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"Management of Protected Areas"

Evaluation of Protected Areas – a case study of Chitwan National Park of Nepal

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INTRODUCTION

1.1. Background

There is an increase trend of conserving the natural resources by designating an area as one where various types of resources are under protection. More than 100,000 designated protected areas have been listed in the World Database on Protected Areas which cover around 11.4 % of the Earth's land surface along with marine protected areas (Dudley N. et. al. 2005). Since the IVth World Congress 1992 the prior paradigm focusing on the conservation of species and habitats has been gradually shifting to dynamic and participatory conservation. In the former days protection was somehow done on an ad hoc basis but today deliberate protection with laws, Acts, policies, regulations and management plans is being practiced so as to guide management needs and processes for better management. Furthermore, today, protected areas are regarded as not only significant at the private or national level but also at the international level. This holds true for Nepal too. In Nepal, conservation history originates from the efforts made by the monarchy to protect small patches of forest in Terai. These efforts were primarily aimed for protecting large mammals such as rhinoceros from poachers, preventing villager encroachment, and creating hunting grounds. Later His Majesty's Government (HMG/N- Now the Government of Nepal) passed the National Parks and Wildlife Conservation Act and established the Royal Chitwan National Park in central Terai as Nepal's first protected area (Basnet 1992 cited in Agrawal). There are now 16 designated protected areas (9 national parks, 3 wildlife reserves, 3 conservation areas and 1 hunting reserve) covering more than 19% of the country's total area 1,47,181sq. km. which hold biodiversity of national and global significance. And the protection paradigm in the former days of a strict, segregative and "don't touch" approach has been gradually changing into a landscape level and integrative and "let's participate" approach. As a result, the surrounding areas of the park have been designated as buffer zones where human activities are allowed. Furthermore, the forests around the park have been handing over to community as community forests to meet a twin goal of conservation and development.

Nevertheless, information on the management effectiveness is very scanty. International organizations such as The World Conservation Union–World Commission on Protected Areas (IUCN-WCPA), World Heritage Convention (WHC), and Convention on Biological Diversity (CBD) and RAMSAR convention have been exerting greater efforts to conserve natural resources and to maintain database. The IVth World Parks Congress held in Caracas, Venezuela in 1992 identified effective management as one of the four major protected area issues of global concern and called for IUCN to further develop a system for monitoring management effectiveness of protected areas in order to get a more logical transparent basis for planning and for allocating resources. This was further emphasized in the Vth IUCN World Parks Congress held in Durban in 2003 too. The congresses have laid emphasis on such issues as "How well is the global protected areas estate managed? Are these areas meeting their conservation objective? An evaluation of management effectiveness is a first step to diagnose the ills and prescribe correct treatment." The congresses also addressed on building a global database containing information on the management effectiveness of the protected area estate. This has also been considered as an important part of the protected area management by the Convention on Biological Diversity (CBD) and has been addressed in its Programme of work. Accordingly, the CBD has its Programme element # 4 which has a goal # 4.2 - "To evaluate and improve the effectiveness of protected area management." It has emphasized the evaluations of effective management in at least 30% of each party's protected areas by 2010 and in the nationally protected area systems and, as appropriate, ecological networks (Dudley N. et. al., 2005, 91). It has stated development and adoption of appropriate methods, standards, criteria and indicators for evaluating the effectiveness of protected area management and governance, and has set up a related database, taking into account the IUCN-WCPA framework for evaluating management effectiveness, and other relevant methodologies, which should be adopted to local conditions by 2006 (Dudley N. et.al.,2005). The UNESCO World Heritage Convention and RAMSAR Convention also emphasized to report on management effectiveness. The member states of such conventions have committed to report international conventions such as WHC, CBD and RAMSAR. So, the combination of internal and

external demands, and the practical challenges of managing such large and diverse areas, has led to a rapid increase in interest in monitoring and assessment (Hockings M. et al, 2006).

There are various terms used to describe management effectiveness and efficiency in different documents. The IUCN-WCPA defines management effectiveness as "the assessment of how well the protected areas being managed –primarily the extent to which management is protecting values and achieving goals and objectives." (Hockings et. al., 2006, p. xiii). This definition reflects three major themes—design issues relating to both individual sites and protected area systems; adequacy and appropriateness of management systems and processes; and delivery of protected area objectives including conservation of values. "Effective management is the combination of actions that make it possible to satisfactorily fulfill the function for which the area was created, based on the area's particular traits, capacities and context." (Izurieta, 1997 cited in Cifuetens A.M. et.al. 2000). Evaluation should be seen primarily as a tool to assist managers in their work, not as a system for watching and punishing managers for inadequate performance (Pomeroy R.S., 2005). Information on management effectiveness is a cornerstone of good management (Hockings M. et. al., 2006). Management evaluation helps to improve conservation status and communicate with local, government and donor agencies.

As the management evaluation of protected area is quite a new concept, there has not been much study done in the protected areas of Nepal so far. So, this study which is a part of Master's programme on Management of Protected Areas (MPA) attempted to step up the evaluation process. The study is entitled to "**Evaluation of Management Effectiveness - a case study of Chitwan National Park (CNP), Nepal**." The CNP was selected for the study as it possesses greatest value and significance nationally and globally and also is receiving increasing attention to protect its natural resources. It is utmost important to secure the resources of the CNP to meet growing demand of both conservation and development.

Prior to declaration of national park, the forest of Chitwan was famous for game hunting. Today, this national park has national and global importance. This park holds IUCN category II. It was designated as World Heritage Site in 1984. Beesh Hazari Tal, one of the lakes in its buffer zone was designated as a Ramsar site in 2003. Moreover, the surrounding area (>750 sq. km) has been declared as buffer zone in order to support livelihood of the local people.

This study was carried out through questionnaire survey, key informant interviews, SWOT analysis, group discussions and field observation. The study was undertaken by applying the score cards used by De Faria, 1993 (Cifuentes A.M. et. al., 2000). The scale of five levels from 0-4 is related to a modified percentage ratio of the ISO 10004 standards. The indicators were selected on the basis of MacKinnon et. al., 1990 and preliminary field visit.

This study presents an overview of management effectiveness methodology and indicators and results of the testing of the methodology. It is hoped that the findings of the study will help corrective management practices in a more adaptive, resource effective and participatory approach. As mentioned above, evaluation of effectiveness has been greatly emphasized by the international conventions such as CBD, WHC and RAMSAR, so this study will act as an added brick to pave the way of these international conventions. This will help catalyze discussions within the concerned stakeholders with ground truth proofs so as to conserve the future of the CNP.

1.2. Objectives

The objectives of the study are as follows:

* To test the application of a Management Effectiveness tool in the Chitwan National Park of Nepal
* To develop mechanism to select acceptable indicators for evaluating management effectiveness of the protected area
* To improve site management effectiveness by helping managers to assess management effectiveness

1.3. Limitation of the study

Three main elements limiting the scope of this study should be pointed out. First, the short time schedule and limited resources for field works. Second, the field visits were disturbed by some local disturbances such as road blockage due to unforeseen political situation. Third, there was lack of regular assessment reports which are very important for assessing management effectiveness. Therefore, the study was carried out on some important aspects (Fields) of management of the protected area. These aspects were selected on the basis of information collected in the preliminary visit of the study site. This study covers not all but some of the elements of the IUCN-WCPA Framework, 2000/2006 for evaluation of management effectiveness of protected areas.

2. LITERATURE REVIEW

Although the history of formal protection and conservation of protected area has begun since the establishment of the Yellowstone National Park in 1872, the protected area management effectiveness was drawn attention when Deshler and Thorsell presented papers separately at the World Park Congress held in Bali, Indonesia in 1982 (FOS, 2004). This has been continued by the IVth World Park Congress held in Caracas in 1992 where the delegates identified effective management as one of the four major protected area issues of global concern. Taking into account of this concern, the IUCN's WCPA established a taskforce to explore issues related to the management effectiveness of protected areas in 1995 and developed an overall assessment framework (Hockings et al. 2000) in order to provide a consistent approach to assessing protected area management effectiveness (Fig.1). The WCPA is taking a leading role to systematize this function in the field of protected areas. The Nature Conservancy (TNC) has been working with The World Conservation Union (IUCN) on a four year UNESCO/IUCN project – Enhancing our Heritage Project – Monitoring and Managing for Success in Natural World Heritage Sites since 2001. However, evaluation is a routine part of the management process and is something that most managers have been doing already (Pomeroy R.S. 2005). This also holds true for Nepal where evaluation is superficial and is carried out to monitor whether the targets have been met to prepare annual or other reports.

The evaluation of management effectiveness is a broad area of study. Management effectiveness can be evaluated from different perspectives such as protected area policy, National Park Act, management plan implementation, biodiversity richness, its impact on socio cultural aspect, economic status, etc. A survey report carried out by using a tracking tool in over 200 forest protected areas in 37 countries reported that the management effectiveness differs from one country to another and also in different categories as they have different aims and objectives of protection (Lacerda L. 2004).

Thus the World Commission on Protected Area (WCPA) has developed a framework of evaluating management effectiveness in order to make a standard

format. This format is based on six major elements viz. **context** (where are we now?), **planning** (how are we going to get there?), **input** (What do we need), **process** (How do we go about it), **outputs** (what did we do and what product or services were produced?) and **outcomes** (What did we achieve?) to address design, appropriateness of management system and process and delivery of protected area objectives. These elements are related to each other. Fig. 1 below illustrates how these elements are linked to each other.

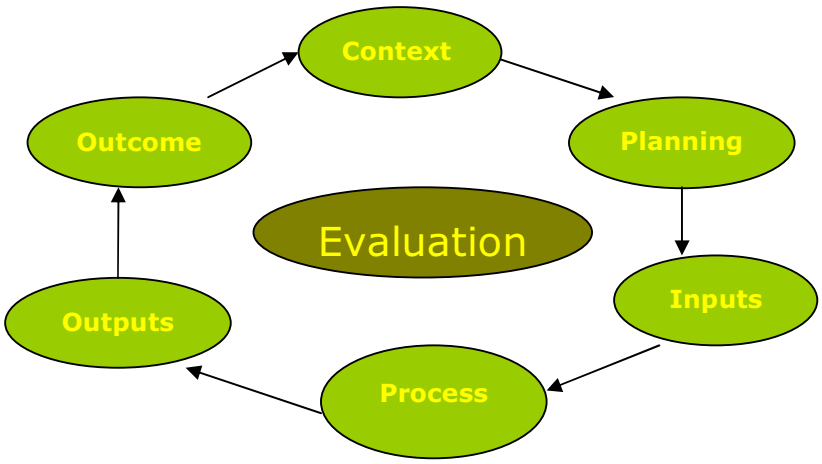


Fig. 1. IUCN/WCPA's Management Effectiveness Evaluation Cycle

These various elements are evaluated on the basis of various indicators. For example, the context is evaluated based on the indicators such as biological importance, socio-economic importance and vulnerability which affect the status and threats of a protected area. Similarly, input is evaluated in terms of number and capacity of staff, budget and quality and quantity of infrastructures. The below Table 1 illustrates various elements of evaluation, their relevant indicators and levels of evaluation of each element.

Table 1: Broad categories of indicators for PA management effectiveness evaluation

Elements	Indicators	Level of evaluation
Context	Biological importance Socio economic importance Vulnerability	Status and threats
Planning	Objective Legal security Site, design and planning	Appropriateness
Input	Staffing Infrastructure Finance	Resources
Process	Management planning Management decision making Research Communication and coordination Monitoring and evaluation	Efficiency and appropriateness
Output	Management plans Regulations Guidelines	Efficiency
Outcome	IUCN category II Recognition as WHS Bufferzone declaration Ramsar Site	Effectiveness and appropriateness

Source: Adopted and modified from Hockings M. 2000

Since the assessment of protected area can be undertaken at different scales and depths, there is flexibility in assessing the effectiveness. As a result, many methods have been developed which focus some or all elements of the IUCN-WCPA framework to evaluate protected areas. But these methods are not mutually exclusive (Pomeroy, 2007).

The first attempt was carried out by a series of questions related to actions necessary for the fulfillment of a PA's management objectives (UICN/PNUMA, 1990 cited in Cifuentes A. et. al., 2000). Those were tested in Central American

PAs and identified a series of indicators and were graded on a four-point scale from 0-3 (UICN/BID, 1993 cited in Cifuentes A. et al., 2000).

WWF Central America and CATIE (Agricultural Center of Tropical Investigation and Teaching) has developed a system in line with recommendations at two World Congresses on Protected Area meetings in Bali, 1982 and Caracas, 1992 (CATIE International Workshop 1999). De Faria conducted the first systematic procedure of rating management effectiveness in protected wilderness areas by applying this system (Cifuentes A. M et al, 2000). The procedure utilized a 0-4 (4 being optimal) scale scoring system which was related to a modified percentage ratio of the ISO 10004 standard. (Cifuentes A.M. et al., 2000). This procedure assessed groups of several fields. A field represented a group of several variables (indicators). These variables were further divided into sub variables and the sub variables into several parameters. A rating matrix of each indicator was developed. The percentage of the optimum values of each field was added up to get the percentage of the overall management of optimum values. The percentages obtained were interpreted in terms of management effectiveness, using the 5 management levels described on the adopted grading scale (from unsatisfactory to very satisfactory) as a reference. This assessment process was participatory involving protected area staff and other stakeholders. This method has been successfully utilized in evaluating various PAs of Central America (Correau, 1997), OSA Conservation Area Costa Rica (Izurieta 1997), Galapagos National Park, Ecuador (Cayot et al, 1998), PAs of Guatemala (Soto, 1998) and Brazil (WWF Brazil 1998) for evaluating implementation of protected area aims and vulnerability (Cifuetens A.M. et al., 2000). The results of the assessment of this methodology carried out in Galapagos National Park was well incorporated into the new management plan (Cayot and Cruz 1998 cited in Hockings M. et al. 2002, Cifuentes A. 2000 and CATIE 1999). In 1990s, "Hockings notes that the WWF/CATIE, Management Effectiveness Methodology, which involves a complex scoring system, is one of the most complete scoring systems." (FOS, 2004). This can be used to assess individual protected areas, PA systems and areas representing as zones of influence such as buffer zones (CATIE, 1999).

The Nature Conservancy (TNC) developed scorecard consolidation criteria for protected areas to monitor progress of protected area of Park's in Peril Programme in Latin America. This card has defined five conditions ranging from 0 to 5 where 5 is the optimal (Cifuentes A. M. et.al, 2000).

The World Bank/WWF Management Effectiveness Tracking Tool is another tool developed for the management effectiveness of protected areas (Stolton S. et al. 2005).This is a simple tracking tool for assessment, which consists of a form of 30 questions following the WCPA framework and scores ranging from 0 (lowest) to 3 (highest). An additional point (1) is provided to each additional information if there is any. The procedure is followed by noting down comments and next steps to be undertaken that are relevant to the questions. Then total score is calculated. This methodology is developed especially for tracking and monitoring progress in the achievement of the World Bank/WWF Alliance worldwide protected area management effectiveness target. This tool has been utilized for over 200 forest protected areas, in 37 countries in Europe, Asia, Africa and Latin America (Lacerda L. 2004). The system has also been adopted by the Global Environment Facility as the basis for tracking changes in management effectiveness in all GEF protected area project sites (Stolton S.et.al. 2005).

The World Heritage Management Effectiveness has developed a workbook for evaluation of World Heritage Sites (http://www.enhancingheritage.net). The UNESCO-IUCN through Enhancing our Heritage Project has been using this workbook. This book contains worksheets on context, planning, inputs, processes and outcomes. This is a qualitative and semi quantitative method. This method has been implementing in 10 world heritage sites of Africa, South Asia and Latin America since 2001 (UNESCO-EoH, 2003). Chitwan National Park in Nepal, Kaziranga National Park and Keoladeo National Park in India are the three South Asian countries where this method has been implemented.

World Wildlife Fund's Forest for Life Campaign has developed a rapid assessment methodology, Rapid Assessment and Prioritization of Protected Area

Management (RAPPAM) in between 1999 and 2002 (Ervin J., 2003). This methodology is based on the six elements propounded by the IUCN-WCPA. "This is developed for broad level of comparative assessment of protected areas and it does not provide detailed, site level adaptive management guidance to protected area managers. However, it can be used as a framework for developing a site level monitoring tool." (Ervin J. 2003). The methodology is based on participatory workshop involving PA managers, administrators and stakeholders. This methodology has been tested in Algeria, Cameroon, France, China, Russia, South Africa, USA, Indonesia, Nepal and Bhutan.

In the context of Nepal the evaluation of protected areas is quite a recent process. A study was undertaken for Initial Management Effectiveness Evaluation in Chitwan National Park by Enhancing Our Heritage Project of UNESCO/IUCN in 2003 for the first time. This study aimed to promote the development of monitoring and evaluation system and facilitate adaptive management. This study used a workbook containing context, planning, input, output and outcome and identified gaps. It was found useful to periodic reporting process for the World Heritage Site. The follow-up study was carried out by the same project in the same protected area in 2005. This study aimed to review the protection strategies and suggestion to enhance their effectiveness and development of a comprehensive capacity building plan for frontline staff (Misra M.K., 2005). The study recommended the following as the top priority needs to manage the national park: establishing wireless communication system for effective communication, enriching park management units with management facilities, reviewing the concessionaire hotels, prioritizing eradication of invasive weeds such as *Micrania micrantha* and water hyacinth, establishing quasi judicial power of the Chief Warden, promoting hassle free joint patrolling by protection and management units, developing tourism in Madi area, and strengthening strict patrolling and law enforcement (Misra M.K., 2005).

A further study on management effectiveness was also carried out by the WWF Nepal by using WWF's RAPPAM Methodology in 2006. This study was made in order to assess all sixteen protected areas of various categories in Nepal. The WWF's RAPPAM study covered four elements, namely, planning, inputs, process and outputs of the WCPA management framework. The study found some major pressures confronting the CNP like crop damage, improper dam building, over-fishing, over-grazing, illegal hunting, illegal settlements, illegal harvest of timber, over cutting of fuel wood, stone and sand collection and ill management of tourism and recreation. The study also found that there are good planning but the outputs are limited because of unwanted circumstances and changing practices (Nepali S.C., 2006).

