed areas; special taxes levied on biological resources such as in Costa Rica; funding linkages with large development projects to generate an environmental maintenance tax; return profits from exploitation of biological resources, e.g., from tourism to the local people such as in Kenya, Zimbabwe and Zambia; conditioned agreements; support from the private sectors; establishment of foundations for conservation; and collection of interest from investments made by protected areas (McNeely et al., 1990). Another way to seek funding for protected areas is by swapping debt for nature. Under this scheme, a portion of a country's international debt is purchased or waived, based on the amount of the protected area coverage. Examples of protected areas partially created through debt swaps are the Monteverde (Cloud Forest), Guanacaste and Corcovado in Costa Rica (WCMC, 1992). This type of funding scheme has been arranged for Philippines, Poland, Dominican Republic, Guatemala, Jamaica, Mexico, Argentina, Bolivia, Ecuador, Peru, Madagascar, Sudan and Zambia (WCMC, 1992). The popularity of this scheme may decline as some governments claim that it is politically offensive to the extent that the sovereignty could be threatened. Another disadvantage is that large amounts of money are required to make the deal.

Multilateral support for biodiversity conservation has increased dramatically as a result of the Global Environment Facility (GEF). Administered by the World Bank, UNDP and UNEP since 1991, the GEF has committed about US \$ 300 million to more than 40 biodiversity conservation projects (Wells and Brandon, 1993). Similarly, there are also local efforts in generating funding for protected areas such as in Nepal which has successfully introduced a user fee equivalent to about four U.S. dollars levied on all non-national visitors to the Annapurna Conservation Area. Unlike other national park fees,

this is channelled to the administrative office of that protected area by the King Mahendra Trust for Nature Conservation, which supports over one hundred staff without any financial assistance from the government (Mishra, 1991). Private sector support is yet weak which points to a large untapped potential. Although the Tiger Mountain Group, a nature tourism enterprise operating in Nepal has established the International Trust for Nature Conservation to support wildlife protection and conservation education, its activities are limited. One possible way of private sector involvement might be the channelling of some revenue earned from tourism by the big entrepreneurs to the development of the local communities. This would not only help to reduce disparity but also motivate local people to support environment and nature conservation programs.

## **VI. SUMMARY AND CONCLUSION**

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One of the major management problems in protected areas of developing nations is the ever more intensifying land use disputes with local, often native people. The customary rights of local people over natural resources, if curtailed by the establishment of national parks, and their disregard by decision makers have given rise to open conflicts, thus, jeopardizing conservation goals. These conflicts have tremendous impact on the management of natural resources not only within the park ecosystem but also in its surroundings. To attain the interdependent goals of conservation and sustainable development, such disputes must be promptly and consensually settled. This paper briefly discussed the paradigm of national park establishment and its impact on local livelihood. It, then, highlighted major sources of conflict which have occurred in national parks in developing countries. Some theoretical approaches to conflict resolution as relevant to national parks were summarized, and several strategies as employed in particular situations are discussed.

The establishment of national parks with the strict remit of preservation has made local, native people who have had traditional and customary rights to the use of resources in such areas find themselves entangled in conflicts of all sorts with representatives of newly created authorities. The quandary is aggravated if preference is given to conservation goals, at the expense of the fulfillment of human needs. The issues of conservation are, thus, in conflict with the eradication of poverty through employment creation, nutrition intervention, growth with equity and social justice for the improvement of the quality of life in rural communities. One of the integral components of such programs was to create a land use pattern which recognizes the prime importance of food production and, at the same time, ensure as well as facilitates environmental conservation (Hanks, 1984). The mountain environment of Nepal is a striking example of conditions, where conservation requirements clash with the challenge of fulfilling basic needs of the ever growing population. Without any appropriate land use planning and management, biodiversity will remain threatened by ever faster and vaster impoverishment which, in turn, will hinder or even reverse economic development, unless the latter is guided by an environmental policy that sustains biodiversity (Wilson, 1988). This stresses the necessity of reconciling the rationale of conservation with issues like land

use and land ownership, rights of access, and decision and control over natural resource utilization.

It stands to reason that national parks should be viewed as components of larger regional human ecosystems and not as isolated entities. Any effort to control and mitigate threats to wildlife and biodiversity inside a park must consider its role and status within a wider human ecosystem. Otherwise, park managers will always have to deal with sudden land use changes in the surroundings in a defensive or protective manner rather than plan strategically with precautions for any threats or impacts (Neumann and Machlis, 1989). Local people should benefit from nature conservation through their active participation in attaining its objectives, so as to strike and maintain a balance between the protection mandate of "their" park and meeting their requirements of livelihood well above the poverty line. A multi-pronged approach to conflict resolution is fundamental to attain the ultimate goal of a participatory conservation strategy which tackles the task through integrated spatial and ecological planning (ISEP) as one strategy component of regional environmental management.

## *Chapter Eleven*

### **PROSPECTS AND RESOLUTIONS**

The establishment of protected areas has been considered one of the safest way to ensure biodiversity conservation. In the past few decades, many protected areas had been established in the developing countries of Asia. However, while the existing protected areas are under serious threats caused by human impacts, the majority suffer from weak administration, lack funding support and necessary manpower. Often the legal basis of protected area establishment is not clear which makes law enforcement difficult. Any further establishment of protected areas may be very difficult if not impossible owing to rapid population growth, poverty and declining land resources.

#### **I. SUMMARY OF FINDINGS**

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This study was undertaken to explore the overall conditions of protected area management in selected Asian countries with particular emphasis on problems related to local people. Altogether, eight case studies from five countries such as China, Myanmar, Nepal, the Philippines and Thailand were discussed. The case studies include the Wuyishan and Xishuangbanna nature reserves in China, the Alaungdaw Kathapa National Park in Myanmar, the Koshi Tappu Wildlife Reserve and Royal Chitwan National Park in Nepal, the Bicol National Park in the Philippines and the Khao Yai and Phu Rua national parks in Thailand. While the case study on the WNR highlights various positive and negative aspects of the relationship between the reserve authority and local people, in the case study on the XNNR, some essential features of the traditional agroecosystem of the Dai and Jino community are explored, and the relocation of the Bulang Community from the reserve examined. The case study on AKNP examines various conservation issues that the management is currently facing and makes suggestions for improvements. The focus in the case of the Koshi Tappu Wildlife Reserve is on livestock grazing problems in a limited resource base. The study on Royal Chitwan National Park examines the various sources of conflict, the potential for conservation among local people and feasibility of buffer zone establishment. The process of relocation is examined in the study of Bicol National Park with emphasis on the role of various agencies and institutions involved in the relocation. The local people's socio-economic conditions and the threat posed by their agricultural activities are examined in the case study from the Khao Yai National Park. Similarly, the applications of GIS and remote sensing in zoning is discussed in the case of the Phu Rua national Park. Finally, several conflict resolution strategies and approaches as employed in other parks and protected areas is discussed with a view to some suitable applications in the protected areas covered under this study. The major findings of the study are summarized in the table below. (Table 25).

Table 25: Summary of Findings from Case Studies

WNR	<p>Resource use regulation based on quota system</p> <p>Economy dependent on bamboo harvest</p> <p>Wildlife damage to bamboo and agricultural crops</p> <p>No local development plans - limited funding</p> <p>Remote region, weak and less diversified economy</p> <p>Participation limited to village representatives</p> <p>Local involvement necessary</p>
XNNR	<p>Jino and Dai community living harmoniously in the Pas</p> <p>Maintenance of traditional life styles</p> <p>Attitude of the reserve staff towards indigenous people favorable, however, view the traditional practices as unsustainable</p> <p>Relocation of the Bulang community had severe negative, social and cultural impacts</p>
AKNP	<p>Several conservation and management problems</p> <p>Management plan not followed</p> <p>New management plan required</p> <p>Suggestions related to improving park administration, community development projects, zonation, tourism development, environmental education and law enforcement.</p>
KTWR	<p>Open access status</p> <p>Fodder/firewood collection by villagers</p> <p>Livestock grazing inside the reserve</p> <p>Border demarcation - adjustments required</p> <p>Controlling crop damage</p> <p>Livestock development and management - improved breed and stall feeding</p> <p>Few influential households keeping large number of livestock species</p> <p>Strict protection and comprehensive strategies</p>
RCNP	<p>Local people heavily dependent on park resources</p> <p>Alternative sources limited, where available, heavily degraded forest</p> <p>Good potential for wildlife and local people to coexist</p> <p>Buffer zone feasible</p> <p>Earlier attempts hardly successful</p> <p>Resource use regulation essential</p> <p>Law enforcement</p> <p>Coherent integrated efforts</p> <p>Involvement of local people</p>
BNP	<p>Inadequate legal provisions, weak law enforcement</p> <p>Relocation as a strategy</p> <p>Majority not satisfied with the relocation sites</p> <p>Long term support for the resettled people essential</p> <p>Community development important</p> <p>Strengthen management capability and launch collaborative ventures</p>
KYNP	<p>Assessment of villagers socio-economic situation.</p> <p>Land distribution not equal.</p> <p>Agricultural encroachment.</p> <p>Wildlife poaching.</p> <p>Community development projects should be extensive</p> <p>Clear linkage of project with protected area essential</p> <p>Relocation</p> <p>Buffer zone establishment</p> <p>Inter-agency cooperation and involvement</p>
PRNP	<p>GIS and Remote Sensing applications in identifying management zones.</p> <p>Management programs - protection, vegetation restoration, visitor interpretation and education, integrated conservation and community development, administration and inter-agency cooperation and research and monitoring.</p>