Besides, there was one study carried out to assess effectiveness of community involvement in delivering conservation benefits to the Annapurna Conservation Area (ACA). This study was done by ecological and social survey. It used transect, interview and questionnaire surveys. Some questionnaires were developed with a five-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). The study found successful community based conservation in ACA (Bajracharya S. B. et. al., 2005).

3. CHITWAN NATIONAL PARK

3.1. History of the national park

Before 1940s Chitwan was covered by very dense forests. It contained more than 1000 square miles of virgin forests, swamps and grasslands which was inhabited by various wild animals such as wild elephant, rhinoceros, swamp deer, water buffalo and birds.

Pic. 1. Protected areas of Nepal

This area was a famous area for game hunting. Starting in 1951, when the Royal family regained the reign of the country from the Rana family, official visits of Royal family to protected area became semi annual event involving much pamp and splendor. Royal hunts in PA ended in 1990 (Bhatta N., 2003). Previously, the area suffered from Malaria which was eradicated in 1954. After the eradication of Malaria, the area had attracted the hill people vigorously. People started residing in the richer and fertile duns, valleys and plains. The human settlement and cultivation had accelerated the encroachment of green forests. As a consequence, the swamp deer and water buffalo had completely disappeared from the area. This drastic degradation of forests and extinction of wildlife had drawn attention. Since then many efforts have been put to manage this national park to protect the decreasing wildlife and their habitats. Later, conservation of biodiversity came up with landscape level conservation. Terai Arc Landscape conservation has been considered as one of the most significant Global 200 eco regions.[1]

Some chronological developments of the CNP are described as follows:

1957: The Chitwan forest was declared as Rhino Sanctuary.

1962: Safari Tourism was introduced in CNP for the first time.

[1] Nepalnature.com

1963: The decreasing number of one-horned rhinoceros called the attention of the Chitwan region.

1963: The southern two third of the park was declared as Rhino Sanctuary.

1964: A relocation scheme was carried out following the Land Settlement to relocate people. Approximately, 22,000 people from the Rapti area were first relocated. Subsequently, 7000 people from 10 of the 16 villages in Padampur Panchayat on the eastern side of the park were resettled to more fertile lands devoid of wild herbivores, based on the recommendation from a study by the International Centre for Environmental Renewal. The scheme received local support but further relocation of any of the other 310 villages that surround the park was not politically or economically feasible.[2]

1970: The first attempt to conservation programme in Chitwan (lowland region) and Langtang (highland region) area by declaring as national parks was approved by the late King Mahendra Bir Bikram Shaha Dev. But it was not found effective as it had been desired due to lack of proper legislation and Act.

1970: Preliminary surveys and assessment of problems were carried out as a baseline for management plan.

1972: National Park and Wildlife Conservation Act was drafted.

1973: Legal protection of the area through National Parks and Wildlife Conservation Act, 1973 (*Rastriya Nikunj Tatha Banyajantu Samraksahn Ain 2029 B.S).*

1973: Royal Chitwan National Park (RCNP) was established as the first national park of Nepal.

1974: The bye-laws (Royal Chitwan National Park Regulations) were introduced.

[2] http://www.unep-wcmc.org/index.cfm

1970s: The Park was internationally recognized by IUCN.

1975: The first Management Plan (MP) for CNP was developed.

1977: A crocodile (Ghariyal) breeding centre was established with the fund supported by Frankfurt Zoological Society.

1984: UNESCO declared the park as the World Heritage Site (# 284) with due importance of conserving the pristine state and unique ecosystems. Chitwan meets **three** criteria for the World Heritage—natural properties, such as the last surviving example of the natural ecosystems of the Terai region (**criteria ii**), superlative natural features of exceptional natural beauty in terms of its scenic attractions of forested hills, grasslands, great rivers and views of the distant Himalayas (**criteria iii**) and significant populations of several rare and endangered species, especially the one horned Asian rhinoceros and the Gharial crocodile (**criteria iv**) (DNPWC, 2002).

1984: The conservation of flora and fauna was further extended in the eastern region of this national park by establishing Parsa Wildlife Reserve. It was once proposed to enlarge further by establishing 259 sq. km of Bara Hunting Reserve adjacent to an east of Parsa but it had been dropped.[3]

1985: Elephant Breeding Centre (EBC) was established with the purpose of breeding domesticated elephants. The survival rate of the calves was reported 59.6% (DNPWC Annual Report 2002/03).

1986: The first Rhino translocation from this national park to Royal Bardiya National Park (RBNP) was done. Many rhinoceros were successfully transported to Royal Bardia National Park (RBNP) and Royal Suklaphanta Wildlife Reserve (RSWR). The main objective of the rhino translocation was to establish a viable population in RBNP, a breeding population in RSWR and to safeguard this endangered species from poaching and natural calamities such as flood, fire and epidemics. The rhino thus translocated to RBNP has successfully given birth to a

[3] BN Upreti 1986 in http://www.unep-wcmc.org/index.cfm

baby which is surviving well in the new habitat. Besides, the translocation also aimed to reduce the conflict perceived as a potential threat in ensuring the long-term survival of rhinos. From 1986 to 2003, a total number of 87 rhinos had been successfully translocated to RBNP and RSWR (DNPWC Annual Report 2002/03).

1993: An anti poaching unit was established for the first time with the fund support from WWF aiming to control illegal trade of endangered species and their body parts.

1996: The buffer zone was established around the national park addressing 30-50% revenue sharing for community development activities as of long term conservation and benefit sharing.

2003 August 13: Beeshhazari Lake in the buffer zone in its eastern region was designated as a Ramsar Site.

2003: Padampur village located in the eastern sector of the park was relocated.

2006: Royal Chitwan National Park (RCNP) became Chitwan National Park (CNP) after the fall of direct rule of the King.

3.2. Location/ Area/Boundary

Chitwan National Park is located in between 830 83' to 84^0 74' E and 27^0 34' to $27^0$68' with lowland Terai and Siwalik features of the southern part of Central Nepal. Initially, it covered an area of 544 sq. km. but later it was extended up to an area of 932 sq. km. in 1977.

Pic. 2. Chitwan National Park

Now the current GPS survey of the park boundary and GIS digitization based on 1992 topographic maps showed a total park area of 1182 sq. km (DNPWC/RCNP Resource Profile 2000). It spreads over four districts viz Chitwan (74.04%),

Parsa (15%), Makwanpur (6.97%) and Nawalparasi (3.54%) of Nepal (DNPWC/ CNP Annual Report 2002/03).

The Chitawan National Park has been divided into four management sectors. They are Eastern/Sauraha sector, Central/Kasara sector, Southern/Bagai/Madi sector and Western/ Amaltari sector. The Central/Kasara sector is also a headquarters of the park.

Pic. 3. Management sectors of CNP

There are nine entry gates to enter the park, viz. Sunachuri via Sunachuri, Khagendramali via Bhandara, Sauraha via Tandi, Ghatgai via Patihani, Kasara via Jagatpur, Bhimle via Meghauli, Piprahar via Rajahar, Laukhani via Pragatinagar and Amaltari via Danda to enter the park.

3.3. Hydrology

Rapti, Narayani and Reu are the major river systems in this national park. Lothar Khola, Harda Khola, Barlu Khola and Mohana Khola are several tributaries of Rapti River. Eighty five to ninety percent of CNP lies within Rapti Watershed. The flood plains made by Rapti are rich in alluvial soil. An average maximum discharge of Rapti River near the outlet of national park area is about 200 to 400 cum/sec and the minimum discharge is about 1.2 cum/sec (1996, Banskota et. al). Rapti and Reu Rivers flow through the park and ultimately join Narayani River. Rapti and Reu Rivers are changing their courses both in the northern and southern parts of the main stream courses. The riverbeds were rising and their spans had increased since 1978. There is not much change in the course of Reu River but its span is changing (Banskota et. al., 1996). This has greatly influenced grassland and riverine forest in the park and also caused severe damages to the property of the people.

3.4. Geology and soil

The Chitwan valley lies between Siwalik and Mahabharat range and is rich in thick alluvial deposition. Narayani, Rapti and Reu are the major river systems of this valley. Soils are largely alluvial deposits left by the shifting river courses. The deposition took place somewhere between late tertiary to Pleistocene period (Banskota et. al., 1996,). The rocks are well exposed in many places. Middle Siwalik rocks are represented by the thick bedded sandstones and silt stones. The northern aspect is relatively more unstable (JICA, 1973 cited in MP 2001/05).

The park soils are representatives of Chitwan dun valley types. Most of the land inside park is loamy with fine sand (MP 2001/05). The water level ranges seasonably from 1m to 1.5m. Hill soils are sandy loam and loamy rubble with stony surfaces less than 50 cm from bed rock (Lekhmkhul, 1989 cited in MP 2001/05).

3.5. Climate

The climate of CNP is tropical and subtropical with a summer monsoon from mid June to late September, and relatively dry winter. There are three major seasons viz. cool dry, hot dry and monsoon.

The cool winter season occurs from October to February. During the winter months dry northerly winds from the Himalayan and Tibetan plateau result in greatly reduced temperatures and low relative humidity. Hot dry occurs from mid February to mid June. Summer days are hot with average daily maximum and minimum of 30^{o}C and 16^{o}C respectively. The month of May of 1995 has been recorded as the hottest month of the decade when average air temperature is 39.1°C. Spring starts from March and ends at mid of June which is followed by monsoon. And monsoon starts from mid June to late September, during which time occurs the main annual rainfall (about 90%) between 2100mm to 2400mm. The Monsoon rain causes dramatic floods and changes in the character and courses of rivers.

The months of December and January have lower temperature with occasional frost at night.

3.6. Floral diversity

There are eight types of ecosystems which include seven forest types, six grassland types, five wetlands and three main river system habitats (UNESCO-EoH, 2003). The floral diversity of the park consists of more than 500 species of plants. Three gymnosperms, 13 pteridophytes, 415 dicotyledons, 137 monocotyledons and 16 orchids have been reported from this park. Cycas, a tree fern and Screw pine are the endangered plant species found in this park (Table 2).

Table 2: Floral diversity in CNP

Type of flora	No of species	Endangered species
Gymnosperm	3	
Pteridophytes	13	*Cyathea spinosa, Cycas pectinata*
Dicotyledons	415	
Monocotyledons	137	
Orchids	16	

Source: Report of Enhancing our Heritage 2003

Forest land: There is a total of 100036 ha of forest in the park (DNPWC/RCNP Resource Profile 2000) which can be distinguished into two major types viz. Sal forest and Riverine forest.

- **Sal forest:** This type of forest is the main type of vegetation which covers 62.85% (Resource Nepal, 1998). *Shorea robusta* (Sal) tree is the dominant tree species which occurs in association with other tree species like *Terminalia tomentosa (*Asna*), Buchanania latifolia, Schleichera trijuga, Dillenia pentagyna, Lagerstromea parviflora* (Banjhi), *Syzygium cumini (*Jamun*), Bauhinia vahhi* (Vorla), *Vitis latifolia* etc.
- **Riverine Forest:** This forest consists of tree species such as *Bombax ceiba (*Simal*), Trewia nudiflora, Eretia laevis, Litsea monopetala* and

Premna species as early successional stands. *Persea species, Sizigium species, Mallotus philippenendis* (Sindure) *and Ficus racemosus* (Gullar) are the late successional stands. Along the Rapti River is a forest of *Dalbergia sisoo* (Sisoo) and *Acacia catechu* (Khayar).

Grassland: A total of 5520 ha of grassland is distributed in patch form in CNP. The greater parts are distributed in center (3149.7 ha) and eastern (1309) part of the park (DNPWC/RCNP Resource Profile 2000). *Saccharam orundinacium* (Dhaddi), Saccharam *spontanium* (Kans), *Phragmites karka* (Narakat), *Imprerata cylindrica* (Siru), *Narenga porphyrocoma (*Khadai*), Themda caudate*, *Heteropogon contortus* are the major species of grass with tree species such as *Bombax ceiba* (Simal) *and Butea monosperma (*Patash*)* growing along the periphery of the grasslands.

Wetlands: Wetlands are another major habitats in the park. The major rivers such as Narayani, Rapti and Reu and several lakes, ponds, marshes constitute important wetland habitats in the park.

3.7. Faunal diversity

The CNP harbors 50 species of mammals, more than 500 species of birds, 49 species of reptiles and amphibians and 120 species of fish. Rhino, Wild boar, crocodile, deer along with birds are commonly sighted wild animals in this park (Table 3).

Table 3: Faunal diversity in CNP

Type of animal	No of species	Endangered species
Mammals	50	*Rhionoceros unicornis, Panthera tigris, Elephus maximus, Bos gaurus, Platanista gangetica*
Birds	526	*Houbaropsis bengalensis, Buceros bicornis*
Reptiles and Amphibians	49	*Gravialis gangeticus*
Fish	120	

Source: Report of Enhancing our Heritage 2003

Rhinocerous unicornis (One horned rhino), *Elephas maximus* (elephant), *Bos gaurus* (Gaur), *Axis axis* (deer), *Panthera tigris* (tiger), *Platanista gangetica* (Gangetic dolphin), *Melursus ursinus* (Sloth bear) *Tetraceros quadricornis* (Four horned antelope), *Prionodon pardicolar* (Spotted lingsang), *Manis crasicaudata* (Pangolin), Hyena are some endangered mammals found in this park. Similarly, birds such as *Bucers bicornis* (Giant horn bill), *Ciconia nigra* (Black stork), *Ciconi ciconia* (White stork), *Grus grus* (Sarus crane), *Houbaropsis bengalensis* (Bengal florican) and *Sypheotides indica* (Lesser florican); reptiles such as *Python molurus* (Asian rock python), *Gavialis gangeticus* (Ghariyal) and *Varanus flavescens* (Golden monitor lizard); amphibians such as *Tomoptema maskeyi* (Maskey frog) are the other endangered animals found in this park. Water buffalo (*Bubalus bubalis*), Swamp deer (*Cerevus duvauceli*) have disappeared from the park. Similarly, dolphin sightings are also decreasing.

3.8. Cultural diversity

Cultural diversity is another significant feature of the park. Many temples of Hindus and Gompas of Budhist are located in the park. Bikram Baba Temple, Balmiki Ashram, Brahma Chauri and Laxmi Narayani Temple, Godak Nath Temple and several holy ponds have religious and historical significance.

3.9. Buffer zone

An area of more than 750 sq. km outside the national park has been declared as buffer zone so as to give protective layer to the national park and to meet the resource needs of the local people. It covers 35 Village Development Committees (VDCs) and 2 Municipalities. Approximately, a population of 223,260 people resides in these areas, who depend on the agriculture, park resources for livelihood subsistence and tourism and trade. There are conflicts between people and wildlife. In order to save the endangered wildlife, local people and the park management have set some animal preventive infrastructures. Trenches, bio fence, Machan guard and recently introduced electric fence are the major measures to control livestock and wild animals' movement. The 30-50 % of the park revenue has been channeled to the buffer zone programme.

3.10. Park Management Objectives

The prime aim of the national park is the biodiversity conservation at the ecosystem level and the secondary objective is the development of recreational tourism to support livelihood of the local people. To reach these objectives the park management has envisioned the following park management objectives.

- Implementing management zoning system
- Conserving habitats
- Maintaining biodiversity and viable populations of endangered species
- Conserving cultural heritage
- Promoting quality tourism
- Raising general awareness of conservation
- Sharing resources
- Strengthening institutions for better participation in conservation activities
- Carrying out research and monitoring

4. METHODOLOGY

4.1. Reconnaissance survey of the site

After several consultations with the park management experts, I visited Chitwan National Park in December 2006 to gather preliminary information. During this, general idea on visiting the park area for observation and interviewing with major stakeholders was developed. Moreover, some appointments with the stakeholders were made during this visit.

4.2. Selection of Indicators

The indicators were selected on the basis of MacKinnon et. al., 1990 and preliminary information. Altogether eight major fields are selected for the study, namely, biogeographic characteristics field, threat fields, legislation and political field, planning field, administrative field, management programme field, current legal uses field and current illegal uses field. These fields were further broken down into twenty five variables. Here, a field represents a large group of variables. The variables represent major indicators. The variables were further broken down into sub variables and parameters. Please refer to Table 4 for the details of the fields, variables, sub variables and parameters.

Table 4: Details of the indicators

Field	Variable	Sub variable	Parameter	Relation with IUCN –WCPA framework
Biological characteristics	Connectivity			
	Status of flagship species	* Rhino * Tiger * Crocodile		Context
	Change of land			
Threat	Invasion by weeds			Context
	Poaching			
	Construction and flood			

	Pollution			
Legislation and policy	Clarity Application			Plannig
Planning	PA Management Plan	*MP exist and up to date *Characteristics of the planning team *Plan implementation		Planning
	Zoning			
Administrative	Finance	Operational budget		Input
		Regularity of budget		
		Capacity to manage own resources		
		Extraordinary fund		
		Financial accounting system	* Management capacity * Institutional capacity * Budget management * Spending capacity * Auditing mechanism	
	Infrastructure	Facilities for basic management	Staff Housing, transportation, communication	Input
		Facilities for specific management		Input
Management programmes	Habitat management			Process
	Conservation education			
	Research, monitoring and evaluation			
	Coordination and collaboration			
Legal uses	Thatch grass collection			Output
	Allotment of timber and other resources			
	Public right of way			

	Concessionaires hotels			
Illegal Uses	Extraction of natural resources			Output
	Poaching			
	Grazing			
	Fishing			

Source: Adopted and modified from Cifuentes A.M. et.al. 2000

4.3. Data collection

4.3.1. Primary data collection

4.3.1.1. Interview/Questionnaire survey/ Group discussion

A semi structured questionnaire (including both closed and open ended) survey done with tourists visiting the national park was carried out on contact basis. The questionnaire survey for visitors was done both in the hotels and at the Sauraha information center. This survey was done on interview basis for local people. Information was generated from the park staffs, hoteliers, by conducting questionnaire and interview whereas a group discussion was carried out for local people and other stakeholders.

Composition of the respondents for the study

The process was completely participatory which included representatives from various professions. Park staff (Chief Warden, Assistant Warden, former warden, rangers, game scouts, administrative, Hattisar (Elephant management and breeding center and others) were the respondents for the study. Other key respondents were as follows:

- Local people
- Hoteliers (inside and outside hoteliers)
- Nature and tourist guides
- Visitors (Nepalese, SAARC, Foreigners)
- BZ Management Council, BZ User's Committee, BZ Users Group.
- Researcher

4.3.1.2. SWOT analysis

A Strength, Weakness, Opportunities and Threats (SWOT) exercise was carried out during the field visit.

4.3.1.3. Field observation

Field observation was done both inside and outside of the national park. Sauraha, Kasara and Madi sectors, Baghmara Community Forest, Kumroj Community Forest were visited. Observation on participation, interest of responding, quality of infrastructure etc. were recorded during the field visit. The data was further examined by photographs where appropriate.

4.3.2. Secondary data collection

Related literatures were thoroughly reviewed. Consultations with different relevant agencies were also carried out. The annual reports of DNPWC from 2000/01 to 2005/06 and management plan 2001-2005 were thoroughly reviewed along with numbers of other relevant literatures. The central library of Tribhuvan University (TU), National Trust for Nature Conservation (NTNC), The World Conservation Union (IUCN), World Wildlife Fund (WWF), Department of National Parks and Wildlife Conservation (DNPWC), Participatory Conservation Programme Library, International Center for Integrated Mountain Development (ICIMOD) were visited for the collection of secondary data.

4.4. Application of the evaluation procedure

4.4.1. Definition of scenarios

Five different criteria (0-4) of management scenario were developed with the optimal condition having the highest value for each variable, sub variable and parameter. The management scenario for the PA was defined based on the information contained in the management plan, regulations, guidelines and other existing planning instruments. Because the plans frequently do not reflect reality and the target mentioned to achieve can be identified as an optimum value (Cifuentes A. M.et.al., 2000).

4.4.2. Rating of indicators

The percentage weighing was adapted from the ISO 10004 standard, tested in the evaluation of quality of services offered by private and public enterprise.

The rating was carried out by means of specific matrices for each field, using the five rating levels ranging from 0 to 4, where 4 refers to optimum value. In some cases the values were assigned by simple percentage ratios comparing the existing situation and the optimum and in other cases by specific qualitative criteria or combinations of criteria. Then an overall score for each field was calculated by combining the scores of its associated indicators. Stringent scoring formulas could not be applied to some indicators in this study. The percentages obtained were interpreted in terms of management effectiveness using the 5 management levels from unsatisfactory to very satisfactory as reference. The details of the rating are shown below in Table 5.

Table 5: Rate of Management Effectiveness

Rating	% of optimum	Significance
0	<35	Unsatisfactory
1	36-50	Minicammly satisfactory
2	51-75	Modereately satisfactory
3	76-90	Satisfactorily
4	91-100	Very satisfactory

Source: Cifentes A. M. et. al., 2000

4.5. Data analysis

Quantification of data obtained was achieved through tabulation and counting. Information collected were analyzed, cross checked and verified with the data collected from other sources. Results were presented in the tabular form of totals, percentages and averages. This study tried to explain qualitative information to quantitative terms. The judgment is based on visual impressions, secondary sources and interaction with local people.

5. RESULTS

The findings of the study were presented in three major parts. The first part consists of the findings of the SWOT exercise which were presented in tabular form where the numbers in parenthesis represent the number of responses. The second part consists of the assessment of eight fields. Five different criteria with values ranging from 0 to 4 were presented in the tabular form. The assessed criteria for the indicator were marked as 'tick mark' on the parallel box of the table. The judgment was done based on visual impressions, secondary sources, responses obtained from interaction with local people and SWOT exercise. The value of each variable was added and calculated to get the optimum total value of the relevant field. For the variable having several sub variables, the total values of the sub variable were added and their average value was calculated. Similarly, for the sub variable having several parameters, the values of parameters were added and their average value for that particular sub variable was calculated. Then the values of each field were calculated in average and percentage and were presented in the tabular form. The third part summarized the overall findings of the study. The details are as follows:

5.1. SWOT exercise

- Place: Hotel Wildlife Camp, Ward no 2, Bachhauli VDC,
- No. of participants: 30
- Nature of participation: Mixed participation of representatives from hotel, park management, community forest and culture.
- Method: Firstly, the participants were made clear on the objective of the study. Secondly, they were made clear upon the concepts of strength, weakness, opportunity and threats. They were asked to write down three most important responses on each aspect so as to have a wide range of thinking and putting down their opinions.

- Progress: All participants participated actively in the exercise. They appreciated the exercise and put forward many considerable thoughts, ideas and opinions.

Pic. 4. Participants in the SWOT exercise

The SWOT analysis showed rhino (25) as the major strength followed by biodiversity (15) which include forests and wild animals. This was followed by opportunity of income generation through tourism (14), international recognition (10) and so on. While inadequate guard posts and weak control in poaching (9), inadequate management of habitats and inadequate coordination (8) were reported as major weaknesses. Similarly, habitat management (15), strict enforcement of law and order against illegal activities especially poaching, and increase of awareness and relocation of concessionaire hotels (8) were reported as major opportunities while poaching (21), weed invasion (20) and construction activities resulting in flood (11), as the major threats to the national park. Please see Table 6 for detail responses of this exercise. The numbers in the parenthesis represent the number of responses.

Table 6: SWOT analysis

Strength (77)	Weakness (80)	Opportunities (86)	Threats (90)
Rhino (25)	Inadequate guard posts and weak control in poaching (9)	Habitat management (15)	Poaching (21)
Biodiversity (15)	Lack of coordination (8)	Strict enforcement of Law and order (8)	Weed invasion in grassland and wetland 20)
Opportunity of income through tourism (14)	Inadequate management of habitat (8)	Relocate concessionaire hotels from the park (8)	Construction and flood (11)
International recognition of CNP like WHS and Ramsar Site (10)	Lack of awareness among the politicians (7)	Awareness to poor local people (7)	Pollution (8)
Birds (5)	Weak management and protection administration because of inadequate management facilities (7)	Enrichment of park management with all types of resources (6)	More political discussion in conservation (7)
Culture (4)	Park management more focused to work in buffer zone than in the park management activities (5)	Participatory Conservation Unit (6)	Weak policy and commitment from high level (7)
Participatory management (4)	Lack of awareness among local people (5)	Coordination with local people (5)	Unstable political situation (5)
	Turn over of staff especially Chief Warden (5)	Tourism development (5)	Deforestation due to timber smuggling (5)
	Political play to create conflict between people and park staff (5)	Monitoring by park staff regularly and strictly (5)	Trend of asking to compensation for small damage (3)
	Inadequate anti poaching units (4)	Direct use of park income to poor locals living adjacent to the national park (5)	Open border (3)
	Lack of coordination between park staff and local people (4)	Strong management administration (5)	
	Unequal division of conservation income (3)	Manage strong protection unit Increase guard posts (5)	
	Translocation of Rhino and presenting as gift to other countries (3)	Awareness through media (4)	

	Late decision and lack of adequate authority to field level staff (3)	Use of certain amount of buffer zone income to park management (2)	
	Difficult to change people's attitude (2)		
	Inadequate services for tourist (2)		

Source: Field work 2006

The SWOT analysis carried out by UNESCO's Enhancing our Heritage (EoH) project identified several strengths, weaknesses, opportunities and threats. This report (n = 28) also stated rhino (16), tiger, elephant (14) and other natural resources as major strengths. Similarly, unstable political situation was accounted highest (5) as a major threat followed by habitat destruction and invasion by alien species (4) and poaching (3). Inadequate protection (19) and inadequate staff facilities (11) were reported highest as weaknesses while strong protection (10) and staff amenities (8) were reported to be the opportunities. The initial study carried out by UNESCO/EoH in 2003 also accounted the soil erosion, flood, industrial pollution and livestock and crop depredation as the major threats to the park. It also identified unregulated tourism and infrastructure development activities as the potential threats.

Land degradation, habitat loss, poaching, illegal trade, pollution and several others (encroachment, irrigation canals, hydro power dams etc.) have been reported to be the major threats of the protected area management during the WCPA workshop in 2001. Urgent need of strengthening management capacity was addressed for effective management of protected areas in the workshop (Maskey T.M. 2001).

5.2. Evaluation of various fields

5.2.1. Biogeographical characteristics field

This field was evaluated under the variables such as connectivity, status of key species and change of land pattern.

5.2.1.1. Connectivity

The area around the park has been surrounded by buffer zone. Some patches of the forest around the park have been handed over to community as community forest so as to maintain and use the resources. For example, Baghmara Community Forest and Barandabhar Corridor Forest have provided good links to the park.

Besides, the initiatives such as water whole construction in the buffer zone could be helpful for wildlife. Moreover, the park links with Parsa Wildlife Reserve in the eastern part, Balmiki Tiger Sanctuary and Udayapur Sanctuary lie across the Indian border in Bihar, not adjoining but close to Sohagbarwa Sanctuary lying to the south west in Uttar Pradesh, India. The contiguous surface area of these five protected areas is well over 2000 sq. km., making it one of the largest protected areas in the lowlands of the Indian sub continent (UNESCO/EoH 2003). The connectivity was reported very good by the same report.

Pic. 5. CNP showing connectivity

Therefore, in regards to the connectivity, the park is directly or indirectly connected to other sources of biodiversity resources which has received Value 4.

Connectivity

Criteria	Value	Reached value
More than 90% of the PA perimeter is physically connected to other areas where genetic and biological resources and ecological processes occur and help sustain the PA.	**4**	√
>76% of the PA perimeter is directly connected to other sources of biodiversity resources.	**3**	
>50% of the PA perimeter is directly connected. There are some areas connected to biological corridors.	**2**	
The PA is practically isolated. There are some biological corridors to connect it. Some border effects are evident.	**1**	
The PA is totally isolated with no connection to biological corridors; exchange of genetic material may be difficult. Border effects are evident.	**0**	

5.2.1.2. Status of flagship species

The status of flagship species such as rhino, tiger, crocodile, Bengal florican and Gaur was evaluated and presented based on their sighting and counts taken from various census and other reports.

5.2.1.2.1. Rhino (*Rhinoceros unicornis*)

Pic 6. Rhino in CNP

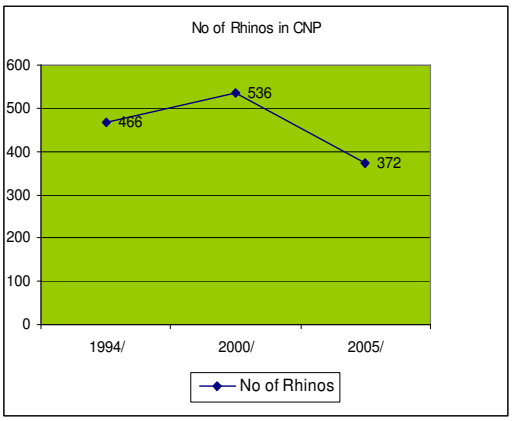


Fig 2. No. of Rhinos in CNP

Source: DNPWC Annua Reports

Rhinoceros is listed as an endangered species in the IUCN Red List of Threatened species. It was once found across the entire northern part of the Indian sub-continent. "Today only about 2480 rhinoceros survive in the wild and about 136 in captivity." (IUCN 1997 cited in DNPWC 2006). The major population is found in Kaziranga National Park, India and Chitawan National park, Nepal.

In Nepal, the population census of rhino has started since 1994 by the Department of National Parks and Wildlife Conservation (DNPWC) with the collaborative support from the King Mahendra Trust for Nature conservation (now National trust for Nature Conservation) and World Wildlife Fund Nepal programme. Since then it has been counted in every five years. The recent count was carried out in 2005 with the same support which counted a total of 372

rhinos (Fig 2). Among them 262 were adults, 42 sub adults and 68 calves (DNPWC 2006). In 2000 and 1994 it was counted 536 and 466 respectively (DNPWC, 2005).

Recently an action plan "A Great One-horned Rhinoceros Conservation Action Plan for Nepal 2006-2011" has been issued to protect this animal. An Asian Rhino Specialist Group (AsRSG) has been formed to better protect the rhinos in South Asia (IUCN/N News 16 March 2007). Moreover, several local level Anti Poaching Units (APUs) have been exerting greater efforts to protect this animal.

Mortality of Rhino

Despite greater efforts of protection, there has been loss of this animal both by natural and human induced reasons. A total of 196 numbers of rhinos were lost in between FY 2000/01 to 2005/06 due to various reasons such as natural death, poaching, tiger predation and mutual aggregation, retaliation etc.

Table 7: Mortality of Rhino in CNP

Year	Natural	Poaching	Others	Total
2000/01	5	10	10	25
2001/02	7	34	9	50
2002/03	16	27	7	50
2003/04				24
2004/05	9	15	3	27
2005/06	8	9	3	20
Total	45	95	32	196

Source: DNPWC Annual Reports

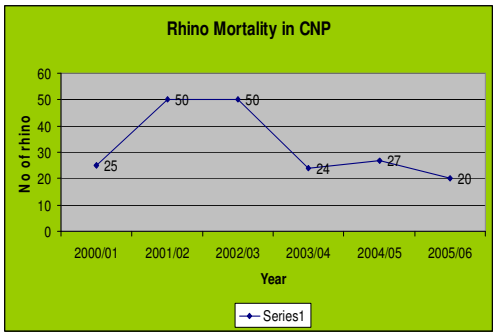


Fig.3. Rhino mortality in CNP

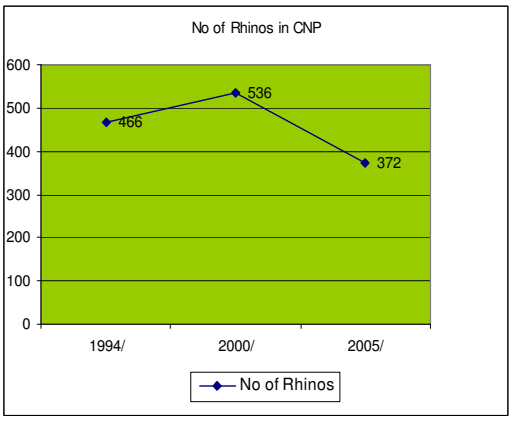
Source: DNPWC Annual Reports

The highest lost (50) was recorded in FYs 2001/02 and 2002/03 (Fig 3). Among the various reasons of loss the highest (>95) was accounted for poaching. This was followed by natural death (>45) and other reasons (>32)

such as tiger predation and mutual aggregation, electrocution, retaliation (poisoning), etc. (Table 8). There has been a great lost of rhino in this FY 2006/07. A total of 11 rhinos have been lost mostly due to poaching in between July to December 2006 (field visit). Four rhinos were killed in one month period during this field study (December 2006).

5.2.1.2.2. 2Tiger (*Panthera tigris*)

Tiger is another important flagship species of this national park. Tiger population census has been undertaking by the park management with the technical support from NTNC. The technique of camera trapping and pugmark study carried out between years 2000-2001 recorded 65 tigers in CNP (DNPWC, Annual Report 2003/04).



Pic 7. Baby tiger in the Orphanage cage

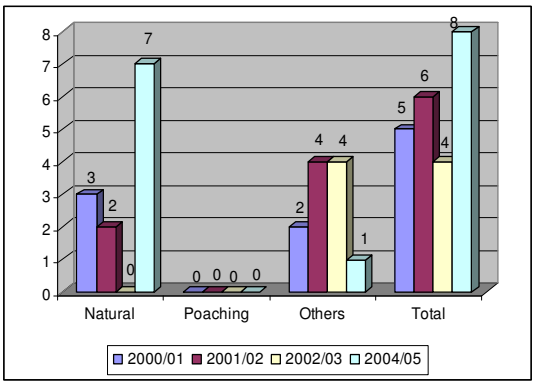


Fig. 4. Mortality of tiger in CNP

Source: DNPWC Annual reports

There is a Tiger Action Plan being implemented to protect this animal.

A total of 23 tigers were lost during the five year period from 2000/01 to 2004/05. The lost was highest (8) in 2004/05 due to natural death. Poaching of this animal was not reported during that period (DNPWC Annual Reports 2000/01 to 2004/05).

5.2.1.2.3. Crocodile (*Gavialis gengeticus*)

Crocodile is another important flagship species of this national park. This is an endangered reptile found in the park. There is a Crocodile Breeding Center at Kasara in CNP which has been successful to produce hatchlings of two types of crocodiles and to release the survived hatchlings to different water systems in Nepal. Fig. 5 shows 100% survival of hatchling in the center in FY 2005. (Please see Appendix I for details).

Pic 8. Crocodiles in CBC

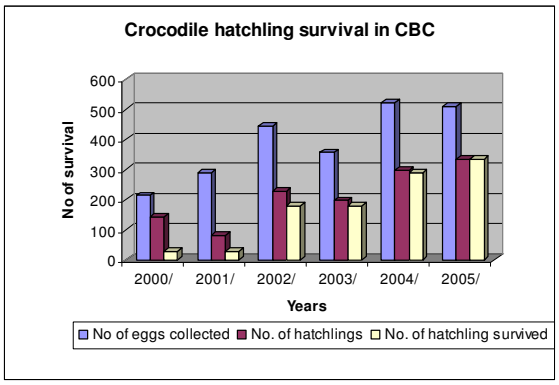


Fig. 5. Survival of Crocodile hatchlings in CBC

Source: DNPWC Annual reports

From 1981 to 2005 a total of 661 Ghariyal crocodile and 142 Mugger Crocodile were released to various water bodies in Nepal (DNPWC Annual Report 2004/05). However, there is no action plan intended to protect this animal.