The major sources of conflict in the case study protected areas include illegal extraction of wildlife resources by the local people, livestock grazing and wild animals damaging crops. The KYNP and PRNP suffer from agricultural encroachment. Wildlife poaching is common in the AKNP, RCNP, KYNP and PRNP. Wildlife damage to crops are serious problems in the RCNP, KYNP and WNR. The impact of livestock grazing in the KTWR is tremendous with many big herds permanently residing inside the reserve. Illegal grazing is also a major problem in the RCNP where the livestock population is recorded to be very high in its vicinity as compared to other areas. The resident community in the WNR and BNP had been relocated with the majority not being satisfied with the new environment. There is no involvement of local people in protected area management, although some form of participation by the village representatives was observed in the XNNR and RCNP. The indigenous agroecosystem in the XNNR were found to be sustainable, however, it was not known to what degree human activities were impacting on the reserve. The Dai and Jino community's various religious and cultural traditions reflect their conservation practices. In general, the attitude of local people towards protected areas is favorable. Though the majority of local people have low level of formal education, they are increasingly aware of the value of wildlife conservation in protected areas. However, attitude towards the protected area officials are not in favor, as the protected area management has tended not to respond to local people's complains and grievances. This is apparent in the case of Khao Yai and Royal Chitwan National Park. Almost all the case studies emphasize the need for linking protected area management with community development activities. In order to resolve these issues, the strategies as discussed in Chapter Ten should be implemented.

As is the case of the Bulang community in the XNNR, relocation can cause severe negative social, economic and cultural impacts and, thus, should be taken as a last resort only in situations where it is documented that resident peoples are really the cause for protected area degradation such as in the Bicol National Park. However, it should be ensured that the relocation site conditions are suitable and favorable to the displaced communities. Long-term support should be made available to them until they are stable in the new environment. More evaluation studies are required. An important consideration in relocation of people from protected areas should be the nature and type of compensation provided. The continuity between prior economic modes of production and opportunities for economic improvement should be favored over the provision of welfare services such as housing and cash payments. Without the inclusion of access to productive resources, basic needs services such as those provided to the relocated people in the Bicol National Park will not ensure their livelihood needs. Without adequate long-term support, the relocated people may eventually want to exert their traditional controls of resources.

Access to resources within park lands should be regulated as a short-term alternative until other options become available. This is necessary as there is no alternative sources of resources such as firewood, fodder, bamboo etc. outside the park boundary. Efforts should be geared towards the possibility of sustainable harvesting of certain wildlife species which are abundant in the protected areas, the sale of which could make a significant contribution to the local economy. Agricultural encroachment (Khao Yai and Phu Rua national parks) remains a thorny issue, which should be solved with the involvement of various agencies in working out integrated agricultural development policies adjacent to protected areas. Such policies should help to increase productivity and lesser need to seek for land expansion. In areas where park encroachment is motivated by commercial interests, strict law enforcement is the only alternative. Access to resources is also necessary for the

cultural identity and continuity (Xishuangbanna Nature Reserve). Because local resource needs exceed sustainable yield potential, extra effort should be made to enhance sustainable supplies within protected area zones or in the region surrounding a protected area. Such efforts should include establishing a buffer zone, firewood plantations, community forestry and agroforestry practices. Research effort should be geared towards exploring fast growing indigenous species that the local people often utilize but not well known to the foresters and yet may have good potential for use as a firewood species. Alternative sources of energy should also be made available.

The case studies on Royal Chitwan, Khao Yai, Phu Rua and Bicol national parks signal the need for recognizing the ownership of land of the local community and empowering them to regulate and manage the utilization of forest resources. In the past, the respective national governments had nationalized the forest lands and given forestry departments the legal responsibility for managing them, a task formerly carried out by the local communities relying on customary law. The lack of tenure has been a major disincentive to local people who not only cleared their own forest lands but also encroached upon state owned land for agricultural expansion. The case of the RCNP exemplifies the local people's apathy to government sponsored forest conservation activities. Sound policies are needed in the forestry sector which ensures ownership rights of the local people, thus, encouraging their participation in the conservation and management of forest land outside the protected areas.

Almost all the case studies recognize the need to involve local people in the planning and management aspects of protected areas. Local participation has been very limited in all the protected areas discussed here. There has been hardly any formal opportunity for local communities to make recommendations or comment on the current protected area policy. The consensus building process initiated in the Royal Chitwan National Park is the only attempt made so far, however, this has hardly been successful and is no longer practiced. True participation must involve a give and take and a sharing of decision-making power. Joint management on major issues such as resource use regulation and wildlife damage to crops is an unfulfilled agenda which must be given due consideration. A balance of power with institutional checks and balance may represent an optimum model as suggested by the case study on Royal Chitwan National Park. Interactive planning and conflict mediation processes should be utilized in working through the operation of these checks and balances on any given policy issue. The traditional concept of protected area must be re-examined and adapted so that it is more appropriately suited to the existing resource uses. To solicit local participation, it is essential to incorporate the local systems of knowledge and management, local rights to resources, local institutions and social organization, locally available resources and technologies, local participation in planning, management and evaluation and process-oriented and flexible projects (Pretty and Pimbert, 1995).

Because modern protected areas have tended to be established by central or provincial governments, they cannot always reflect local needs and desires. Further, most protected area management agencies are relatively young, with much of their growth coming only in the past few decades. One of the key institutional issues is to ensure that the appropriate tasks are undertaken at the appropriate levels. A strong central authority is often required to ensure that an effective protected area network is designed, that the national legal and policy framework is appropriate, and that information is built into the national curriculum. More local approaches are required to implement the protected areas, provide benefits to local communities, design appropriate buffer zone

activities, seek alternative sources of income for local people, and implement other activities to reduce the pressure of the local people on protected areas. Very few countries in Asia have yet entrusted protected area management to private institutions or NGOs. Among the case studies included here, the only exception is Nepal where the King Mahendra Trust for Nature Conservation (KMTNC) runs the Annapurna Conservation Area ensuring that conservation and development go side by side. Other local NGOs such as the Wildlife Fund Thailand and Haribon Foundation (Philippines) are also helping their respective governments to attain the interdependent goal of protected area conservation and local development. In any projects linked with protected area management where activities become multi-sectoral and beyond the confines of the protected area agency's traditional sphere of expertise, it is important that there is significant government involvement.

In almost all the countries covered under this study, the funding problems of the protected areas are part of a larger picture of rural poverty. The remote areas adjacent to protected areas are often financially neglected and poorly managed, and their under-development is a source of pressure on the protected areas. Such problems may best be addressed by funding development projects in the surrounding lands, thereby reducing pressure on the protected areas. Stressing a multi-agency approach to these surrounding lands could increase the resources available. A strong financial commitment from the national governments and the multilateral and bilateral funding agencies remains central to the improved funding situation. It is also the responsibility of the protected area planners and conservation community to utilize more effectively the funds which are already available. In the case study protected areas, management authorities lack resources, equipment and trained personnel. Traditional wildlife management training has not equipped nor even sensitized park managers to recognize the needs of local communities.

This research has identified the major conservation issues in the protected areas covered under study. The need for inter-personal relationship, effective communication and reliable information has been mentioned in almost all the case studies, not expressed explicitly in some cases, though. The following sections briefly discuss the significance of information needs and research in the context of the protected areas covered under this study. This is discussed in a more general format as it is applicable equally to any protected area.

## **II. INFORMATION AND COMMUNICATION NEEDS IN PROTECTED AREAS**

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The majority of the protected areas covered under this study have made reference to the significance of information base and means of communicating it to other related agencies, local communities and grassroots organizations. The process of gathering information provides an opportunity for the local community to discuss problems with regard to the inconvenience and constraint imposed by the protected area authority while the latter may have adequate opportunity to explain their motives and objectives in doing so and, thus, could avoid potential conflicts between them. Information gathering is a necessary first step in the process of effective communication and resolution of problems caused by ineffective management and disputes with surrounding human population.