5.2.1.2.4. Some other animals

Gaur (*Bos gaurus*)

A total of 189 Gaur were counted in 1996 (KMTNC, 1997) in the Jarneli - Marchauli area of the eastern sector. It was reported that the minimum average and largest group size of the animal were 230 and 90 respectively (KMTNC, 1997). Since then there has not been any census carried out of this animal.

Bengal florican (***Houbaropsis bengalensis***)

Bengal Florican is listed as endangered bird in 1988 by IUCN. Now the IUCN has enlisted this bird as a threatened bird. The various reports reported maximum of

29 individuals sighting in 1999 and minimum of 1 in 2001. The recent research done in 2006 counted 5 individuals (PajiyarR. 2006).

On the basis of this information this sub variable has scored Value 3 for the biodiversity and ecological values are being conserved with few flagship species with the action plan.

Biological status

Criteria	Value	Reached value
Biodiversity and ecology are predominantly conserved with specific action plans to preserve focal species and their habitat.	**4**	
Biodiversity and ecological values are being conserved with few focal species with action plan	**3**	√
Some biodiversity and ecological values are being partially degraded but the most important values have not been significantly impacted	**2**	
Some biodiversity and ecological values are being severely degraded. There is no action plan for conserving such values.	**1**	
Important biodiversity and ecological values are being severely degraded. There is not any action plan for conserving such values.	**0**	

5.2.1.3. Change of land pattern

Pic 9. Grassland changed to forest land

Pic 10. Grassland changed into river/sand

In CNP dynamic of land pattern change in between 1978-1992 (Table 8) showed that forest and grassland decreased by 250 ha and 1530 ha respectively whereas shrub land and river-sand land increased by 558 ha and 1222 ha respectively (DNPWC, 2000). There has been remarkable decrease in grassland and increase in river and sand lands due to continuous change of river courses as a result of

flood. The situation has been further aggravated by the rapid growth of invasive weed especially *Micrania micrantha* on terrestrial land and *Eichhornia crassipes* in the wetland. However, the detail study has not yet undertaken after the 1992 survey. Please see Table 8 below for the details of land use change.

Table 8: Change in Land pattern in CNP between 1978 and 1992

Land use	1978 area (ha)	%	1992 area (ha)	%	Change in area (ha)	%
Forest land	1000286.2	84.84	100036.2	84.63	- 250	- 0.21
Grassland	7051	5.96	5521	4.67	- 1530	- 1.29
Shrubland	-	-	558	0.47	+ 558	+ 0.47
Others (River/sand)	10863.4	9.19	12085.4	10.22	+ 1222	+ 1.03
Total	118,200	100	118,200	100		

Source: CNP Resource Profile 2000

The vegetation has been changing rigorously by weed invasion as well as flood. There are some activities undertaking to manage the grasslands and forest lands but these are not adequate to combat the adverse impact.

Based on this information this variable has reached Value 1.

Change in land pattern

Criteria	Value	Reached value
Very resistant to biological invasions and or other disturbances. Very low impact	**4**	
Resistant to biological invasions and other disturbances. Low impact.	**3**	
Moderately resistant to biological invasions and or disturbances. Moderate impact.	**2**	
Little resistane to biological invasions and or disturbances. High impact.	**1**	√
No resistance to disturbance or biological invasion and other disturbances. Very high impact.	**0**	

Table I: Assessment of the value of Biogeographic features

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Connectivity	Status of key species	Land use change	Total reached	Optimum total	% of optimum
CNP	4	3	1	8	12	66.6
Optimum total	4	4	4			
% of optimum	100	75	25			

Thus a percentage of optimum was 66.6% (Table I) which indicated need of more attention for better management. The rigorously changing habitat can impact species conservation. However, there is very satisfactory linkage of CNP to other viable habitats.

5.2.2. Threats field

The SWOT exercise found several threats to the park. Invasion by weed *Micrania micrantha* on the terrestrial habitats and *Ecchornia crassipes* in wetlands, poaching, construction activities resulting in flood and pollution are the major threats to the park (Table 6). Besides, unstable political situation and more political discussion, weak policy implementation were also reported to be the threats to the park. Moreover, the open border and people's dependency on park resources are also the threats to the park. In addition, unregulated tourism activities and infrastructure development are other potential threats reported during the field visit. The tourism is concentrated only in few particular areas such as Sauraha (DNPWC, 2001/05 MP). This has posed serious impact in one area. It was observed that the ongoing tourism activity especially jungle drive has been creating disturbance to wild animals and also polluting the park. This was reported by the visitors and the nature guides. Furthermore, according to the nature guides the view towers constructed in the park have impacted on habitats and wild animals. They reported that the view towers constructed near Bridge No. 1, Bridge No. 2, Tented camp, Dumaraia, Jarneli and Bhimpur have destructed the wildlife movement in these areas. They recalled those days when

they could satisfy the guests while walking through these areas. But nowadays it is even difficult to see the foot prints of the wild animals. They added that Dumaria was a very good place for viewing bison but nowadays it is difficult to see them in that area because of the continuous disturbance posed by the view towers.

Some major threats were evaluated and discussed as follows:

5.2.2.1. Invasion by unfavorable plant species

Pic. 11. Micrania micrantha invasion on grassland

Pic. 12 Micrania micrantha invasion on forest trees

Pic. 13. Micrania micrantha invasion on shrubland

Pic. 14. Micrania free forest

Plant succession and weed invasion are some of the many emerging challenges of management of all types of habitats in and around the park. It was observed that all types of vegetation have been highly affected by *Micrania micrantha.* However, Sal forests in Barandabhar corridor forest and in some areas in the

park are seen comparatively less affected. But it does not mean that Sal trees are not affected. Annual report CNP 2002/03 reported decrease of grassland area from 20% in 1970s to 4.2% in 1992. Four types of plant succession have been reported to be affecting ecosystems of the park (DNPWC, 2002). The succession by tall grass species on grass species like *Imperata cylindrica* and *Cynodon dactylon,* the rapid spread of *Micrania micrantha* in all types of vegetation, the colonization of sandy grasslands with tall *Saccharam* species and the encroachment of fire resistant species like *Bombax ceiba, Cordia dichotoma, Ehretia laevis, Trewia nudiflora, Syzygium cumini, Xeromorphis uliginoides* were reported to be serious to habitat alteration. Similarly, wetlands are suffering from water hyacinth (*Eichhornia crassipes*) and *Leersia* species (Karaute).

The IUCN Species Survival Commission also states that invasive alien species are the second greatest threat to biological diversity globally and the highest threat to many island ecosystems. But there is less analysis on this issue and the possible reasons for this may be that this threat remains unrecognized to many managers, misrepresentation of places where the invasion is the highest, and or misrepresentation of more problematic species. So, enough database addressing specific problem is very important to develop appropriate programmes to cope with this issue of management (Lacerda L. 2004).

Micrania micrantha is a climber plant. It has very high growth rate –a single plant can produce up to 40,000 seeds per year which can be easily dispersed by wind or adhere to cloth or animal fur (Matthews S., 2004, 21). Moreover, the plant can propagate vegetatively by its nodes when coming in contact with the soil (Field response and Matthews S., 2004). The growth rate is very high and the shoots have been reported to lengthen by as much as 27mm per day and within a few months an individual plant can cover more than 25 sq.km. Due to this characteristic it has been named as "Mile a minute" plant. This plant has been nominated as among the "World's worst 100" invaders.[4] This plant is invaded into Nepal via India. It was reported first by KMTNC 10-15 years back in Chitwan (Baral H.S 2005 cited in Poudel A. et.al, 2005). In India, it was deliberately

[4] Global Invasive Species Database modified on 24 January 2005, www.issg.org

introduced during the Second World War 1940s to securing military installations as camouflage airfields (Matthews S., 2004, and Poudel A. et. al., 2005).

According to the personal conversation with the researcher currently undertaking study on *Micrania micrantha,* the open vegetation is seriously affected by this weed. It covers the ground and canopy of the trees and deprives them of the light needed for photosynthesis and also competes with the nutrients and water thus retards their growth. This weed has also alleopathic properties releasing substance that will inhibit the growth of other plants (Matthews S., 2004, 21). This has not only affected the host plant and other associates but also impacted animals and birds to greater extent. Since this plant covers the ground surface, birds such as thrushes and francolins are seriously affected because they feed on the forest floor (Poudel A. et. al. 2005). Also, the canopy cover by this weed has accelerated the defoliation and death of trees which has affected birds' habitats.

Besides, a report carried out in the grassland of northern part of CNP showed the presence of seedlings of some invasive tree and shrub species in the grassland. The study carried out in the period of 1996 to 2000 reported *Imperata cylindrica* as the most dominant species followed by the *Saccharum spontaneum.* But there was decrease in dominance of *S. spontaneum* which is the most preferred grass for rhinoceros (Jnwali and Wegge, 2000 cited in Shrestha B.K. et. al, 2006). The study reported serious change in grassland habitats and recommended to control grazing and thatch collection. It has also recommended regular removal of invasive species.

Although *Micrania* problem has been emerging, "there is no recognition of this problem: a paper on weed problems in 2003 did not even mention Micrania as a problem." (Baral H.S. 2005 in Poudel A.k. et. al., 2005). A national workshop was held on *Micrania micrantha* invasion in Kathmandu, Nepal in 2004. But the follow-up activity has not been known so far. All respondents responded that if immediate action is not undertaken to solve this problem the habitats will be irreparably destroyed in 3-4 years.

Activities like grass cutting and control burning of grass have been undertaking for better management of grassland and other habitats. However, the effectiveness of these activities has not been known so far. One study undertaken in India reported that slash and burn to remove the weed was actually escalating the problem as it can grow even from a small piece of the plant when it comes in contact with the soil. According to Matthews, the use of herbicide was also not an effective measure. Herbicide such as glyphosate and 2-4-D was found to be complicated as it kills the host plant and contaminates the crops (Matthews S., 2004). It was reported that the use of herbicide and manual removal are not effective measures (Poudel A. et. al., 2005). However, the workshop identified biological control by using the rust, *Puccinia spegazzinii* as the most advisable measure to curb this weed. Moreover, Abraham M. (2002) reported that natural enemies could be the biocontrol agents for *Micrania* invasion. He found nineteen species of insect pests and a species of mite as natural enemy of *Micrania*. Among them tea mosquito bug (*Helopeltis theivora*) caused serious damage on *Micrania*. He reported that it caused average intensity of attack (percentage of damaged leaves) of 18.02%. Similarly, thrips *(Microcephalothrips abdominalis)* attacked the flowers causing drying of the flowers. However, all these enemies are polyphagous in nature so the potentiality is limited.

Based on this information it can be assumed that the invasion of weed has possibly violent effects but they could be reversed in the medium or long term and has reached Value 1.

Weed invasion

Criteria	Value	Reached value
There is no problem of invasive weeds in the area	4	
The invasion of weed has little effect in the PA environment	3	
The invasion of weed has serious effect but they are manageable, avoidable and early reversible.	2	
The invasion of weed has possibly violent effects but they could be reversed in the medium or long term	1	√
The invasion of weeds has effected extremely serious and irreversible.	0	

5.2.2.2. Poaching

Poaching was found to be one of the most emerging problems in and around this park as was found in the SWOT exercise and the field visit. Poaching was mainly done by shooting, electrocution and poisoning.

The data on Table 8 shows that out of the total loss of 196 rhinos from the FY 2000/01 to 2005/06 the highest lost (>95 individuals) was due to poaching. However, there has been relative success in reducing the poaching of rhino comparative to 2001/02 and the following years. There was highest lost (34 individuals) of rhino in the FY 2001/02 due to poaching.

Pic 15. Treatment of the injured rhino

A great loss of 11 rhinos was witnessed in six months period in the FY 2006/07.[5] There is Anti Poaching Unit (APU) programme to combat this problem in CNP.

The findings thus showed that the poaching has possibly violent effects but they could be reduced in the medium or long term. So it has reached Value 1.

Poaching

Criteria	Value	Reached value
There is no problem of poaching in the area	4	
The poaching has little effect in the PA environment	3	
The poaching has serious effect but they are manageable, avoidable and early reversible.	2	
The poaching has possibly violent effects but they could be reversed in the medium or long term	1	√
The poaching has effected extremely serious and irreversible.	0	

[5] Kantipur Daily, 23 December 2006 and field visit

5.2.2.3. Construction and flood

Pic 16. Flood in the Rapti River

Construction and the consequencing flood were reported to be another challenge for management of the park and buffer zone (Table 6). Every year flood occurs in Rapti, Narayani and Reu Rivers eliciting serious damage to cropland, forest, grassland, settlements, etc. However, flood in the Rapti River was found to be the most damage-causing than the other two rivers (CNP Annual Report 2002/03).

Various study reports showed that construction of dams and embankments is the main reason to cause flood. A study done in Kaziranga National Park in India reported that some flood control methods such as construction of embankments, together with extreme monsoon precipitation and deforestation, resulted in heavy siltation in the river, altering riverine ecosystem. It reported that in upper Assam the river bed has been raised to such an extent that only a few days of rain can bring about severe flood (Mathur V.B et.al.).

Under an East Rapti Irrigation Project, a series of embankments have been constructed to the north of Rapti River at Hetauda, Lothar khola, Manahari khola and Sauraha down to Gangapur North of Tiger Tops Hotel in CNP. Similarly, there are series of embankments constructed along the west of Narayani River by several donor partners under District Development Committees. Besides, several small dams have been built to protect agricultural fields by VDCs and BZ groups in the Madi River and the Reu River.

The CNP was listed as a threatened protected area by the IUCN Commission on National Parks and Protected Areas in 1990 in view of the proposed establishment of a hydroelectric barrage on the Narayani River upstream of the park and the East Rapti Irrigation Project, which would reduce the base flow by

75%. Both projects would result in changes to the riverine ecosystems, and could seriously affect aquatic and terrestrial faunal populations (Sharma, 1990; Anon., 1991). The assessment report of East Rapti Irrigation Project for the Asian Development Bank, Talbot (1991) concluded that environmental risks from the project are unacceptably high and recommended that it be reformulated or replaced by one or more lower-cost projects.[6]

Another reason for flood may be high siltation in the rivers such as in Lothar Khola where this has almost reached to the bridge of the Khola (reported during the field visit). Moreover, there is huge collection of drift wood in the rivers which also has caused siltation and changed the river courses.

The flood occurred in the early July 2002/03 was very destructive to almost all parts of the CNP causing loss of many posts, Hattisar, Elephant Breeding Center, Dumaria post, Ghatgai Post, VIP complex in Kasara, vehicles along with storage and many belongings of staff and local people. Besides, forests of Sal, of Sisoo, Velor, Simal and a large area of grassland along with several wildlife were washed away by the Rapti River (CNP Annual Report 2002/03 and UNESCO/EoH, 2003).

Nepal S. K. (1993) also mentioned flooding as a major problem in the vicinity of CNP particularly at Padampur, where a section of the village would seasonally be submerged in flood water. The study in Kaziranga NP, India reported the large dams to be the cause of submerging land area which displaced at least of 42 million people in India (Mathur V.B. et. al.).

Beside the loss of habitats and properties, flooding has also impacted several nesting birds such as open bill stork when tree species like Simal on the bank are washed away by flood. Moreover, the accumulation of drift wood may increase

[6] http://www.unep-wcmc.org

the growth of plants (algae) which can reduce oxygen content in the water thus by impacting fish, crocodile and other aquatic animals.

However, some grassland experts said that flood is a natural phenomenon and can be taken as a management tool for riverine grasslands to renew fresh grass time to time, otherwise woody vegetation will take over and convert into forest land.

In a word, construction activities are causing flood and this has been regarded as one of the major management challenges. Thus it has reached Value 1 as it has violent effects but they could be minimized in the medium or long term.

Construction and flood

Criteria	Value	Reached value
There is no flooding problem in the area	4	
The flooding has little effect in the PA environment	3	
The flooding has serious effect but they are manageable, avoidable and early reversible.	2	
The flooding has possibly violent effects but they could be reversed in the medium or long term	1	√
The flooding has effected extremely serious and irreversible.	0	

5.2.2.4. Pollution

Pollution is another major threat to the park. The increased number of hotels both inside and outside the park, unregulated tourism, increased settlements and industries have been continuously creating problems in both physical and biological resources. The emissions produced by these industries pollute the air and effluents pollute the streams. The sewage of Hetauda and Narayangarh towns is released directly in the river systems while industrial effluents are discharged into river and streams without any treatment. The garbage of hotels in Sauraha area is dumped into Rapti River. The use of chemical fertilizers and pesticides has increased and their residue affects water quality of the river systems. This has adversely affected the aquatic life including Ghariyal and Gangetic dolphin (UNESCO/EoH 2003).

Besides, there is noise pollution from the running vehicles especially for jungle drive and from the tractors for grass collection. Interviews with the visitors reported noise (people talking and vehicles running) in the park. Some visitors also reported that people talking on mobile phones during jungle walk and elephant riding may create disturbance to wild animals. This was also observed during the field visit.

Regarding this issue of pollution, the Department of National Parks and Wildlife Conservation (DNPWC) has been coordinating with the Ministry of Population and Environment to control the water pollution in the Narayani and Rapti Rivers due to various industries in Chitwan, Makawanpur and Nawalparasi districts (DNPWC, 2002). Besides, the park management and buffer zone have been undertaking several programmes such as conservation education and awareness programme in collaboration with other NGOs and INGOs for reducing pollution. Moreover, the management could urge the industries and hoteliers to establish waste treatment plants.

Therefore, based on this, it can be concluded that pollution has serious effects but they could be reversed in the medium and long term. So it has received Value 1.