The need for information in protected areas has been recognized as a key factor in assessing and making decisions on projects, programs and policies for both conservation and development. Such information can be viewed in several ways. Some information are more objective or descriptive than others, for example data on areas covered by forests or other types of land use. Other information is more interpretive because it involves interpretation or judgment about the significance of certain features or processes.

The relevant information should be available in a timely manner and understandable to those affected or involved in some way. To be helpful and relevant, the information base must be pluralist and comprehensive in the sense that it addresses what is considered to be significant from the standpoint of the different values and perceptions of those involved in management and those affected by land use changes. Without a wide range of information some groups could be disadvantaged because the type of information needed to make their case is simply not made available in the decision-making process. For example, some resource and environmental inventory systems do not include information on land use or on land tenure, population distribution, occupation, or other socioeconomic or cultural aspects in deciding on the design of new management measures or programs (Nelson and Serafin, 1995).

There is a real need for accurate and detailed information on the people, processes, and natural resources important to the park. Especially in the developing countries, there are hundreds of protected areas where there is almost no information at all on which to base effective conservation. This has led to some unfortunate management mistakes, such as over protection from fire resulting in bush encroachment and lower faunal diversity (Thorsell, 1992). Information is needed both on the effects of the surrounding land on the park and on the impacts of park actions on surrounding communities. Information will indeed improve our capacity to respond to existing problems and to make environmentally responsible decisions. Inventories, assessments and monitoring certain vulnerable areas within protected areas should be broad and human ecological in nature. From a planning and management standpoint, assessments are of limited value if they do not include studies of historic and present human use and management and their interactions with the environment. Documentation of the response of an ecosystem to changes resulting from human impacts are critical for effective protected area planning and management.

Some relevant information that could help in effective management of protected area should include:

- data for species - numbers, range and habitat
- species known to be at risk
- trend data on many species
- monitoring programs or trend data for major species and degraded habitats
- land degradation data
- monitoring trends in quantity, quality, use or regulation of habitats,
- carrying capacity of habitats for certain wildlife species
- use and impact of adjacent land use practices
- effects of pressure from the human use of protected area resources
- information on the local socio-economic conditions and culture
- sources and levels of impact

- existence of formal and informal institutions and their activities
- local people's attitude and level of awareness

The park staff should have detailed information on physical, biological and socio-economic aspects. Data on human population and their economic activities, as well as the existing natural resources such as flora, fauna, soil and water and their utilization by the local population is important. They should also be aware of the constraints in resolving issues that arise from local human population. Information should contain general and detail narratives, descriptions, lists etc. Activities, uses and site specific impacts should be surveyed and occurrence record maintained. Simple field surveys repeated periodically are required for a trend analysis. The local people should have access to information that help increase their knowledge and understanding of a protected area and its conservation values. Such information may include the goals and objectives of protected areas establishment, wildlife species and habitat distribution, legal basis, various rules and regulations as related to the utilization of park resources.

Broader inventory, assessment and monitoring systems are needed to collect the range of biophysical and human information that is needed in a human ecological approach to protected area planning and management. Existing inventory, assessment and monitoring systems tend to be strongly biophysical in nature, focusing on species, habitats, plant associations and the like to the neglect of human use and institutional arrangements which interact and help explain ecosystem patterns. The majority of the protected areas lack substantial information on the natural resources of the park, the sources of external impacts affecting the park, neighboring human population and living conditions, existence of various formal and informal institutions. The Abiotic, Biotic and Cultural (ABC) approach of information gathering is relevant in this context which is different than the other conventional approaches of information collection in that it includes much broader disciplines focusing on the inter-relationship of the three factors, abiotic, biotic and cultural (Nelson and Serafin, 1995). The various applications of the ABC approach have led to an increasing emphasis on finding ways of involving those affected and those knowledgeable about a local situation in assessments of the abiotic, biotic and cultural features and their significance and constraints. Methods of information gathering should try to encourage the participation of people in the community. Informal methods provide a way of sharing the information between agency and community which more formal methods easily do not allow.

Many of the protected area staff consider ineffective communication to be a serious problem. Communication difficulties lead to unnecessary confrontations and thwart cooperation between landowners, advisory groups, and politically active individuals. Effective communication requires that park personnel are good at conveying complex information to individuals with little background in natural resource science. It also implies that the park personnel have access to adequate information on both the natural resources of the park and the local communities to whom the information must be conveyed. Lack of such information make difficult to establish a mutual understanding between the protected area staff and local communities. Meetings between park authority and local people should be held frequently on which occasion whatever information is available should be exchanged. Also, when large cooperative programs are launched, lack of information and its timely availability slow down any planning and decision making. Personal interactions between park staff and individuals from the surrounding areas can be facilitated only with the availability of relevant information to both.

The results of research programs and model projects would be valuable only if effectively communicated to the park management and the local people. Effective communication and translation seldom exist in protected areas. A failure of communication can lie at the base of some conflicts between parks and their neighbors. When sufficient information is not available, the difficulty of effective communication is increased. Even when information is available, it must be conveyed adequately and persuasively to all parties involved in the conflict. This can be a daunting task, considering the vast number of jurisdictions, ownerships, individuals, agencies and corporations involved in any single park issue. There should be a two-way information flow and feedback mechanism among various agencies involved in multi-sectoral interdisciplinary projects related to protected area conservation and community development (Fig. 21). In order to make the protected areas related information widely available among various agencies working on integrated conservation and development projects in the surrounding region, an information system should be developed. The MASS (MacKinnon Ali Software System) database, established with WWF support, stores information on species, habitats and protected areas and is installed at Mahidol University, Wildlife Fund Thailand and RFD in Thailand (MIDAS, 1993). It is also being used in China and Nepal. This system however does not cover the information on human ecology surrounding a protected area which may prove valuable to those working in projects linking protected areas and community development.

The indigenous knowledge is rather a neglected source of information. Much of the information about methods of managing agricultural and natural resources available from local people is of significance to further the goals of sustainability. It may guide researchers in the selection of pertinent research questions and provide a base upon which more analytical, precise scientific investigations incorporating more sociological factors can be built. Special potential lies in the blending of traditional and modern knowledge to develop practical new technologies (Nowland et al., 1994).

### **III. RESEARCH AGENDA**

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Parks and reserves act as the focal points for scientific research and monitoring. The broad focus of the research agenda should be the problem of biodiversity conservation rather than the biodiversity preservation that has dominated much of the biological literature in the past. Concern should be the sustainability of resource use in protected areas. Among the case study protected areas discussed in the preceding chapters, the Royal Chitwan National Park is perhaps the most well researched where a center has been established to conduct research on various biological and socio-economic issues of the park.

There should be extensive use of local empirical knowledge, especially with regard to the value and usage of plants and animals. Similarly effort should be geared towards utilizing the local skills and resources for research and data collection. The results of research should also be conveyed to the local people through publications in lay man's language using illustrations. Successful programs elsewhere in Asia, for example, in Indonesia, have shown that field staff and local villagers with elementary education can be trained to collect reliable data on plant and animal distribution (MIDAS, 1993). Regular collection of such data on a monthly basis provides useful information for

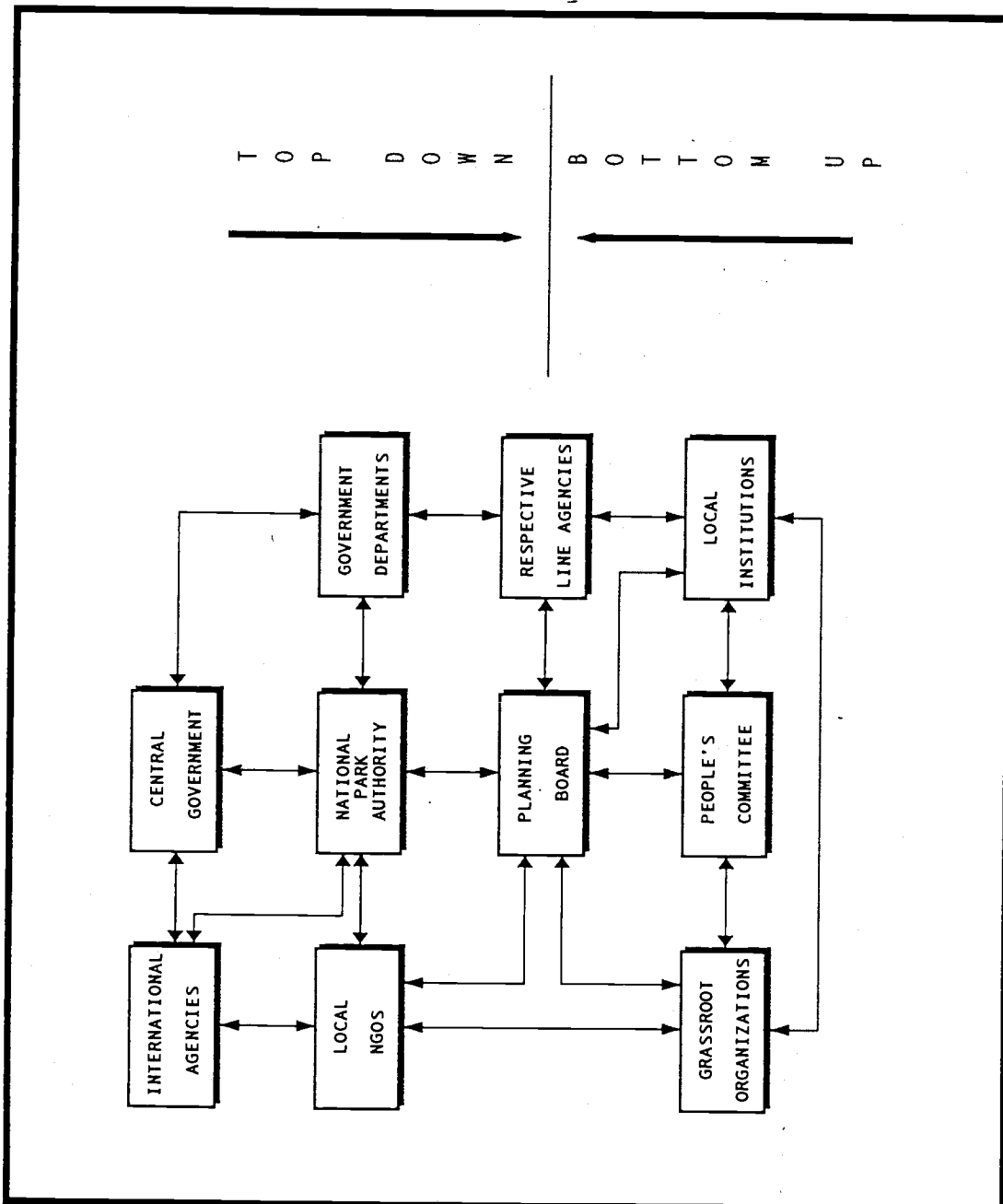


Fig. 21: Information Flow and Feedback Mechanism

management decisions. Technical assistance for training field staff and local community researchers in simple identification and field survey techniques should be provided. Project sites should be developed within the protected areas where long-term research and monitoring of impacts is feasible.

The research needs in the context of a protected area can be distinguished as biological research and socio-economic research. The biological research may include the following:

- inventory of all wildlife species in protected areas and location specific threats; this is lacking in almost all the case studies included here.
- detailed research is required on habitat requirements of important species, for example, this information is available only for rhinoceros, tiger and deer species in the Royal Chitwan National Park, while there is no information on other wildlife species.
- monitoring and dynamics of change in habitats and ecosystems; this may include monitoring the degraded habitats and the result of restoration and rehabilitation efforts.
- site specific visitor impact studies which might tell us the tolerance levels of different sites with different biophysical characteristics; this will help in preparing site specific visitor management programs.
- protected area zoning and buffer zone establishment.

Similarly, the socio-economic research may include:

- indigenous knowledge and evaluation of wildlife species and their methods of conservation; in the RCNP, an attempt has been made to document the knowledge and utilization of various plant species by the indigenous *Tharu* community (Müller-Böker, 1991).
- mechanism identifying public-involvement in protected area planning and management, institutional arrangement, and networking structure.
- mechanism for implementing short-term and long-term conflict resolution strategies.
- mechanism identifying channeling of park generated tourism revenue to local economy.
- the need for and types of manpower training and education for park personnel which would make them knowledgeable about the human ecological situation and the need to address the inherent problem with a systems approach, and develop expertise in conflict resolution.
- effective communication mechanism between park personnel and local people.
- economic valuation of protected areas and the costs and benefits involved.
- strategies for promoting recreation and tourism.
- systematic research on the socio-economic and environmental impacts of relocation and mitigating measures.
- strengthening protected area administration.

Findings based on applications of geographic information system (GIS) and remote sensing can be very useful in identifying and delineating buffer areas. A GIS can display information at different scales, combine data coverages from different sources and themes, display relationships involving time dependence, create modeling capabilities in an integrated computing environment and provide quick access to linked spatial and attribute data (Christman et al., 1989; Lai, 1990 as cited in McKendry and Machlis, 1991). Owing to its interactive capability, it provides an opportunity to experiment with known processes and simulate environmental conditions (Eastman,

1987 as cited in McKendry and Machlis, 1991). The data and information requirements for such analysis and the conventional source are specified in Table 26. GIS application offers ways and means of integrating these sets of data/information in the decision making process.

Table 26: Data/Information Requirements and Sources

Data/Information	Sources
Target Wildlife Species	Field Observation/Literature
Habitat Type and Range	Satellite Data/Field Observation
Forest Classification	Forest Map/Satellite Data
Topographical Features	Topo Map/Aerial Photographs/Satellite Data
Land Use	Land Use Map/Satellite Data
Distance (Homestead-Park)	Actual Field Measurement
Flood Prone Areas	Field Observation/Surveying
Number of Villages	Village Office/Field Survey
Household Population	Village Office
Number and Location of Market/Service Centers	Observation/Official Records
Number and Location of Industrial/Commercial Establishments	Observation/Official Records
Management Data	Concerned Authorities and Villagers
Expert Opinion	Formal Questionnaire Interviews

The GIS model identifies potential buffer areas near the protected area based on several biophysical and socio-economic criteria that influence buffer zone planning and management (Fig. 22). Through the analysis of these criteria, a realistic buffer zone design can become feasible. Also, data manipulation is feasible to experiment with simulated conditions illustrating varying scenarios. A full range of alternative management strategies could be analyzed and evaluated through GIS application including biodiversity conservation, protection of protected areas and vulnerable agricultural areas in terms of crop raidings by wild animals of the park, and integration with regional-rural land use planning and sustainable development activities.

#### IV. CONCLUSION

Given the mounting socio-economic and demographic threats to protected areas and the need to advance global sustainability, it is neither politically feasible or ethically justifiable to exclude local people from protected areas without furnishing them with an alternative means of economic survival. In other words, the concept of protected areas will not succeed unless local people derive benefits from its presence.

The concept of integrating local people in protected areas was the major theme of the 1982 Bali Congress. Yet, progress has been painfully slow and realities vary depending on the outlook of the observer. After years of concerted efforts, there are still relatively few conservation and development success cases. Even the best protected areas are threatened by many off-site factors which are beyond the control of protected area authority. If modern conservation has its origins in the developed West, its shortcomings are being exposed most harshly in the developing countries, where population pressure and poverty are tearing down the richest and most intact ecosystems on the earth. The Western concept of preservation by segregation is alien to societies evicted from their traditional homes and denied use of animals and plants within newly created protected areas.