Pollution

Criteria	Value	Reached value
There is pollution problem in the area	4	
The pollution has little effect in the PA environment	3	
The pollution has serious effect but they are manageable, avoidable and early reversible.	2	
The pollution has possibly violent effects but they could be reversed in the medium or long term	1	√
The pollution has effected extremely serious and irreversible.	0	

Table II: Value assessment of Threat field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Invasion by weeds	Poaching	Construction	Polluiton	Total reached	Optimum total	% of optimum
CNP	1	1	1	1	4	16	25
Optimum total	4	4	4	4			
% of optimum	25	25	25	25			

The findings showed that all types of threats have scored optimum percentage of 25% (Table II) which indicated minimally satisfactory management. These are very serious and need immediate attention to escape from the disaster of threats.

5.2.3. Legislation and policy field

5.2.3.1. Clarity

The CNP has been protected under the National Parks and Wildlife Conservation Act 1973 (2029 B.S). By adopting the IUCN category II of the protected area, HMG/N has also published CNP regulation 1974 (2030 B.S.). The Act and its regulations give special power to the Park Warden for the protection and management of the park. The Act was amended for times so as to curb protection needs and also the welfare of the people residing in and around the park. Till date the NPWC Act has been amended for four times in 1975, 1983, 1990 and 1993. The 4th amendment done in 1993 (2049 B.S.) has made a provision of declaring a buffer zone and the BZ Management Regulation 1996 (2052 B.S.) and BZ Management Guideline 1999 (2055 B.S.) are developed. These developments have provisioned 30-50 % of the park revenue to be ploughed back to the BZ for its development. These also provide authority to the Park Warden to design programmes in the BZ that are compatible with the

national park management. The Park Warden is authorized to hear offence cases and impose the following penalties on conviction [7] (Misra M.K., 2005):

1. Any person who illegally kills or injures, sells, purchases or transfers or obtains rhinoceros, tiger, elephant, musk deer, clouded leopard, snow leopard, bison, or keeps, purchases or sells rhinoceros horn or musk pods or the fur of snow leopard as well as trophies of any other protected wildlife, shall be punished with a fine ranging from fifty to one hundred thousand rupees or an imprisonment ranging from five years to fifteen years or both.
2. Any person who kills or injures any other protected wildlife other than those mentioned in sub section 1 shall be punished with a fine ranging from forty to seventy five thousand rupees, or face an imprisonment ranging from one year to ten years or both.
3. Any person who hunts and kills or injures wildlife other than birds and fish inside a national park, strict nature reserve or wildlife reserve without obtaining a license shall be punished with a fine ranging from one thousand rupees and ten thousand rupees or face imprisonment ranging from six to two years or both.
4. Any person who hunts and kills or injures protected birds shall be punished with a fine ranging from five hundred rupees to ten thousand rupees or face imprisonment ranging from three months and two years or both.
5. Any person who hunts and kills or injures birds other than protected birds inside national park, strict nature reserve or wildlife reserve without obtaining a license shall be punished with a fine ranging from two hundred rupees and ten thousand rupees or face imprisonment ranging between three months and two years or both.
6. Any person who commits an offense other than those mentioned in sub section (1), (2), (3), (4) and (5) in contravention of this Act or the rules framed under the Act shall be punished with a fine up to ten thousand rupees or two years imprisonment or both depending on the nature of the case.

[7] The judicial decisions of the Chief Warden can be appealed in the Appeal Court (Punarabedan Adalat Hetauda for CNP) of the respective district judge.

Besides, there is King Mahendra Trust for Nature Conservation Act 1982 (Now National Trust for Nature Conservation). Other relevant Acts and Conventions are as follows:

- Environment Protection Act 1996
- Forest Act 1993 and its amendments
- Water Resources Act 1992
- Soil and Water Conservation Act 1982
- Aquatic Animal Protection Act 1961
- RAMSAR Convention 1971
- Convention Concerning the Protection of the World Cultural and Natural Heritage 1972
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1975)
- Convention on Biological Diversity 1992

The CNP has very clear laws and regulations which focus on protection of natural resources. So, it has reached Value 4 in terms of clarity.

Clarity

Criteria	Value	Reached value
The laws and regulation are very clear and encompasses every level of the jurisprudence over natural resources, protected or not, guaranteeing their sustainable use as well as good PA management.	4	√
There are laws and regulation as indicated above and they do not overlap, and although there are gaps in coverage these does not seriously affect PA management.	3	
The laws and regulations on natural resources use have some gaps in and overlaps that impair or hinder PA management.	2	
There are some laws and regulations that promote natural resource conservation but there are marked conditions among them which impede or prevent good PA management.	1	
There are no general laws of regulations that standardize natural resource use.	0	

5.2.3.2. Application

Although there is very satisfactory law and policy, strong enforcement is needed in their implementation, reported by almost all respondents during the study. They remarked that even if the poachers are confiscated they are released soon. The unstable political situation, weak policy application, more political discussions were also reported during the SWOT analysis exercise (Table 6). Boxes 1, 2, and 3 illustrate the recent case filed in regards to poaching. The need of revision of the existing legislative, contractual and traditional protection especially addressing pollution, contract of concessionaire hotels, and public right of way of Madi village was also reported in the periodic report to World Heritage (DNPWC, 2002).

Box 1. Major Rhino Horn Poachers Arrested in Nepal

On Tuesday, 20 July, the authorities in Nepal announced the sensational arrest of eight major rhino horn poachers and traders. Working on a tip-off, the Royal Nepal Army and the National Park authorities of Royal Chitwan National Park arrested the men near Kasara, where the Park headquarters are situated.

The man who is thought to be the kingpin of the rhino horn trade in Nepal, Pemba Lama Gurung alias Yakche, was also arrested. Around 40 years of age he is believed to have been involved in the purchase and sale of rhino horns to "foreign countries" for a number of years. He was caught with one rhino horn, a Toyota Corolla Car, NRs.4.46 lakhs in cash (approx. US$ 6,330) a spring weighing machine, and a mobile phone. Lama has apparently already confessed to trading in 20 rhino horns, which he purchased for about Rs.4 lakhs (~US$ 5,700) each. To give some scale of the financial clout of Lama, the Assistant Warden of Royal Chitwan National Park, Mr. Kamal Jung Kuwar, said that Lama has a three-storey house in Sitapaila, Kathmandu that he has rented out to a foreign donor agency for NRs.1.3 lakhs (~US$ 1,850) per month. In the meantime Lama has been residing in a luxurious rented house in Chettrapati, Kathmandu.

Source: UNESCO/ EoH Report 2005

Box 2. Park staff jailed

Chief Warden, Assistant Warden and team leader of anti-poaching operations and ranger were jailed for the alleged murder of Shikha Ram Chaudhari, suspected of being a poacher and illegal wildlife trader. He died during interrogation on 4 June 2006, which led to the three park staff being taken into custody. The chief warden was later released on bail while Assitant Warden and ranger remained in police custody till the date of field visit January 2007.

Another case of suicide by the poacher in the jail further aggravated the situation of park management and the government decision. Moreover, nine people who were jailed in Bharatpur Jail for rhino poaching were released at the same time.

This type of decision of the government seemed to be unfair. Conservationists, local communities, bufferzone councils and committees, hoteliers, political parties expressed joint dissatisfaction and made delegation against this unfair decision of the government. They opined that this would certainly discourage the management staff to undertake their responsibility in future days, then what is the meaning of being existence for protection and conservation authority and staff.

Most of the people voiced that there is some hidden linkage of poachers to some kind of strong force. So, the poachers are not afraid of being arrested and jailed. They have no fear of being arrested because they get released soon. This obviously raises question on the rules and regulation and authority given to the Park Warden. In spite of being recognized and respected, the park officials who are given the responsibility of managing the park were jailed. This may be the reason of increasing poaching rhino one after another in very short period. It is certain that such activity will encourage the poachers leading to increased poaching. Besides, it may discourage staff and local people. They may feel less interest in such activities rather they might be attracted for getting profit from poachers.

Source: Field visit 2007

Box 3. Release of the park staffs 07 March 2007

The government of Nepal withdrew the case against Chitwan National Park's Chief Warden Tika Ram Adhikari, Assistant Warden and team leader of anti-poaching operations Kamal Jung Kunwar, and ranger Ritesh Bhushan Basnet for the alleged murder of Shikha Ram Chaudhari who died in the Bharatpur Teaching Hospital while treatment in the investigation period of park custody. Kamal Jung and Ritesh Bhusan were released on 4 March 2007. They remained in police custody for nine months, which is great loss of management as well as conservation efforts.

Source: WWF online news

Based on this information this variable has reached Value 2.

Application

Criteria	Value	Reached value
The laws/regulations relating to the PA are always compiled to by users and the PA staffs make great efforts to publicize and enforce them.	4	
The laws/ regulations are compiled to by the majority of users. PA staff publicizes and enforce them.	3	
PA users comply with laws/regulations though reluctantly in spite of PA staff's efforts to publicize and enforce them.	2	√
PA users comply with laws/regulations though very reluctantly, PA staffs perform limited control actions and sporadic efforts to publicize and enforce them.	1	
La/regulations are rarely compiled to by PA users; employees make so efforts at publicizing or enforcing them.	0	

Table III: Value assessment of Legislation and political field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Clarity	Application	Total reached	Optimum total	% of optimum
CNP	4	2	6	8	75
Optimum total	4	4			
% of optimum	100	50			

Therefore, the optimum percentage of management effectiveness for legislation and policy field was 75% (Table III). The findings showed that there is clear legal status but subsequent efforts are needed in implementing the prescribed rules and regulations into practice.

5.2.4. Planning field

The planning field was evaluated on the basis of variables such as management plan and zoning.

5.2.4.1. Management Plan

This variable was measured by means of the following sub variables: existence and revision of the plan, characteristics of the planning team and implementation of the plan. Although the park and buffer zone have been divided into four management sectors, sectorwise plan is not yet prepared.

5.2.4.1. 1. Existence and age of MP

The CNP had a five-year Management Plan (1975-1979) for the first time. This plan aimed to conserve the indigenous Terai fauna and in particular, Greater one horned rhino, tiger, Gaur, Gangetic dolphin and Ghariyal in their natural habitats and provided opportunities for research, education and recreation while developing the area as an important site for tourism. The plan's objectives laid main emphasis on the conservation of habitats as well as representative and endangered species. After this plan there was neither assessed the effectiveness of this plan nor was developed any follow-up plan. This wide gap thus resulted in increasing resentments and conflicts in management (DNPWC, 2001/05 MP).

After a wide gap of about 22 years a second five-year Management Plan (2000-2005) was developed. This management plan aimed to activate a sense of common purpose of biodiversity conservation and sustainable community development not only through the sentiments of conservation ethics but also through a common sense of partnership between the park and the people

(DNPWC, 2001/05 MP). This plan broadly described the goals, objectives, guiding policies, management approach and activities.

A third five-year Management Plan (2006-2010) has been made as a follow-up management plan. This plan is under the process of implementation (Field response December 2006).

With this information it can be said that the PA has management plan which has been reviewed timely. So, it has reached Value 4.

Existence of age of MP

Criteria	Value	Reached value
There is MP prepared or revised less than 5 years ago, which is implemented by the PA administration	4	√
The PA is in the process of preparing or revising an out of date plans > 5 years old.	3	
There is MP that has not been revised for more than 5 years. There are no studies or other planning instruments that guide PA activities.	2	
There is a very out of date MP >10 years old that the PA administration no longer uses. Nothing is being done to revise it.	1	
There is no MP nor are there any plans to prepare one	0	

5.2.4.1. 2. Characteristics of planning team

In the former years the management plans were prepared by specific technical group. But now it has been prepared by a multidisciplinary team of park officials, consultants (socio economic, biodiversity, GIS etc) with subsequent consultation with the local community. The respondents of the BZ management reported that there was subsequent consultation during the preparation of the Management Plan (2006-2010).

Box 4. Community consultation

Mr. Basu Dev Dhungana, Chairman of the Mriga Kunja Users Committee, Bachhauli VDC reported that this year the management plan preparation team consulted the local institutions such as BZMC, BZUC, BZUG in the beginning of the plan preparation. He said that he was given to review the draft plan. He had also provided some inputs in the draft plan 2006-2010. The Chairman of BZMC, Mr. K.P. Bhurtel added that there were series of consultation during plan preparation and this had encouraged them to know the park management in detail. *Source: Field visit*

So, the planning team is multidisciplinary and there is community involvement during preparation thus it has reached Value 4.

Characteristics of planning team

Criteria	Value	Reached value
Multidisciplinary team and community	4	√
Multidisciplinary team	3	
Specific technical group and community	2	
Individual planning by a specialist	1	
No planning team	0	

5.2.4.1.3. Plan implementation

All the 20 respondents (100%) said management plan is important for planning further activities. The park staff and members of BZ Committee and BZ Users Committee responded that the plan has been useful to make annual plans. The park administration has been implementing it on top priority as per the availability of the resources (DNPWC, 2002). However, all the activities planned in the management plan could not have been carried out. For example, zoning inside the park, setting up new organizational structure with a park director etc. have not achieved so far. The implementation of sectoral approach was reported to be not desirably practiced. It was reported that this depended on the capacity and will of Chief Warden. Although this approach has somehow been implemented, more people are still confused with this approach. This was also noticed during the field visit. There were some people who came to get approval from the eastern sector to establish a project in this sector but they did not. So, it seemed that although the sector approach has been developed aiming to ease the process it has not been practiced so far as intended. I thought that it might be because of the centralized authority of the headquarters and the lack of decision-making power at the sector level. But it should be clearly communicated to the local people.

UESCO/ EoH also reported that there is a clear priority indicated within the plan in a way that supports work programming and allocation of resources (Misra M.K. 2005). The activities such as zonation, organizational structure (staffing) of

the park management, sectoral approach have not been fully implemented yet. The WWF's RAPPAM study also showed that although there is a good management plan the implementation is poor (Nepali S.C., 2006).

Based on this information it can be said that there is management plan based on which management activities have been developed. This has thus reached Value 3.

Plan implementation

Criteria	Value	Reached value
Management actions specified in the plan can be clearly understood and provide a useful basis for developing works programmes, budgets and other operational plans and programmes.	4	
Management actions specified in the plan can generally be clearly understood and provide an adequate basis for developing works programmes and budgets and other operational plans and programmes	3	√
Management actions are sometimes unclear or lacking in specificity making it difficult to use the plan as a basis for developing works programmes, budgets and other operational plans and programmes	2	
Management actions are often unclear or lacking in specificity making it difficult to use the plan as a basis for developing works programmes, budgets and other operational plans and programmes.	1	
Planned activities are feebly carried out	0	

5.2.4. 2. Zoning

The Management Plan (2001-2005) has clearly mentioned about zoning of the park into three zones viz. **core zone** (no human activity except research and monitoring), **utility zone** (location for hotels and campsites shall be designated along with the sites for visitor center, museum, routes for jungle drive, elephant ride, nature walk, grass and thatch cutting areas, religious sites etc.) and **management facility zone** (park headquarter, sectoral headquarters, posts, road and fire line networks and watch towers), but this has not yet practiced in the park.

According to this study, 75% of the respondents (n= 20) reported that there is zoning but they referred to the whole park as a core zone and buffer zone as added protective zone. Twenty five percent of the respondents said that there is no zonation in the park as was prescribed in MP 2001/05. This means only few

people know about the zonation approach in the park. The park staff opined that there should not be any utility zone in the park. It seems that there is still confusion on understating of zonation. It may be because zonation is not implemented into the field as was planned in the paper. For example, there are concessionaire hotels and campsites in the park and tourist activities such as jungle drive are still ongoing in the park which is supposed to be a core area of the park. These may be the reasons for mixed responses during the field visit.

The respondents responded that the plan should be very practical and achievable. They responded that an over ambitious plan may cause difficulties in plan implementation effectively and efficiently resulting in failure of the plan.

So, although zonation of the park has been defined, it has not yet implemented. There is confusion of zonation due to existing activities which otherwise should not be undertaken. Based on this information this variable has reached Value 1.

Zoning

Criteria	Value	Reached value
There are defined zoning with clear regulations and is implemented	4	
The zoning is defined but the zoning regulations are not known or taken into consideration	3	
The zoning is defined in the MP but not implemented and needs revised due to changing factors and circumstances that affect its management.	2	
The zoning is defined but not clearly understood by all. It does not fit to current situation and need review	1	√
There is no zoning	0	

Table IV: Assessment value of Planning field

0=Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Management Plan				Zoning	Total reached	Optimum total	% of optimum
	Age and existence of MP	Characteristics of the planning team	Plan implementation	Average				
CNP	4	4	3	3.6	1	4.6	8	57.5
Optimum total	4	4	4	4	4			
% of optimum	100	100	75	80	25			

The overall optimum value for this variable was 57.5% (Table IV) which indicated that although management plan has been well prepared its implementation has not been accomplished as was planned. To my mind, what is more important is to put the plan into practice.

5.2.5. Administrative field

This field was assessed based on two variables—finance and infrastructure.

5.2.5.1. Finance

This variable was evaluated on the basis of five sub variables—annual operational budget, regularity of fund transference, capacity to generate own resources, extraordinary fund and financial/accounting system. These sub variables were further evaluated on the basis of various parameters.

In CNP, the budget is planned for annual and quarter basis. The budget allocation and its release and expenditure are shown below in Table 9.

Table 9: Annual budget structure of CNP (Amount in NRs.[8])

Year	Budget	Released	Expenditure
2000/01	11509000.00	11490734.16	11490734.16
2001/02	14579000.00	12175753.00	12175753.00
2002/03	14025000.00	13219826.48	13219826.48
2003/04	13395000.00	13636431.71	13636431.71
2004/05	15600000.00	15597000.00	15597000.00

Source: Annual Reports of the respective FYS

5.2.5.1.1. Operating budget

This sub variable was evaluated by the amounts received in determined period. The above data showed that there was more than 90% of budget released as was planned and 100% was expended as per the planned programme. However, there was less released in the budget as was planned.

Operating budget

Percentage of budget received	Value	Reached value
≥ 90	4	√
76-89	3	
51-75	2	
36-50	1	
≤35	0	

5.2.5.1. 2. Regularity of transfer of budget

Adequate information regarding this has not been achieved so far. However, the interviews with BZMC, UC and administration found that there was some delay of budget transfer for two to seven months, which makes difficult to perform the planned activities. They mentioned that the FY begins in mid of July (Month of Shrawan) but the budget is received in the following months.

The research done by Enhancing our Heritage project also indicated insecure financial resource, although there were good plans of allocating the required budget (UNESCO/EOH, 2003).

[8] The exchange rate of 1 Euro = Approximately NRs 90

Based on this information this sub variable has received Value 1.

Regularity of fund

Criteria	Value	Reached value
Transfers always arrive within the set deadline.	**4**	
Transfers are carried out by the set deadline, with small occasional variations.	**3**	
Transfers are carried out regularly with predictable variations.	**2**	
Transfers are irregular, which makes it difficult to carry out plans.	**1**	√
Transfers are totally irregular.	**0**	

5.2.5.1. 3. Capacity for generating independent resources

The CNP has no legal provision to raise its own fund. The 50% of the revenue generated (after deducting 50% for buffer zone) goes to the central treasury and then it is disbursed to the park management as per the approval.

Based on this information this sub variable has received Value 0.

Capacity of generating own fund

Criteria	Value	Reached value
PA has a legal mechanism to raise its own funds, which can be directly reinvested in the PA through an established administrative and financial structure.	**4**	
PA has a legal mechanism to raise its own funds that are used directly, although the administrative and financial systems are not adequately structured.	**3**	
PA has a legal mechanism to raise its own funds but the administrative and financial structure prevents it from being used directly by the area.	**2**	
PA does not have the legal mechanism to raise its own funds, in spite of the fact that the administrative and financial structure would facilitate their direct use in the area.	**1**	
PA does not have the legal mechanism to raise its own funds and does not have the administrative and financial systems that would permit it to do so.	**0**	√

5.2.5.1. 4. Extraordinary financing

There is a special provision of collecting entry fee of the concessionaire hotels as the same amount of royalty which has been collected in the account of National Trust for Nature Conservation (NTNC) since 1986. This has been utilizing for emergency expenditure such as on Rhino/Tiger conservation, Rhino translocation, running anti-poaching activities, carry out maintenance work such

as road, bridge, guard post, guest house etc. The park can use this revenue without any approval from the government. There is a committee under the chair of Director General of DNPWC which decides and approves for allocating this fund to implement various conservation and development activities. However, some clear and effective policy is needed for better and effective use of this fund.

Based on this information, this sub variable has received Value 3.

Extraordinary financing

Criteria	Value	Reached value
There is a secured capacity for covering expenses and they are always taken quickly.	**4**	
The institution maintains a slush fund that is used to cover emergencies without problem.	**3**	√
There is moderate institutional capacity to meet financial and administrative demands, though speed is somewhat encumbered by some bureaucratic red tape.	**2**	
Emergency situations are dealt with but the time needed for administrative operations is lengthy and discouraging	**1**	
The PA does not have this type of help, and there are no possibilities of achieving it.	**0**	

5.2.5.1. 5. Financial/Accounting system

This variable was evaluated under the various parameters such as management capacity, institutional capacity, and budget management, spending capacity and auditing mechanism.

5.2.5.1. 5.1. Management capacity

This variable was evaluated taking into consideration the ability to establish links and maintain good contacts with funding sources to obtain long-term financial and technical support. The park has moderate capacity to establish links with potential funding sources. The relationships are not always the best, which hampers the possibilities of permanent financial support.

Based on this information this parameter has received Value 2.

Management capacity

Criteria	Value	Reached value
Demonstrated capacity to establish links with potential funding sources and to maintain good relationships with them.	**4**	
Relatively good capacity to establish links with potential funding sources and to maintain good relationships with them.	**3**	
Moderate capacity to establish links with potential funding sources. The relationships are not always the best, which hampers the possibilities of permanent financial support.	**2**	√
Low capacity to establish links with potential funding sources; relationships are rare and indirect. The possibilities of financial support are scarce.	**1**	
There are no direct or indirect links with possible funding sources.	**0**	

5.2.5.1. 5.2. Institutional capacity

The institutional capacity of administration was found satisfactory. The administrative staff have some knowledge of planning and accounting system.

Thus it has received Value 3.

Institutional capacity

Criteria	Value	Reached value
The financial management personnel are well trained in financial matters; they have a defined and functional accounting system and appropriate financial planning.	**4**	
The financial management personnel have some knowledge of finance and there is an acceptable, defined accounting scheme. The financial planning is acceptable.	**3**	√
The personnel have basic knowledge of finance. There is a referential accounting framework that has functional deficiencies. The financial planning is deficient.	**2**	
The personnel have elementary financial/accounting skills. Minimal accounting systems are used. There is no real financial planning.	**1**	
The personnel have no knowledge of finance. There is no accounting system. There is no financial planning.	**0**	

5.2.5.1. 5.3. Budget Management

Insufficient budget to carry out the park management activities was reported by the park staff. They reported that lack of budget has led to dropping out the planned activities. The periodic report of DNPWC 2002 also mentioned several

management activities dropped out due to lack of budget. Maintenance of several roads and bridges, repairment of computers and accessories, habitat management activities, conservation education (public coordination meeting, school program, world environment day), custody house construction and drinking water scheme were some of the many activities which dropped out due to lack of budget (DNPWC, 2002).

According to Misra M.K., although the budget has been planned for various activities in the five-year plan and annual plan clearly, the financial resources are not ensured (Misra M.K., 2005). The Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) carried out by WWF also showed the insufficient budget disbursement during the past five years as the government budget was channeled into the security budget (Nepali S.C. 2006).

Furthermore, the environment sector has been increasingly under funded after the declaration of emergency in November 2001(Dhakal, 2004 cited in Murphy et.al, 2005). The budget for environment sector was reduced by 14% in FY 2003/04. There was 50% cut in funds for the Ghariyal Breeding Center in the FY 2004/05. This could be a serious blow to a crucial link in the Ghariyal survival in Nepal.

It has been reported that to objectively manage the park a total budget of Rs 623.3 million (equivalent to US$8.9 million) based on year 2000 price has been estimated for a period of 5 years. Of the total budget, the park management requires 56.9% and buffer zone management 43.1%. There is evidently a large deficit of about Rs 359.7 million (58%) between the budget estimated by this plan and allocation from HMG (DNPWC, 2001/05 MP and DNPWC, 2002).

So, although budget preparation is acceptable as per the need but the spending is limited due to budget short fall. Thus this has reached Value 2.

Budget management

Criteria	Value	Reached value
Adequate budgets are prepared and spending programe is defined according to need.	**4**	
Budget preparation is acceptable. The spending programs are not well defined.	**3**	
Budgets preparation is acceptable but spending is limited due to budget short fall.	**2**	√
Budgets are not structured; spending is uncontrolled.	**1**	
There is no real budget nor is there a spending plan.	**0**	

5.2.5.1. 5.4. Spending capacity

It was found that the spending was timely and programmed and budget spending reports were prepared regularly. Table 9 showed that cent percent released budget is spent on various activities. However, there is delay in transferring the budget.

Thus this parameter has reached Value 4.

Spending capacity

Criteria	value	Reached value
Spending is timely and programmed. Budget spending reports are prepared regularly.	**4**	√
Expenditure is not always timely in spite of being programmed. Budget spending reports are not regularly prepared.	**3**	
Expenditures are often delayed and programming is weak. Budget spending reports are prepared sporadically.	**2**	
Expenditure, while sometimes made on time, does not obey any prioritization. Budget spending reports are insufficient.	**1**	
Expenditures are not made on time and no budget spending reports are prepared.	**0**	

5.2.5.1. 5.5. Auditing mechanism

In CNP, the financial reporting is carried out on quarter and annual basis. There is regular audit by the government under accepted accounting standards. The audit is included as a regular activity in annual work plan.

On this basis this parameter has received Value 4.

Auditing mechanism

Criteria	Value	Reached value
The accounting management is sufficiently flexible and independent and carried out under accepted accounting standards. Periodic regular audits are conducted.	**4**	√
The accounting management is acceptable and sufficiently independent, carried out under accepted accounting standards. Audits are conducted on request.	**3**	
The accounting management has deficiencies and is subject to internal bureaucratic red tape. Management fails to meet some accounting standards. Audits are conducted sporadically.	**2**	
The accounting management is elementary and does not meet accepted accounting standards. Audits are practically non-existent	**1**	
There is no accounting management and no audits are conducted	**0**	

Tab (a): Assessing the value of the Finance

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Operational budget	Regularity of transfer	Capacity to manage own resources	Extraordinary fund	Financial/ accounting system						Total reached	Optimum total	% of optimum
					Management capacity	Institutional capacity	Budget management	Spending capacity	Auditing mechanism	Average			
CNP	4	1	0	3	2	3	2	4	4	3	11	20	55
Optimum total	4	4	4	4	4	4	4	4	4	4			
% of optimum	100	25	0	75	50	75	50	100	100	75			

The findings showed that the financial/budgeting mechanism variable received 55% (Tab a), which indicated being moderately satisfactory. There is minimal management effectiveness (25%) in transferring the budget. Resource is not guaranteed as the park has no capacity of managing its own resources (0).

However, it has extra ordinary fund to meet the management needs. The financial accounting system is moderately satisfactory managed (75%). So, there are some imbalances among the various budget related components and the objectives may be only partially accomplished.

5.2.5.2. Infrastructure

This field was assessed on the basis of basic management facilities and specific facilities.

5.2.5.2.1. Basic management facilities

Staff and basic infrastructures (offices, housing facilities, guard posts, vehicles, number of communication equipments etc) were assessed.

5.2.5.2.1.1. Staff

Presently, 128 staff members have been posted to warden office out of the total 144 staff sanctioned. The Chief Warden headed the organization in the park level. The study found inadequate staff in CNP. Furthermore, since the declaration of buffer zone and its management under the park management the responsibility of the staff has been increased (Field response and DNPWC, 2002). Similar is the situation with Hattisar and Elephant Breeding Center. There are 92 staff members posted out of 129 sanctioned numbers. Since three workers are needed for each elephant, there is no full staff to meet this need. Furthermore, there has been increasing number of new elephants in the EBC but there has not yet been additional staff posted for the newly born calves. According to Hattisar, the workload of 9 staff has been carrying out by 2/3 staff. Due to this the actual work division has not been followed. For example, Phanit has to work a job assigned to Mahut. This could be the reason for increased trend of resignation by the staff (field response). This situation was also reported by Yadav B.R. 2002 as the increasing number of calves and 23 already vacant posts have been creating problem in effective management of Hattisar.

The SWOT analysis carried out during the study also found inadequate guard posts referring to inadequate staff and turnover of staff especially the Chief Warden and rangers, which caused weak administrative procedure.

The workshop of IUCN/WCPA held in 2001 reported that the most protected areas suffer from insufficient staff which has been further worsened by vacancies, retirement, resignation, and added responsibility of buffer zone management (field visit and WCPA, 2001). Although there has been a great emphasis on people's participation in biodiversity conservation, the existing staff has not yet been adequately trained to this policy. Need of additional training on the aspects such as anti-poaching operation, habitat management and research techniques, community development and conservation awareness, information technology, tourism and elephant management was also reported by the WH Periodic Report Section II (DNPWC, 2002).

The MP 2001-2005 mentioned to set up the organizational structure with Park Director and two Chief Wardens for park and buffer zone management seperately. It also proposed to increase the staff by 46.3 % in the park warden office, 68.7% to Hattisar Section, Sauraha and 3% in Elephant Breeding Center (EBC) but this goal has not been achieved so far.

Regarding this insufficient staff it was found that although some areas which were under the District Forest Office were now managed under the National Park Management but the staff were not yet ascribed to increased responsibility (Pers. Comm. with the Management staff). Please see the Box 5.

Box 5. Staff recruitment

In regards to the staff deficiencies, Mr. Suray Bahadur Pandey, Assistant Management Officer indicated that there is need of relocation of staff from the District Forest Office to CNP management. Some areas which were under the District Forest Office have been now fallen in to buffer zone. But the staffs of the DFO are not yet transferred under the park management authority. He opined that the staffs of the Range Posts of DFO are to transfer as soon as possible to CNP management to fulfill this inadequacy. A total of 60 staffs from three District Forest Offices are to be transferred to CNP management. Please see Appendix II.

The study carried out by Lacerda L. 2004 showed close correlation between staff number and management aspects. However, he also mentioned an example of protected areas of Australia where there are few staff but are generally regarded as successful (Australia was not taken for study). In his report he mentioned variation depending on aspects such as size of the PA, permanency of staff and number of staff in different parts of the world. "Staffing needs are strongly related to pressures and to overall levels of governance" (Lecerda L. 2004).

It is therefore, there is need of increasing number of staff and enhancing their capacity as per the expanded responsibility and management interventions. It has thus reached Value 2.

Staff

Criteria	Value	Reached value
Staff numbers are adequate. Personal management is excellent. Staff training and skills are in tuned with the management needs of PA. They have defined work	4	
Staff numbers are not adequate. Personal management is excellent. But the existing staff is well trained to carry out most of the PA's activities.	3	
Staff numbers are below optimum level for critical management activities. Personal management is adequate but could be improved. They are adequately trained but could be improved.	2	√
There area not enough staff. Their condition does not allow for the many of the PA's needs to be met.	1	
There are very few staff and they are not well trained and skillful and cause difficulties to management activities	0	

5.2.5.2.1.2. Facilities (housing, transportation and communication equipments)

During the study, sixty percent of the respondents (n = 20) responded that there are not enough facilities and they are of poor quality. There are not enough basic management facilities for carrying out management activities. Their location does not allow to meet many of the PA's needs.

Pic.19 Location of posts before merging several posts

The rest mentioned that there are not enough facilities and the existing facilities are not of best quality but are strategically located to develop key activities.

Pic. 17 Field post in the park

Pic. 18 Damaged field post

There is inadequate staff quarter in CNP (CNP Annual Report 2002/03). The existing housing structures are not enough and well maintained. Most of the office buildings, guard posts and elephant sheds have been built of corrugated sheets for roofing which was reported not suitable for Terai since these are too cold in winter and too hot in summer (Yadav, 2002). Moreover, most of the office buildings were destroyed by Maoist attacks. The Misra M.K., 2005 also reported immediate need of repairment of at least 33 buildings in the park in the UNESCO/EoH 2005 Report.

The existing transportation and communication facilities need immediate repairing and maintaining. This situation was also indicated in the SWOT analysis. The participants indicated inadequate guard posts and appropriate tools to accomplish basic management activities (Table 6). They also mentioned that although there is some assistance from other organizations such as PCP, BCC, TAL and concessionaires hotels this is not sufficient and secured all the time. Moreover, it needs more time to go through a series of processes.

Also, there is only one VHF telephone set for the whole park. The UNESCO/EoH 2005 observed that the telephonic and wireless communication facility in the

park was awfully inadequate. The field posts (except those manned by the RNA) were found to have no audio communication facilities and hence had no means of direct and immediate communication with posts and headquarters. This report

reported urgent need of attention in terms of number and functionality of the facilities. Difficulties in accomplishing park management activities due to inadequate communication facilities were also stated in the annual report of CNP 2002/03. There is no regular 4-wheeler transportation facility in the sectors to conduct regular patrolling. The WWF has provided two motorboats to the park for patrolling (DNPWC Annual Report 2004/05). The inadequacy of basic management facilities was also reported by the group discussion held during the study. Box 6 below illustrated the situation.

Murphy M.L. reported that recently RNA units have largely withdrawn from extensive portions of PAs and are limited to the patrolling areas close to PA headquarters. It stated that safeguarding of PA began to deteriorate after November 2001, when RNA became engaged in fighting with the Maoists. For units stationed within PAs, their mandate changed from patrolling and protecting PA to combating Maoist forces as well. This in turn made PAs and the military units within them a target for Maoist attacks. Maoists began their assault as PA infrastructure by striking and destroying outlying PA guard posts and offices. Presently many PAs are poorly guarded and therefore vulnerable to unchecked resource extraction and biodiversity loss (Murphy M.L. et. al., 2005).

However, the MP 2001-05 mentioned a provision of providing transportation facilities such as bicycles in each post and boats according to need. Motorcycle in each park entry point, motorcycle and pick-up vehicles in each sector and motorcycle and pick-up vehicles and tractors in the park headquarter. Similarly, it was planned to provide adequate communication equipment such as wireless radio set at each post, wacky talkie at the park entry point, VHF telephone sets and wacky talkie at each sector headquarter, telephone, fax, computer, internet, GIS facility at the park headquarters.

So based on this information this sub variable has reached Value 1.

Basic management facility

Criteria	Value	Reached value
Existing facilities are sufficient in quantity and quality to support the PA's activities. They are placed strategically to meet most needs	4	
There are not enough facilities but they are good quality and make it possible to carry out most of the PA's activities.	3	
There are not enough facilities. They are not of the best quality but are strategically located to develop key activities.	2	
There are not enough facilities and they are of poor quality. Their condition does not allow for the many of the PA's needs to be met.	1	√
There are no facilities and or they are so badly deteriorated that they cannot be used.	0	

5.2.5.2.2. Specific facility

Specific facilities here referred to facilities such as visitor centers, laboratories, bridge, trails, and view towers etc. for specific programmes such as tourism.

Facilities and services for visitors were reported adequate in CNP (UNESCO/EoH 2003). However, there is need of maintenance and publicity of the information center. Some tourist responded that they did not know about the information center. This may be because many guides take entry tickets for the tourists and tourists do not go to entry permit station where they can see the information center.

Pic.21 Wooden bridge in CNP

Pic. 22 Forest trail in CNP

So, based on this information this sub variable has received Value 3.