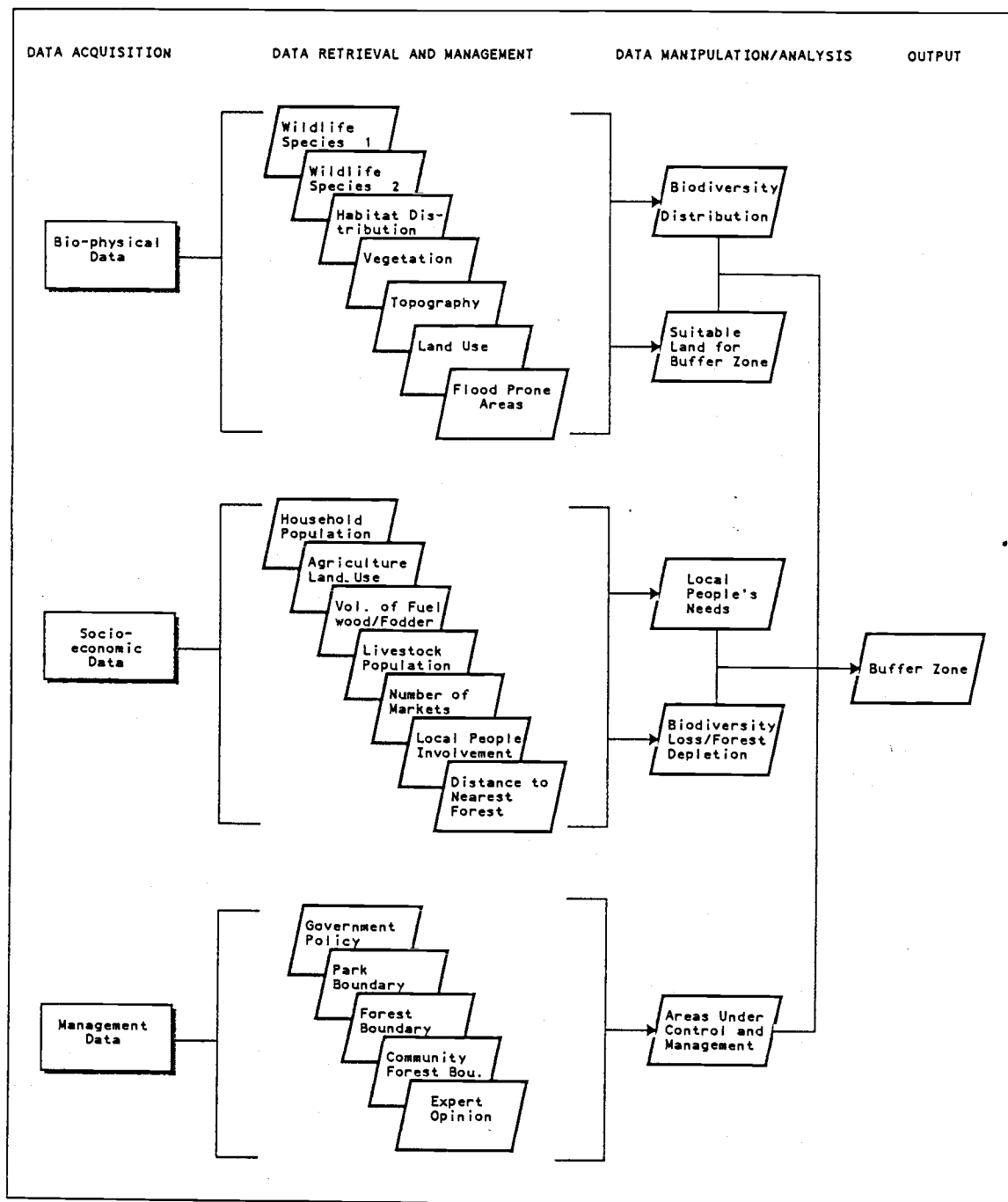


Fig. 22: A GIS-based Conceptual Model for Delineating Buffer Zones

Conservation is not an alien concept to the traditional societies but the harsh alien laws which give more rights to animals than human beings are resented. Conservation must have tangible meaning if it is to win their acceptance.

The solution ultimately lies in the tackling the root and not the symptoms of the problem. Resolving issues related to land and resource ownership, rights of access to resources and decision and control are very important. Protected areas will face severe problems in the future that few will survive without a great deal of protection and management. The ultimate fate of protected areas will depend on the degree to which policy makers, land managers, and most important the people living in these areas, share a cooperative, equitable and farsighted vision -- a vision which promotes real social progress by providing viable alternatives to those who might otherwise endanger reserve resources. If we are successful in integrating protected areas into regional and cultural life, the underlying threats to degrade them will diminish. In this regard, the following strategies need careful consideration in managing protected areas:

- allow limited access to resources to local people where resources are scarce outside the protected areas.
- reform and improve agricultural practices and other current land based activities of the local community, to increase their incomes from their sources and reduce their dependency on forest resources in the protected area as source of supplementary income; all improvements should be appropriate to biodiversity conservation and the management needs of the protected areas.
- introduce new forms of non-farm employment opportunities which help replace any income people lose by no longer being able to use forest resources from the protected areas.
- provide opportunities for higher education and job training to allow people to seek off-farm work reducing the need to encroach for new farmland.
- increase conservation awareness of people through special awareness programs targeting the local population, study tours and conservation activities in or near the villages.
- provide secure land tenure security improved infrastructure in the vicinity of protected areas.
- increase the administration and management capability of the protected area agency by providing more funding, manpower and necessary equipment; the commitment of the national government is critical.
- ensure local participation in protected area management, buffer zone related activities and other forest conservation programs.
- maintain effective communication between protected area authority and local people and also between agencies where integrated conservation and development projects are launched.
- research should be a continuous ongoing process; research is needed not only in the biophysical sciences but the socio-economics of the surrounding regions.