Specific management facility

Criteria	Value	Reached value
Existing facilities are sufficient in quantity and quality to support tourism. They are placed strategically to meet most needs.	4	
There are enough facilities but they are not good quality but make it possible to carry out most of the tourist activities.	3	√
There are not enough facilities. They are not of the best quality but are strategically located to carryout some activities.	2	
There are not enough facilities and they are of poor quality. Their condition does not allow for the many activities.	1	
There are no facilities and or they are so badly deteriorated that they cannot be used.	0	

Tab (b): Assessement of value of Infrastructure

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Basic Management facilities			Specific management facility	Total reached	Optimum total	% of optimum
	Staff	Basic facilities	Average				
CNP	2	1	1.5	3	4.5	8	56.25
Optimum total	4	4	4	4			
% of optimum	50	25	37.5	75			

Thus this sub variable scored 56.25% which indicated moderately satisfactory management effectiveness. However, basic management facilities were minimally satisfactory (37.5%).

Table V: Combined presentation of (Tab a and Tab b) Administration field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Fund	Infrastructure	Total reached	Optimum total	% of optimum
CNP	2.2	2.25	4.45	8	56.125
Optimum total	4	4			
% of optimum	55	56.25			

Therefore, the administrative variable scored optimum percentage of 56.1% (Table V), which showed that the administrative aspect is moderately satisfactory. The national park has some resources for management but many necessary resources are in minimum acceptable level. This characteristic makes the area highly vulnerable to external and internal factors and consequently there is no guarantee for its long-term permanence.

5.2.6. Management programme field

5.2.6.1. Habitat management

The management of grassland and wetland is one of the regular activities of the park. Control burning, allowance for annual grass cutting and manual removal of invasive weeds are the major habitat management activities done in the park. The Ministry of Local Development has handed over the area of Padampur to the CNP in 2004 in order to maintain grassland habitats in the park for long run. That area lying in the park was inhibited by the local people who are now relocated in another place.

Collecting and transporting grass by many people and tractors and burning grass for the management of grassland were observed during the field visit. Such practices could be helpful to some extent. However, in my opinion, such practices undertaking at once have certainly disturbed wild animals in the park. On the one hand there was loud noise of people and vehicles and on the other hand there is fire. So, there is very urgent need of management supervision in this aspect.

Pic.23 Grass cutting

Pic. 24 Wetland management

One study reported that during 10 days of open access [9] in 1999, almost 50,000 tones of biomass were removed from the park, the total gross economic value of the grass cutting programme in 1999 was more than US $ 1 million. It is argued that the grass cutting programme does not, in its present form, comply with the concept of community based conservation but is rather an example of nature based development.

Some local respondents opined that in the past there was comparatively higher grazing in the park but now there is control of grazing which might have invited the aggressive invasion of *Micrania* and habitat deterioration. But grazing is commonly thought as a reason of invasion (Belsky and Gelband 2000 cited in Shrestha et.al. 2006). Shrestha et.al. (2006) reported that the change of ecology of plant due to invasion limits the availability of diet of the endangered animals in the near future as it brings huge change in food web.

Similarly, wetlands of the park have been invaded by the invasive plants such as *Eichhornia crassipes* and *Leersia* species. There is regular programme of cleaning such land. However, this is not enough to combat the problem. Some

[9] Annual access to the park for the local people allowed by the park management authority

partially cleaned wetlands were observed during the field visit. Such incomplete cleaning may further escalate the growth of aquatic plants creating more difficulties for management. Inadequate management was also reported in the SWOT analysis (Table 6). So, rigorous programmes for habitat management are very urgent to secure CNP.

On this basis this variable has reached Value 2.

Habitat management

Criteria	Value	Reached value
There is a planned and effective habitat management fully linked to the objective and needs of the PA	4	
There is enough planned habitat management programme but there are still serious gaps	3	
There is limited planned habitat management programme but there are still gaps	2	√
There is very few ad hoc programmes and has huge gap	1	
There is no habitat management programme	0	

5.2.6.2. Conservation and awareness Programme

Conservation education is one of the regular activities undertaken for raising awareness among local people. There are formal and informal conservation education peogrammes. Radio programmes, celebration of environmental events such as Environment Day, Wildlife Week, organizing rallies, picture competitions, etc. are some of these awareness-raising programmes. But on the other hand, the phenomenon is not yet very much optimistic. The SWOT analysis showed lack of awareness not only among local people but also among the politicians. Moreover, lack of coordination was also pointed out in the SWOT exercise (Table 6). Thus there is still need of effective awareness programmes focusing on all levels of stakeholders so as to better communicate and coordinate management activities.

With this information this management programme has reached to Value 4.

Conservaton education

Criteria	Value	Reached value
There is a planned and effective education and awareness programme fully linked to the objective and needs of the PA	4	
There is a planned education and awareness programme but there are still serious gaps	3	√
There is limited planned education and awareness programme but there are still gaps	2	
There is very few ad hoc conservation awareness programmes	1	
There is no education and awareness programme	0	

5.2.6.3. Research, monitoring and evaluation

The respondents in the interviews responded that there is comparatively less research undertaken currently. They reported that in the past years research was extensively carried out in the park. But nowadays most of the researches are focused on Buffer zone and Barandabhar forest. It was also noted in the Periodic report section II that during 1970s and 1980s the research work was concentrated on the species studies. In the recent years when the buffer zone has been conceived, the research work has focused also on the socio economic aspects (DNPWC, 2002). The data on research accomplished from 2000/01 to 2005/06 also indicate this situation. There were 43 researches accomplished by the various academic students in and around the CNP. Out of these about 30% (17) of the studies was taken in the CNP and that of 70% (26) was taken in the BZ. The most of the studies carried out in BZ were related to tourism, impact of BZ programme and human wildlife conflicts. Most of the studies are of Master-degree. Besides, the park management unit has been carrying out some survey and monitoring in collaboration with BCC-NTNC and Tiger Tops Hotel. But this is limited to tiger and rhino counting in CNP and Barandabhar corridor forest. Studies and surveys on vegetation and other species such as ungulates are very low both in and out of the park.

Lack of follow-up studies, lack of database maintenance and inadequate information sharing were also reported as management challenges during the

WCPA workshop held in Kathmandu in 2001 (WCPA, 2001). Lack of sufficient budget for undertaking research was reported during the field visit. The research activities are mostly carried out "within the budgets of the projects supported by the donor agencies" and individual researchers. There is no regular government budget for research work (DNPWC, 2002, 31). So, this variable has received Value 2.

Research and monitoring

Criteria	Value	Reached value
There is a comprehensive, integrated programme of survey and research work which is relevant to management needs. This is done regularly by park management with regular budget allocation. There is researches by the park management and outsiders.	4	
There is considerable survey and research work but it is irregular and are readily directed towards the need of PA management.	3	
There is some ad hoc survey and research work by the park management and others which are not directed towards the need of PA management. There is no regular government budget allocation for research by the park management.	2	√
There is some survey and research by the outsiders and not by the park management	1	
There is no survey and research neither by the park management nor by the others	0	

5.2.6.4. Communication and coordination

Communication and coordination of CNP was explained in regards to three main stakeholders viz the Protection Unit (Army), buffer zone (local people) and conservation and development organizations (NGOs).

Protection unit

There are battalions and companies of the Royal Nepal Army (RNA) deployed aiming to strengthen the park protection. Almost all respondents responded weak and ineffective communication and coordination between the park management unit and the park protection unit. They reported that there is no support as it should be. They added that a series of commands to mobilize the army force and the slow process delay the ongoing conservation activities. Although they are to operate in close coordination the two are operating almost independently (Misra M.K., 2005). The report indicated that since only the RNA is armed, the park staff

is often constrained in action whenever the help of the RNA is unavailable in a timely manner. This unit was supposed to be established under the command of Chief Warden but it was established as a separate park protection unit under the jurisdiction of the RNA (DNPWC, 2001/05 MP). The communication and coordination between the two units seem to exist by chance or have been established at the will of some officials and through personal relationships (field response). However, there are a few formal meetings between these units occasionally.

Community

The communication and coordination at the community level have been carrying out through BZ Management Council, BZ Users Committee and BZ Users Groups. There are both formal and informal communication between the park and these Community Based Organizations (CBOs). The formal mechanism of communication such as meeting is clearly defined in the BZ Management Guideline 1999. Accordingly, the BZ MC calls for meeting with BZ UC. However, there is sometimes lack of communication between UC and BZMC. The respondents responded that communication is very important to better manage the resources for conservation and development. They opined that all the areas of the buffer zone have not equal resources for development purposes. For example, Sauraha (Eastern sector) has well developed tourism as well as resources like timber, sand and boulders etc. The community forests like Baghmara Community Forest and Kumroj Community Forest which earn a huge amount of money are in this sector. Moreover, there are several development organizations working in the area. But the area like Madi (Southern sector) has neither such resources nor developing tourism and organizations for development. So, good communication might help to share the resources for overall development.

Other Conservation and development organizations

Biodiversity Conservation Center/National Trust for Nature Conservation (BCC/NTNC) and Terai Arc Landscape Project/WWF (TAL) are the two main

national and international projects working in the field of conservation and development in CNP. Besides, there are 74 local NGOs operating in the BZ such as Tourism and Nature Guide Association, Women and Environment Group, Wildlife Conservation Nepal, Cooperative Development Group etc (DNPWC, 2000/2005 MP). Formal and informal communication and coordination between the park and these organizations have been carrying out as per the need. However, the respondents from Nature Guides Association pointed out that there is lack of consultation of the park with them regarding management activities. They particularly pointed out that there was no consultation with them when the view towers were constructed in the park. They said that the towers constructed are in improper locations, destroying the prime habitats of the wildlife species. They opined that it would have been better if the park consulted them prior to construct the view towers. They added that they are the ones who have been continuously visiting the park while guiding tourists and have much knowledge about wildlife movement and their habitats better than those who very occasionally or not go to the park like the hoteliers.

With this information this variable has reached Value 2.

Communication and coordination

Criteria	Value	Reached value
The activity is desirably effective and efficient with all levels of stakeholders. There is well planned communication and coordination system and there is no complain from the stakeholders.	**4**	
The activity is desirably effective and efficient with all levels of stakeholders. There is planned communication and coordination system but there are complain from the stakeholders.	**3**	
There is no planned communication and coordination with all level of stakeholders but it occurs as per the need and there are some gaps	**2**	√
There is very less communication and coordination among the concerned stakeholders.	**1**	
There is no communication and coordination among the concerned stakeholders.	**0**	

Table VI: Assessment of Value of Management programme field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Habitat management	Conservation education	Research and monitoring	Communication and coordination	Total reached	Optimum total	% of optimum
CNP	2	3	2	2	9	16	56.2
Optimum total	4	4	4	4			
% of optimum	50	75	50	50			

The percentage of optimum management was 56.2% (Table VI), indicating that the management programmes are moderately satisfactory. More attention should be paid to habitat management, research and monitoring, and communication and coordination. This situation was also reported during the SWOT analysis.

5.2.7. Legal uses field

The park regulations have provisioned to use the park resources by the local people without sacrifying the overall park management objectives. An annual grass cutting, allotment of park resources, public right of way and concessionaire hotels are the main currently existing legal uses of the park resources.

5.2.7.1. Grass and thatch collection *(Khar khadai)*

The park permits to collect thatch grass and reed cutting particularly Siru (*Imperata cylindrical*) and Kans (*Saccharum spontaneum*) upon certain charge in the months of October- December every year from 1976 onward. In the past year it was allowed for 15 days. This was reduced to 7 days and now it was again reduced to 3 days. The charge of each entry is Rs 10. This activity has been performing in order to manage grassland in the park and at the same time to support the local people. The number of thatch grass collection permit issued was 80,152 in the year 1997/98, which has increased to almost 18000 in 10 years. The pressure is very high in Kasara (27,657 permits) and Sauraha (25,472 permits). In 2004/05 (2061/62), a total of 32831 persons were allowed to entry the park and this had generated Rs 328310. Grass collection has helped the local

people not only in domestic use but also helped to generate income. The local people sell the collection to Bhrikuti Papar and Pulps Mill. Every year the Mill collect about 5000 quintal of grass at the rate of Rs 130 per quintal from the local people. However, during this time illegal activities like timber smuggling and wildlife related accidents and vandalism to wild animal were reported to occur (DNPWC, 2001/05MP). In the former days the monitoring and controlling were done by the park management authority but now this activity is done under the supervision of BZ Users Committee. The UC has developed several ways to discourage the misconducts. The UC members reported that they have been undertaking Identity Card (ID card) system. In this system, whoever is caught taking any resources other than the permitted one will get a red mark on his/her ID card. In this way, illegal conducts are discouraged. The BZ management has been making greater efforts to regularize and systematize the process.

Based on this information this variable has reached Value 2.

Annual Grass cutting

Criteria	Value	Reached value
The activity is compatible with the PA's management objectives, is done in accordance with land use capacity, adheres to legal regulations and there is good technical and administrative management.	**4**	
The activity is compatible with the PA's management objectives; it is acceptable with regard to land use capacity. Supporting legal regulations have some gaps. Technical and administrative management is acceptable.	**3**	
The activity is compatible with the PA's objectives; It is acceptable with regard to land use capacity. Supporting legal regulations are deficient. Technical and administrative management need to be strengthened.	**2**	√
The activity is compatible with the PA's objective; it is acceptable with regard to lad use capacity. There are no legal regulations to support it, there is no technical or administrative management.	**1**	
The activity is not compatible with eh PA's objective, the resource is being over exploited, and there are no regulations or sound management	**0**	

5.2.7.2. Allotment of timber and fuel wood

Timber and fuel wood are provided free of charge for community development work to the people living in the periphery of the park. According to estimation a lodge consumed over 13000 kg of fuel wood per annum and the total

consumption was 452000 kg (KMTNC, 1996). However, sometimes fuel woods and timber were illegally collected.

Based on this information this variable has received Value 3.

Allotment of timber and other forest products

Criteria	Value	Reached value
The activity is compatible with the PA's management objectives, is done in accordance with land use capacity, adheres to legal regulations and there is good technical and administrative management.	**4**	
The activity is compatible with the PA's management objectives; it is acceptable with regard to land use capacity. Supporting legal regulations have some gaps. Technical and administrative management need to be strengthened.	**3**	√
The activity is compatible with the PA's objectives; It is acceptable with regard to land use capacity. Supporting legal regulations are deficient. Technical and administrative management has weakness.	**2**	
The activity is compatible with the PA's objective; it is acceptable with regard to lad use capacity. There are no legal regulations to support it, there is no technical or administrative management.	**1**	
The activity is not compatible with eh PA's objective, the resource is being over exploited, and there are no regulations or sound management	**0**	

5.2.7.3. Public Right of way

There are four public ways passing through the park. There is a short seasonal tract stretches from Sauraha to Jayamangala (Padampur) crossing the Rapti River. It continues to Amuwa in the center of the park. Two ways open to the public run north south from Ghatgai to Dhauba (seasonal) and from Dhurba Bankatta. Dhurba Bankatta is an all-weather graveled motorable road with bus transport facility. There is an entry permit system at the Dhurba Bankatta. This is the only way to reach the southern sector of the park. Furthermore, there is a concrete bridge on Rapti River at Dhurba ghat to facilitate the year-round use of the road. In the east, a seasonal route crosses the Bandarjhula Island from east to west.

The roads inside the park have disturbed wild animals and even cause casualties of wild animals and human (DNPWC, 2001/05 MP). The disturbance to wild

animals (forest cocks, etc) was also observed during the field visit. The recently constructed bridge may have added disturbance to the wild animals in the park.

Based on this information this variable has reached Value 3.

Public right of way

Criteria	Value	Reached value
The activity is compatible with the PA's management objectives, is done in accordance with land use capacity, adheres to legal regulations and there is good technical and administrative management.	**4**	
The activity is compatible with the PA's management objectives; it is acceptable with regard to land use capacity. Supporting legal regulations have some gaps. Technical and administrative management is acceptable.	**3**	√
The activity is compatible with the PA's objectives; It is acceptable with regard to land use capacity. Supporting legal regulations are deficient. Technical and administrative management has weakness.	**2**	
The activity is compatible with the PA's objective; it is acceptable with regard to lad use capacity. There are no legal regulations to support it, there is no technical or administrative management.	**1**	
The activity is not compatible with eh PA's objective, the resource is being over exploited, and there are no regulations or sound management	**0**	

5.2.7.4. Concessionaire hotels in the park

There is a special provision to establish concessionaire hotels in the park. Tourism was first established by jungle safari with 4 beds tented in the forest before the establishment of the national park in 1962. That means one hotel is even older than the national park. This is now known as Tiger Tops hotel in the park.

Pic 25 "→" represents concessionaire hotels in the

From 1962 to 1988 seven hotels, along with three tented camps, were constructed, spreading over the park from east to west. Most of the respondents reported that these hotels should be relocated outside the protected area. This was also reported during the SWOT exercise. They responded that the increase in

hotels, who use elephants and keep employees, has definitely increased the pressure on the use of the park resources.

Furthermore, there has not been done any regular monitoring to such hotels. Also, mid-term evaluation is not done in such hotels (MP 2001/05). Some cases were reported, in which due to the delay of hotel fee payment, some hotels were closed down by the management for some days and reopened after the clearance of the dues.

Based on this information this variable received Value 2.

Concessionaire hotels

Criteria	Value	Reached value
The activity is compatible with the PA's management objectives. It is done in accordance with land use capacity, and adheres to legal regulations. The concessionaire fee is timely paid. There is regular monitoring and mid term evaluation done.	**4**	
The activity is compatible with the PA's management objectives; it is acceptable with regard to land use capacity. Supporting legal regulations have some gaps. The concessionaire fee is timely paid. There is regular monitoring and mid term evaluation done.	**3**	
The activity is compatible with the PA's objectives. Acceptable land use capacity is not known. Supporting legal regulations are deficient. There is sometimes delay in timely payment of fee. Need strengthening monitoring and evaluation.	**2**	√
The activity is compatible with the PA's objective; it is not acceptable with regard to lad use capacity. There are no legal regulations to support it; there is no technical or administrative management. No regular monitoring.	**1**	
The activity is not compatible with the PA's objective, the resource is being over exploited, and there are no regulations or sound management	**0**	

Table VII: Value assessment of Legal use field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Khar khadai	Timber and other products	Right of way	Concessionaire hotel	Total reached	Optimum total	% of optimum
CNP	2	3	3	2	10	16	62.5
Optimum total	4	4	4	4			
% of optimum	50	75	75	50			

The percentage of optimum was 62.5 % (Table VII) which indicated moderately satisfactory management and want of attention for further management. The findings showed more attention needed in the effective management of annual grass cutting and concessionaire hotels.