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## **APPENDICES**

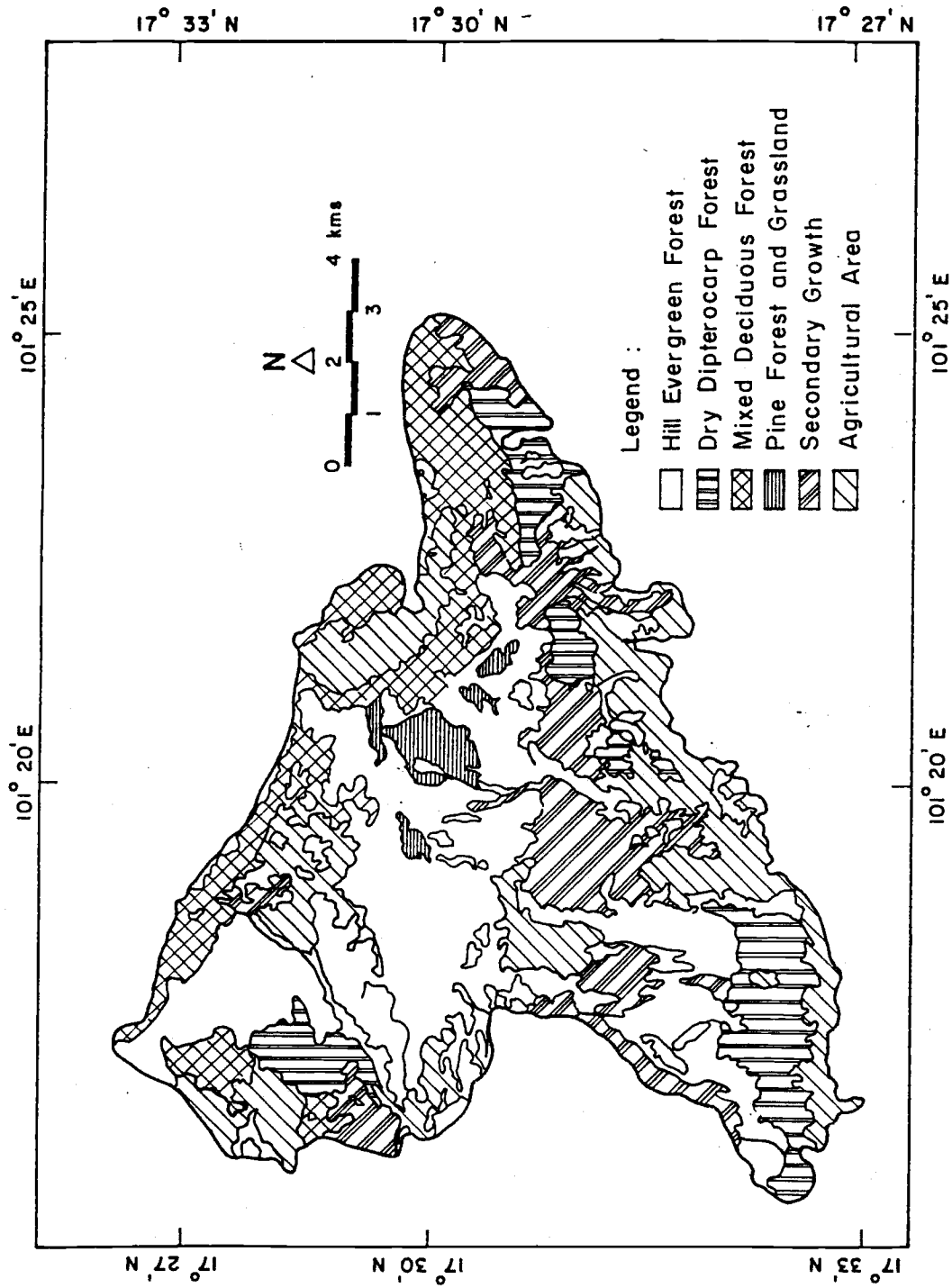


Fig. A1: Vegetation Distribution in Phu Rua National Park

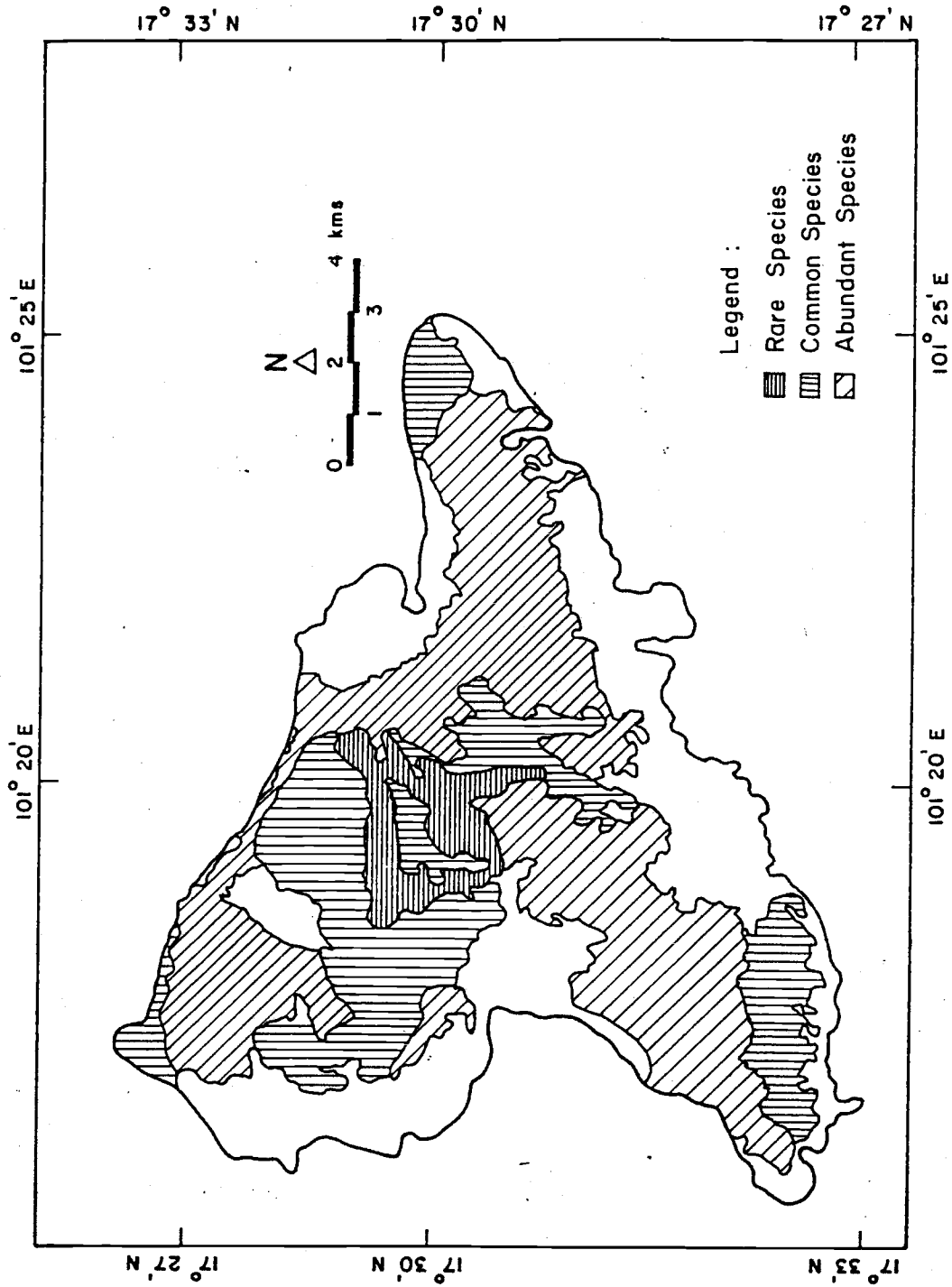


Fig. A2: Wildlife Habitat in Phu Rua National Park

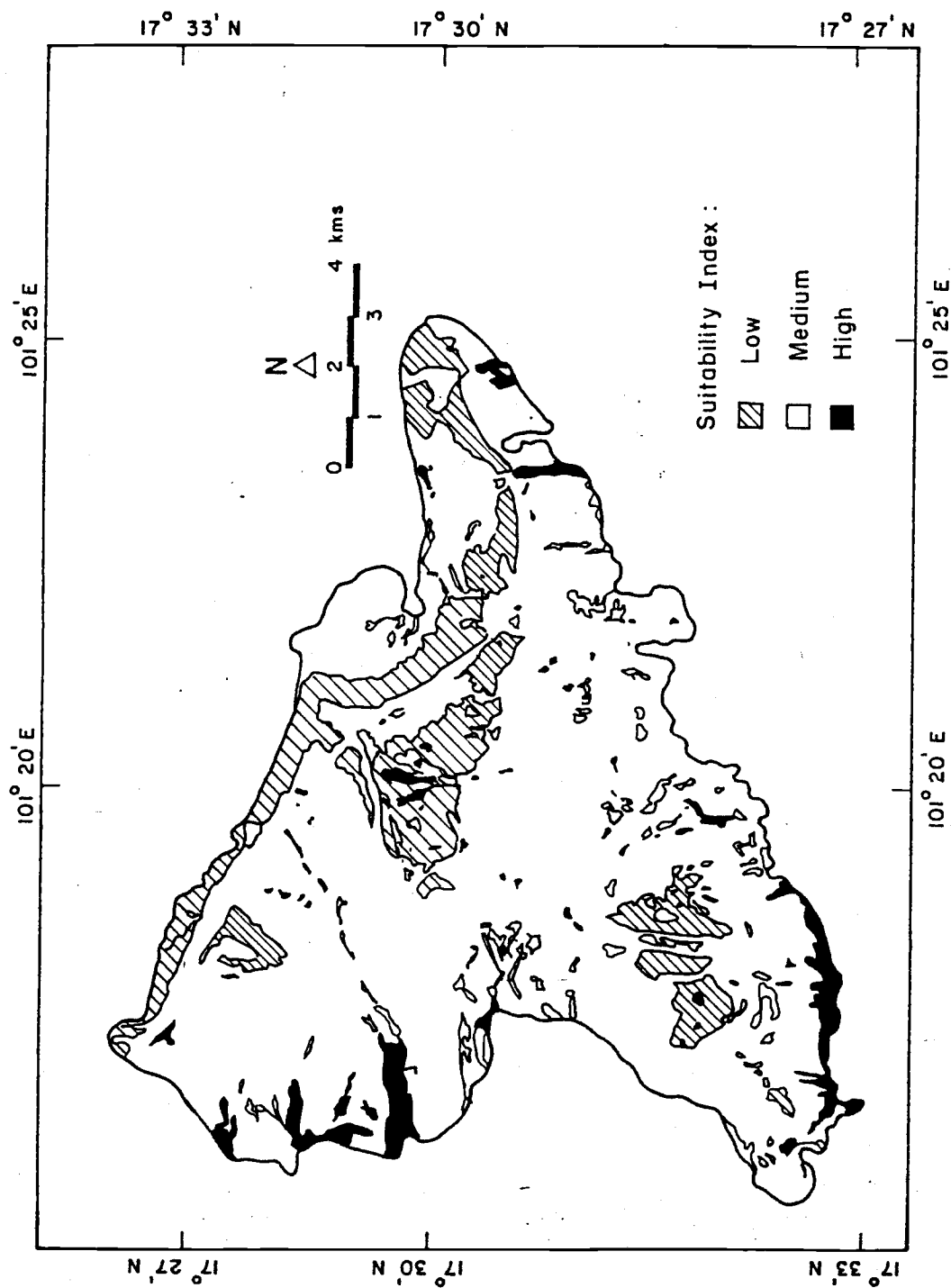


Fig. A3: Intensive Use Zone in Phu Rua National Park

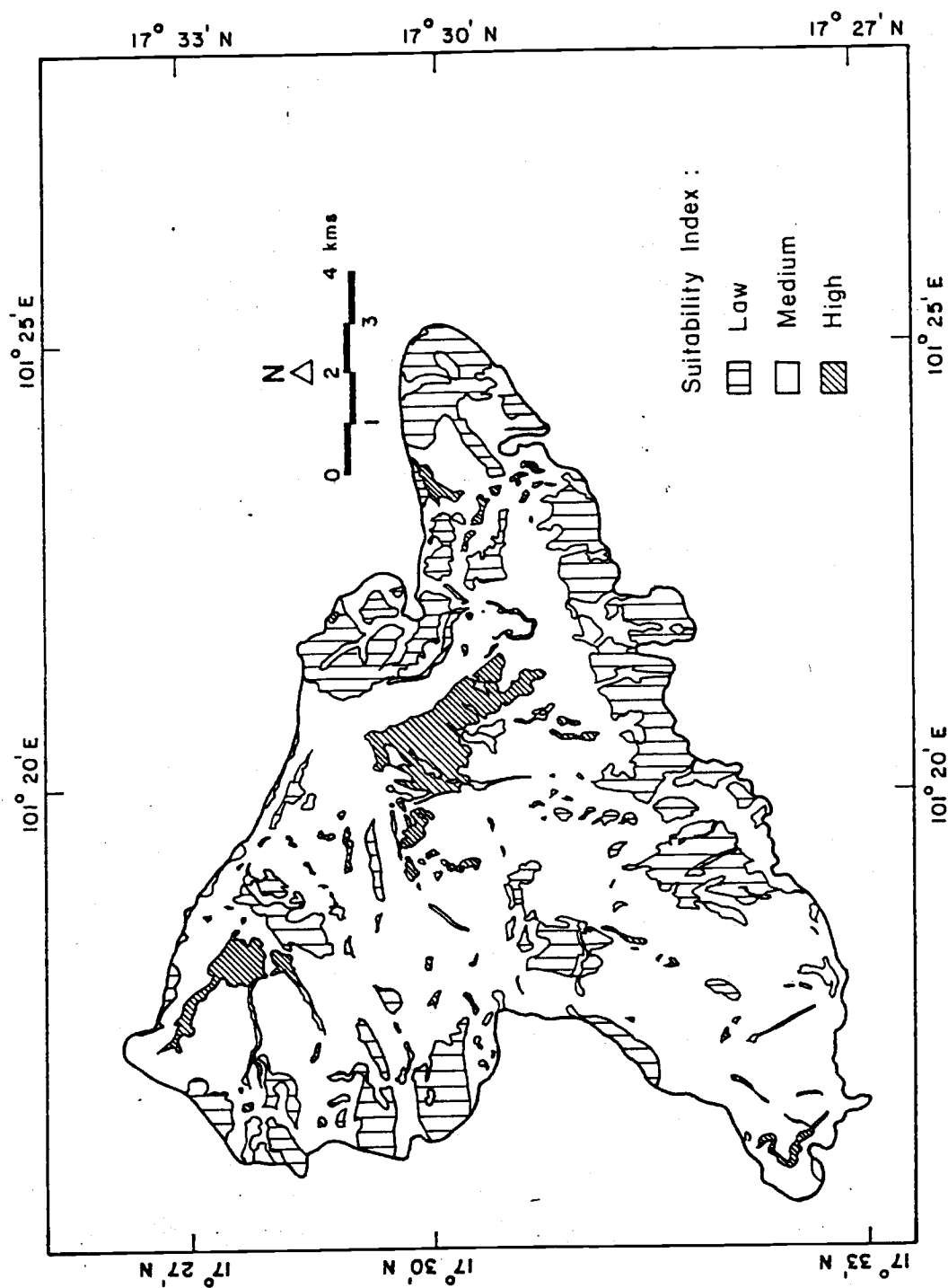


Fig. A4: Outdoor Recreation Zone in Phu Rua National Park

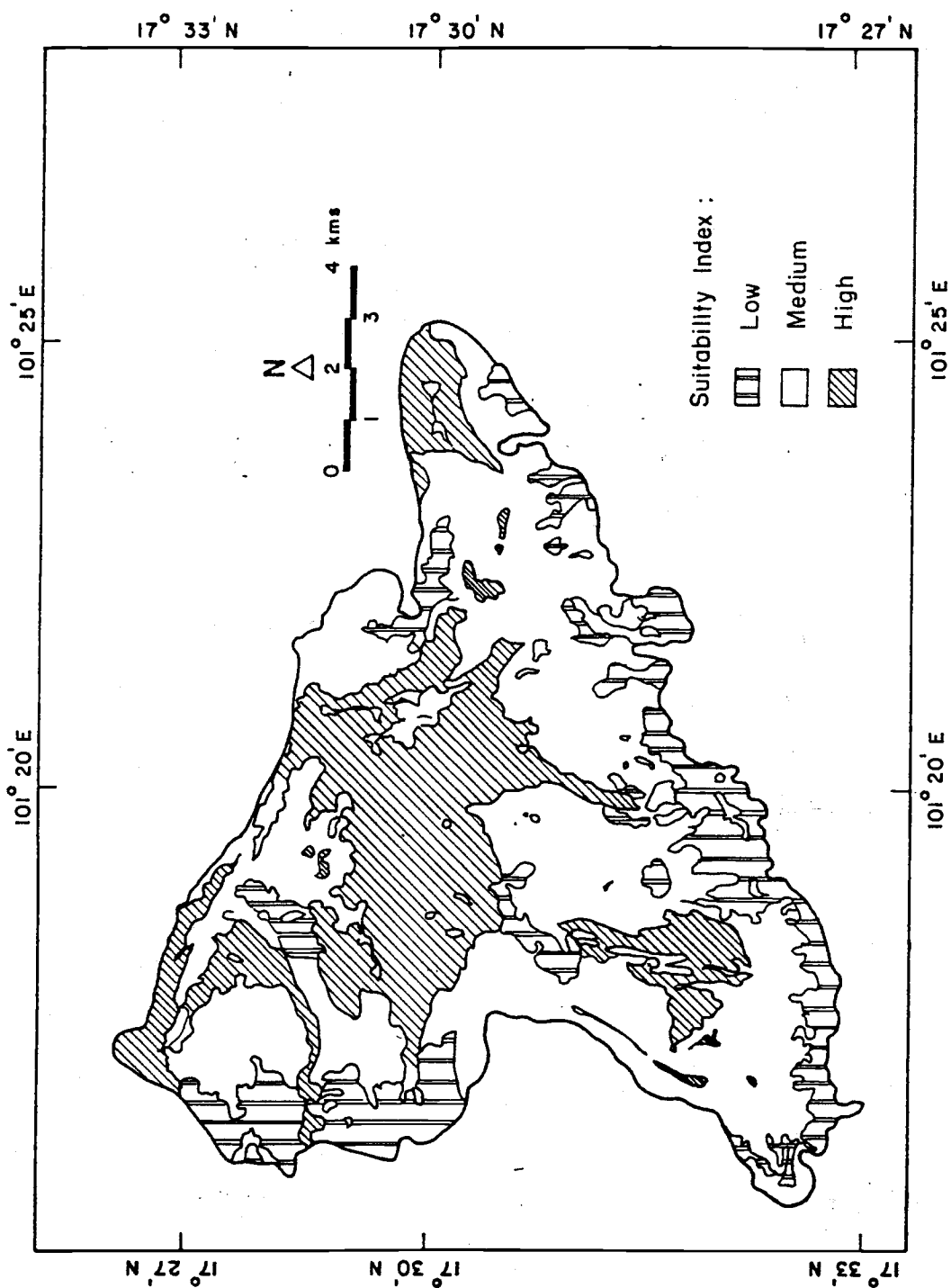


Fig. A5: Primitive Zone in Phu Rua National Park

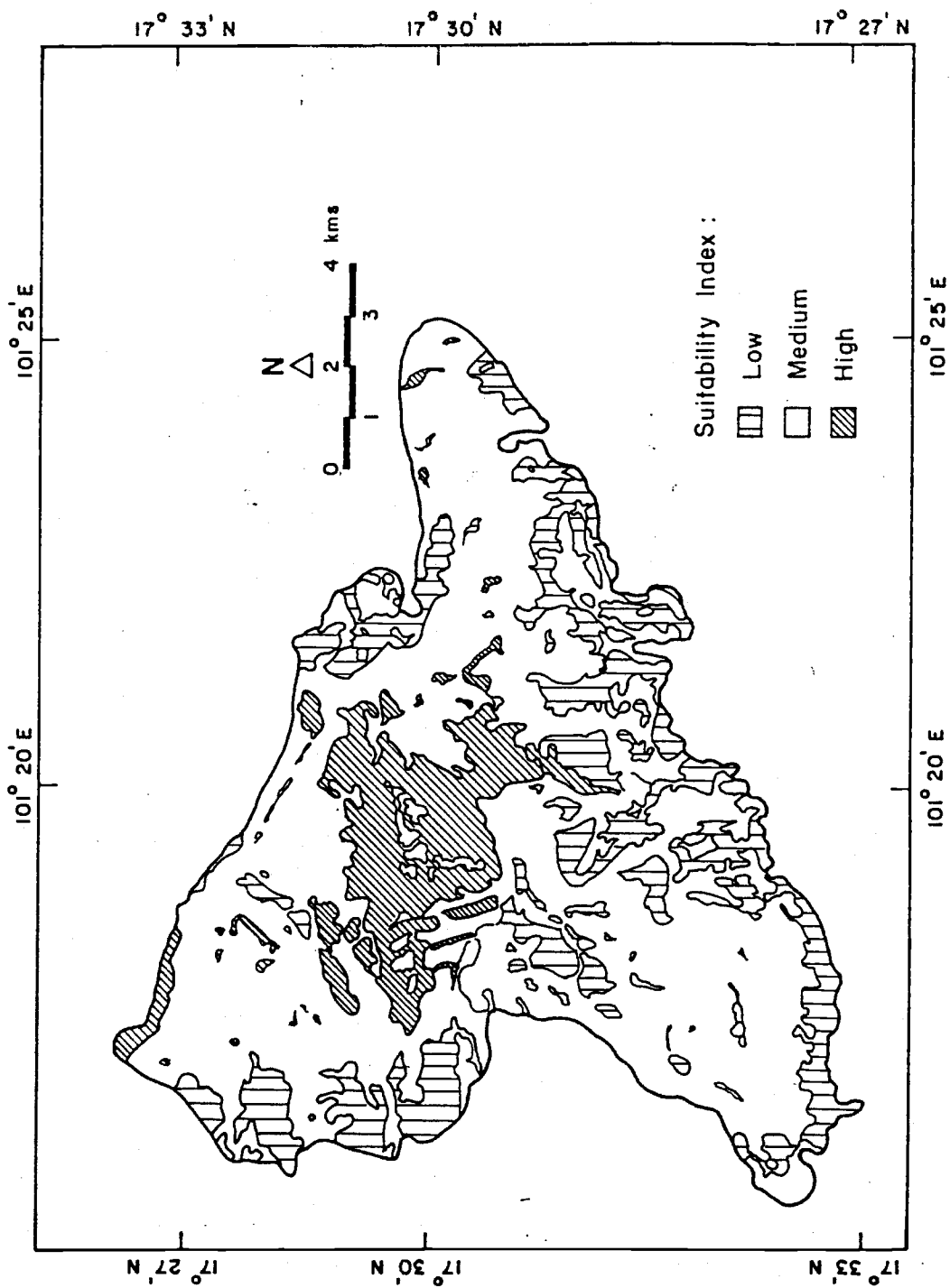


Fig. A6: Strict Nature Reserve in Phu Rua National Park

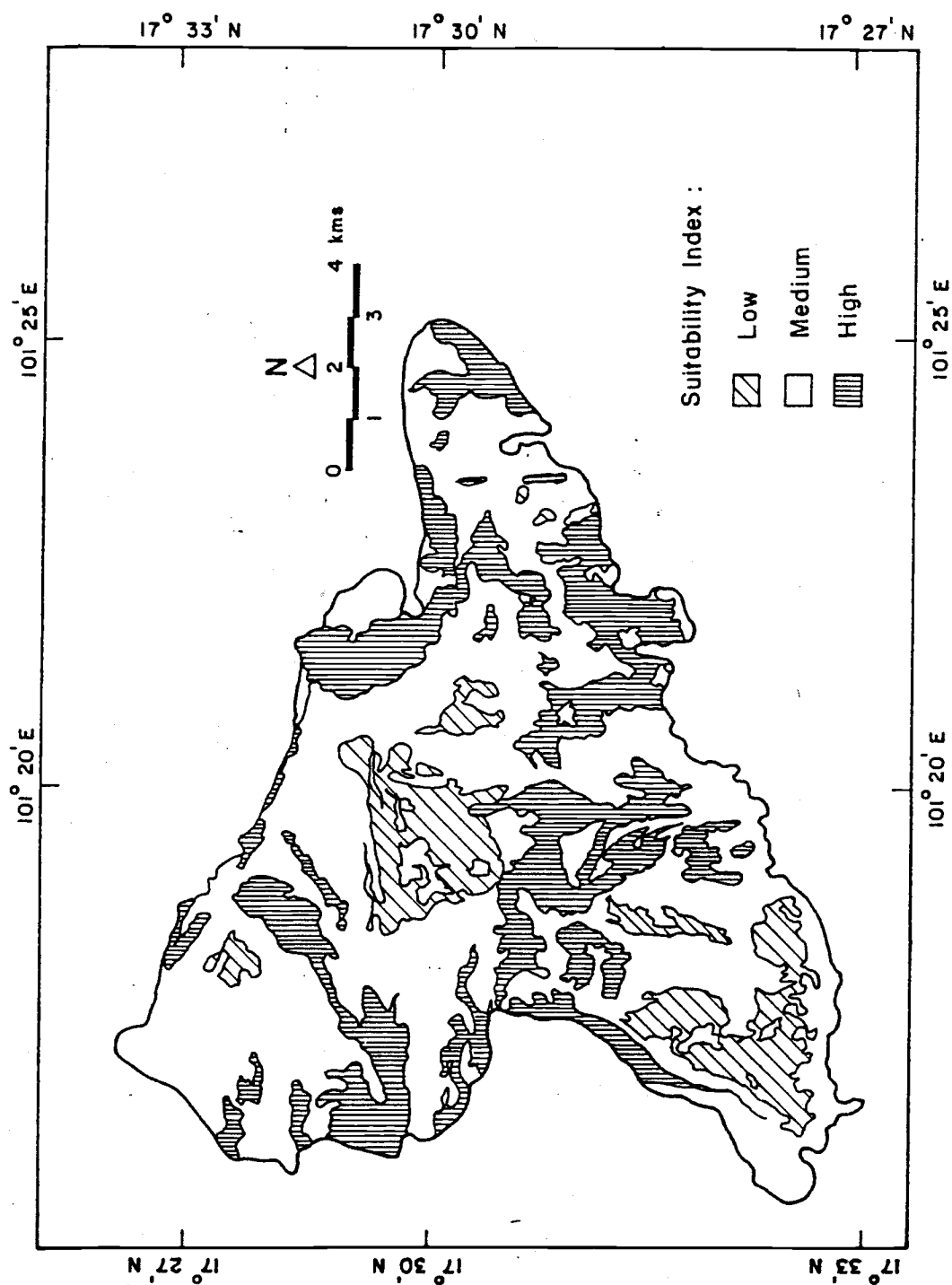


Fig. A7: Recovery Zone in Phu Rua National Park



## Appendix B

### GEF Funded Biodiversity Projects

Country	Project	Amount	Lead Agency
Philippines	Conservation and Management of Priority Protected Areas	up to US\$ 20 million	World Bank, WWF-US and Haribon Foundation
Activities	Policy based lending package tied to legislative conditionally to ensure means of better management and sustainability through contractual arrangements with NGOs and establishment of endowment funds.		
China	Biodiversity Action Plan	US\$ 22 million	World Bank
Activities	Strengthen cross-sectoral linkages through development of BAP. BAP also will address institutional reforms and identify areas for donor financing. Develop means to ensure better sustainability of protected area management.		
Thailand	Forest Reserve Conservation	US\$10-25 million	World Bank
Activities	Changes in policy governing forest occupants and increased participation, protection of forest areas representing different incursions and occupancy.		
Nepal	Makalu-Barun Conservation Area & National Biodiversity Action Plan	US\$ 3.8 million	World Bank/UNDP Woodlands Mts. Institute King Mahendra Trust
Activities	Development of a national plan for biodiversity conservation and of model conservation area - integrating conservation and development		
Myanmar	Biodiversity Conservation	US\$ 3.9 million	UNDP/WWF

### Appendix C Students and Thesis Committee Members

<u>Student</u>	<u>Year</u>	<u>Thesis Committee Members</u>	
Yongyut Trisurat	1990	Dr. Apisit Eiumnoh	- Chairman
		Prof. Douglas Webster	- Member
		Dr. Howard J. Daugherty	- Member
Tippawan Chatchaiwiwatana	1991	Dr. Howard J. Daugherty	- Chairman
		Prof. Karl E. Weber	- Co-Chairman
		Dr. Kaew Nualchawee	- Member
Sanjay K. Nepal	1991	Prof. Karl E. Weber	- Chairman
		Dr. Howard J. Daugherty	- Co-Chairman
		Dr. Yoichiro Higuchi	- Member
Thoung Tint Lwin	1992	Dr. Tri B. Suselo	- Chairman
		Dr. Mohammed Z. Hussain	- Member
		Dr. William Shalinsky	- Member
Christina A. Lantican	1993	Dr. Tri B. Suselo	- Chairman
		Prof. Karl E. Weber	- Member
		Dr. Mohammed Z. Hussain	- Member
Li Zifeng	1993	Dr. Mohammed Z. Hussain	- Chairman
		Prof. Karl E. Weber	- Member
		Dr. David J. King	- Member
Yu Xiao Gang	1993	Dr. Tri B. Suselo	- Chairman
		Dr. Mohammed Z. Hussain	- Member
		Dr. Govinda Kelkar	- Member
Ram Krishna Shrestha	1994	Dr. Tri B. Suselo	- Chairman
		Prof. Karl E. Weber	- Member
		Dr. Mohammed Z. Hussain	- Member