5.2.8. Illegal uses field

Illegal field was evaluated on the basis of different variables. These are as follows:

5.2.8.1. Extraction of the resource

Although there is legal provision for resource sharing such as *Khar khadai* and timber, boulder collection people are found to indulge in illegal extraction of park resources such as grass, timber and fuel wood from the park. Deforestation due to illegal timber collection was also reported as one of the threats during SWOT exercise (Table 6). In 2000/01 to 2002/03 a total of 18 cases for timber smuggling were reported and 64 smugglers were arrested. Similarly, 1350 were arrested for fuel wood and other resources collection. However, there are several initiatives undertaking by the park through its buffer zone programme. It was reported that distribution of firewood and grass, promotion of biogas plant installation and electric fencing have been found effective to minimize this issue to some extent. It is exemplary to note that 65 households out of 80 households using biogas plant in one village in the buffer zone of eastern sector which reduces the firewood pressure in the park.

Based on this information it has received Value 3.

Extraction of the resources

Criteria	Value	Reached value
No extraction of resource	**4**	
Activity present, but with no noticeable impact	**3**	√
Activity present with negative impact on non threatened species	**2**	
Activity present with negative impact on threatened or endangered species and or natural communities	**1**	
Activity present causing destruction of the area	**0**	

5.2.8.2. Grazing

Grazing is another issue of the park management. However, the respondents reported grazing in the park has been decreasing. The number of livestock caught in the FY was 897 which were reduced to 29 numbers (Fig.6).

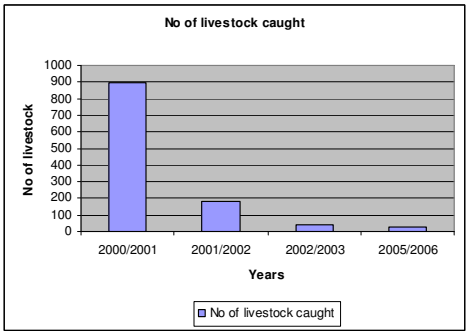


Fig.6 Grazing in CNP

Based on this information it has received Value 3.

Grazing

Criteria	Value	Reached value
No grazing	**4**	
Activity present, but with no noticeable impact	**3**	√
Activity present with negative impact on non threatened species	**2**	
Activity present with negative impact on threatened or endangered species and or natural communities	**1**	
Activity present causing destruction of the area	**0**	

5.2.8.3. Poaching

Poaching is a very serious illegal activity challenging the park management which has been described in the threats field. Please refer to the threats field for the details.

Based on this information it has received Value 1.

Poaching

Criteria	Value	Reached value
No poaching	**4**	
Activity present, but with no noticeable impact	**3**	
Activity present with negative impact on non threatened species	**2**	
Activity present with negative impact on threatened or endangered species and or natural communities	**1**	√
Activity present causing destruction of the endangered species	**0**	

5.2.8.4. Fishing

The low income groups such as Musahar and Chepang have this occupation. In order to support their lives, the park has issued licenses for fishing, however, there are still cases reported that illegal fishing are going on.

There have been initiatives undertaking to tackle this issue. It is appreciable that some ponds are constructed in the buffer zone to meet the needs of the low income people. The pond constructed for Chepang people in Barandabhar area and that for Musahar in Baghmara Community Forest were observed during the field visit. It is hoped that this will reduce the illegal fishing in the park.

Based on this information it has received Value 3.

Fishing

Criteria	**Value**	**Reached value**
No fishing	**4**	
Activity present, but with no noticeable impact	**3**	√
Activity present with negative impact on non threatened species	**2**	
Activity present with negative impact on threatened or endangered species and or natural communities	**1**	

Table VIII: Value assessment of Illegal field

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Extraction of resources	Grazing	Poaching	Fishing	Total reached	Optimum total	% of optimum
CNP	3	3	1	3	10	16	62.5
Optimum total	4	4	4	4			
% of optimum	75	75	25	75			

Therefore, despite several efforts put to effectively manage the park some illegal activities are still prevalent. Optimal percentage of management effectiveness for this field was 62.5% (Table VIII). However, the degree of their impact depends

on the different activities. For example, grazing has been found less serious than poaching in the park. The findings showed that the illegal activities have been moderately controlled except poaching.

5.3. Summary of the overall management effectiveness

Table IX: Overall management in Chitwan National Park

0= Unsatisfactory 1= Minimally satisfactory 2= Moderately satisfactory 3= Satisfactory 4= Very satisfactory	Biogeographic characteristics	Threats	Legislation and Policy	Planning	Administration	Management programmes	Legal uses	Illegal uses	Total reached	Optimum total	% of optimum
CNP	8	4	6	4.6	4.45	9	10	10	56.05	100	56.05
Optimum total	12	16	8	8	8	16	16	16			
% of optimum	66.6	25	75	57.5	56.25	56.2	62.5	62.6			

On the whole, the percentage of management effectiveness was 56.05%, showing that the management effectiveness was moderately satisfactory. The optimum percentage of the threats field in CNP was 25%, which indicated that this field was the most critical one with a minimally satisfactory management. So, appropriate management efforts should be immediately put to effectively reduce the threats. The optimum of administrative field was 55.62%, which also indicated being moderately satisfactory. This was followed by the planning field 57.5%, management programme field 56.2%, legal use field 62.5%, illegal use field 62.5% and biogeographic filed 66.6 %. All of these give the evidence of a moderately satisfactory management. The percentage of management in the legislation and policy field ranked the highest (75%). However, it is still a moderately-satisfactory-management indicator. It may be because although there are very good and clear legislation and policy (100%) their implementation is not desirably satisfactory. Adequate and appropriate management activities need to be carried out as early as possible. Similarly, attention is also needed to check and balance the legal uses field. These various fields are correlated with

each other. The success of one field or variable is not enough to determine the overall management effectiveness of the protected area. For example, the findings showed although there is good management plan (100%) the implementation is not as desired (75%) and this is because of several administrative constraints such as lack of adequate human and financial resources. Urgent actions are needed to better balance the integrated management. So, for effective management, all the concerned stakeholders particularly the government and management authority should pay attention to all aspects of the management scenario.

6. CONCLUSIONS and RECOMMENDATIONS

6.1. Conclusions

That the biogeographical characteristics reached to optimum percentage of 66.6. indicated a moderate satisfaction. Biodiversity and forest were also reported to be the major strengths of the park during the SWOT exercise. Out of the three assessed variables, namely, connectivity, status of key species and land use change, species conservation and habitat management need corrective actions for the long-term conservation of biodiversity.

However, this needs immediate attention as the threats are growing rigorously. Poaching, weed invasion, construction resulting in flood and pollution were found to be the serious threats to the park (Table 6). Overall, the optimum management of the threats was found 25% which indicated that there is minimum level of management of threats. Therefore, threat mitigating measures should be immediately applied for the conservation of habitats, wild animals and other properties.

The percentage of optimum for the field of legislation and policy was 75%, which is moderately satisfactory. There are very satisfactory and clear legislation and policy but its application is minimally satisfactory. The findings showed that there is need of enforcement of these policies into practice. There are some imbalances with various aspects of management which may obstacle the total achievement of the objectives.

Similarly, in the case of planning field, it was also found to be moderately satisfactory with an optimum percentage of 57.5%. The Management Plan prepared by the very satisfactory team of multidisciplinary and community was timely reviewed (100%) and was considered to be very satisfactory. But there is still need of greater efforts to fully implement it. Nevertheless, the management

plan has been found to be a very useful base to prepare for the annual plans. There is need of review on the zoning of the park.

The study found both financial and infrastructural variables moderately satisfactory with their optimum percentages of 55% and 56.25% respectively. Sufficient and regular budget transfer is the major concern in terms of financial management. Likewise, the administration of the basic management facilities, including staff number, transportation and communication, need strengthening and developing.

The park management has been paying efforts as far as possible according to the availability of financial and human resources. However, the management programmes need to be boosted up especially for doing research and monitoring on habitats, species, etc. for relevant documentation which will ultimately help to get insights into what is happening and what needs to be done.

With regards to the legal use of the field, the optimum percentage was 62.5%, which means this field was moderately satisfactorily managed. So, there is need of attention to better integrate conservation and sustainable use.

The optimum percentage of the illegal use of the field was 65%, which indicated that this field was moderately satisfactorily managed. But poaching was found very sensitive and minimally managed (25%) and needs urgent attention.

Therefore, the findings showed that the various aspects are closely interrelated. A success of one aspect is not enough to curb overall effectiveness. Moreover, the success of management depends greatly on the government circumstances and decisions. For example, the reduction of budget, inadequate human resources, and unfavorable working conditions were noticed during last few years due to some unforeseen and unavoidable political situations. These elements have greatly impacted the protected area management.

On the whole, the management effectiveness of CNP was moderately satisfactory. It can be therefore concluded that if appropriate management initiatives were not considered timely then it would be very difficult to keep the achievements in the long run.

6.2. Recommendation

It is noteworthy that if we look back to the conservation history there have been many efforts applied to better management of the park. For example, it shares 50% of its revenue to the community, numbers of local anti -poaching units have been increased, people are comparatively awaked on conservation, but why are there still management problems? Why is poaching increasing? Why are there human animal conflicts? These questions can be posed by the people from outside. So, it is very high time to consider on the part of the park management what has to be done for betterment; and on the part of the people residing over what will happen if there are no wild animals and no tourism. This should be clearly understood by the government who should create favorable circumstances for the overall development. So, the following recommendations are raised for the management effectiveness.

6.2.1. Dealing with the problem of weed

There is urgent need of attention on invasive *Micrania micrantha*. It has destroyed all types of vegetation. All of the respondents said that if corrective measure is not undertaken now, it may cover the whole forest and grassland in the park in 3-4 years which would be of great loss to the wildlife and other native vegetation and CNP as a whole.

The activities such as grass cutting and burning currently undertaking for the management of the grassland and forest land may not be suitable measures. This might have further escalated the growth of this weed resulting in rapid coverage of floor and canopy of trees. Moreover, grass cutting and burning

undertaking at the same time which was observed during the field visit might have seriously disturbed wild animals and birds. The management should take some intervention measures.

A specific plan should be developed including extensive awareness, research, and control actions to control the spreading of this weed. Follow-up action of the national workshop for stakeholders (*Micrania micrantha* invasion) held in Nepal in 2004 should be carried out. The recommendations addressed in the workshop should be followed so that it would not be too late to think on the corrective actions. The workshop identified that a biological control using rust *Puccinia spegazzinni* was the best solution to control this weed. However, it is expensive to purchase rust and apply this measure. It was reported that India had spent 470,000 Sterling Pounds to use this measure. And it is estimated that if we use this method, it will cost us 100,000 Sterling Pounds. According to Abraham M. (2002), natural enemies could be the biocontrol agents for *Micrania* invasion. He found nineteen species of insect pests and a species of mite as natural enemy of *Micrania*. Among them tea mosquito bug (*Helopeltis theivora*) caused serious damage on *Micrania* by causing drying of leaves and thrips *(Microcephalothrips abdominalis)* on the flowers causing drying of the flowers. However, all these enemies are polyphagous in nature so the potentiality is limited. Facing the rapidly increasing problem and the insufficient management budget, the government and management should immediately initiate feasibility study at any cost. And the study should coordinate with the government and donor agencies and international organizations such as CBD, UNESCO World Heritage and RAMSAR conventions to develop collaborative efforts both in terms of finance and technical knowledge. Moreover, it is reported that India and China have succeeded in coping with this weed so knowledge sharing with such countries either by visiting such countries or inviting the experts over to our country should be carried out as early as possible.

6.2.2. Dealing with the problem of poaching

The most emerging problem of poaching especially rhino and other wild animals must be strictly controlled with all possible ways. The following two immediate actions would be helpful to address the problem.

Firstly, the law and order should be strictly followed to discourage the poachers. Although there is stiff penalty of up to 15 years jail and or fine of Rs. 100,000 for killing endangered wildlife species, it has not been strictly followed so far as what has been realized from the recent cases. Moreover, this is too old scheme. The value change is needed to be considered now. For example, penalty of Rs.100,000 for poachers is nothing who earns hundreds of thousands by poaching. Similar is the case of years of jail. The respondents reported some cases of release of poachers against the policy. So, the penalty scheme should be reviewed. Jailing should be increased as per the lifespan of the rhino. Also, if a poacher is confiscated more than once then he/she should be penalized in the multiple bases. However, it largely depends on how far it is taken into practice.

Law enforcement was highly voiced by all the respondents as one of the major opportunities (Table 6) for the park management during the field visit. One study carried out by using tracking tools in over 200 forest protected areas, in 37 countries (Europe, Asia, Africa and Latin America) reported that law enforcement and surveillance was the most important activity followed by working with regional authorities and local communities, management planning, building institutional and governance capacity and ecotourism (Lacerda L., 2004). It was reported that enforcement has the strongest relationship to management effectiveness especially where protected areas face problems of poaching and or invasion.

Secondly, the management should also think of the root cause of poaching. It is often heard that there is involvement of some local people (who are supposed to be poor and living adjacent to the park) in poaching. Such people are allured by some quick money. So, it is high time to think Who? Why? How? are (they)

involved in such misconduct. So, more awareness programme and direct use of buffer zone budget to very needy people residing near the park would be helpful to curb such situation. This would help the park management to be in close communication and contact with such people. Thus they would be discouraged to be indulged in such activity (may be fear of confiscation) and will be encouraged to conservation activities once there requirements are fulfilled.

6.2.3. Improving management facilities

Number of guard posts and basic management facilities should be urgently arranged in the park so as to control the emerging problem of poaching. Basic management facilities should be made available adequately for effective management. The armed force established for the protection and the park management unit should actively collaborate without any hesitation for implementing management activities effectively and efficiently. Moreover, Anti-poaching Units should be strengthened and monitored regularly.

The inadequacy of staff can be fulfilled by transferring the staff from the District Forest Office. Altogether 60 staff members can be fulfilled to combat inadequacy of the human resource. The capacity of the staff should be enhanced by providing appropriate and adequate trainings and exposures. This would help divide the work load of the existing staff in CNP management section and undertake park management effectively and efficiently. Moreover, turnover of staff also should be minimized.

However, since some protected areas were found effectively managed even with low number of staffs it is also advisable to do gap analysis to find the relation of staff number and management effectiveness. This could be done on aspects such as— is it because of number of staff or inadequate training and capacity to them to deal with the management activities or it is just because of less interest of the staff due to various circumstances.

6.2.4. Dealing with flood

The management should pay more attention to flood control. The collection of sand and boulder in the rivers and rivulets such as Lothar Khola and the collection of drift wood in the river have reduced the base flow of the river and increased the surface flow, which result in the change of the river courses and thus bring about flood. So, such collections in the river should be controlled. The management should call for the people to join in the efforts to eliminate the collection of drift wood and at the same time should fulfill people's demands.

In this way the potential danger of flood might be reduced to some extent. Of course, before making decisions and taking actions, research should be done and law and regulations should be established. Moreover, construction activities should be controlled.

6.2.5. Dealing with pollution

The issue of pollution should be put on the agenda. Pollution in the park includes water pollution, noise pollution and garbage pollution etc. The growing industries should be strictly urged to establish waste disposal plants. According to the periodic report of DNPWC 2002, only Gorkha Brewery has established a waste disposal plant.

Tractors should not be allowed to enter into the park to collect grass. Jungle drive should be limited in terms of number of vehicles and specific areas. The park management should also pay attention to whether this activity has impacted the other target groups. For example, it may satisfy some visitors but most visitors who enjoy walking through forest may get unsatisfied with the noise of running vehicles and dusty roads. Moreover, uncontrolled running of vehicles not only create noise pollution but also causes erosion in the long run. Making noise by talking loudly on mobile in the forest also should be controlled.

6.2.6. Enriching the updated data

The park management should undertake research, survey, monitoring and evaluation activities regularly by clearly prescribing under annual programme in order to enrich authentic and up-to-date data. "Monitoring is an essential tool in three main tasks: to inform the conservationist when the system is departing

from the desired state, to measure the success of management actions and to detect the effects of perturbations and disturbances." (Colin J. et.al, 2005). Management teams must develop consistent records of management actions and data. There is always need of linking actions to outputs and outcomes so that appropriate planning can be done for effective management. Moreover, this is even most important where threats are high. "The database on threats is an extremely valuable source of information and opinion and will require further assessment to extract useful lessons to apply to management." (Lacerda L., 2004). Evaluation should be taken as routine part of the management process.

The park staff should be mobilized sufficiently in research and monitoring activities.

There are subsequent researches undertaken by the academicians but most of them focus on socioeconomic and tourism aspect and are carried out in the buffer zone. The management should not only rely on these researches as these may not fully address or meet the immediate and actual need of the park management. However, these are assets of sources of information. Moreover, these researches are not adequately available in the resource libraries. The park should review the researches done in the BZ in wider perspective such as –are the findings leading to adding protective layer to conserve the park or are they more inclined to socio economic development so that the protection would be limited. The researches often focus on how well the living standard of the BZ people is improved and there is no research on how much improvement the protected area has achieved by establishing the BZ around the park. So, it is high time to focus researches on how well the BZ is contributing to habitat improvement and species survival in the park. Similar is the case of tourism. There is good documentation of tourist arrival, the revenue generation by

tourism but there is very less or old documentation of tourism impact and use of the revenue of tourism for management in the park. So, more research should be carried out focusing on the habitat change and status of wild animal population, impact of recreational and concessionaire hotels in the park.

There is need of thorough research on ecological carrying capacity, social carrying capacity and psychological carrying capacity in case of this national park. For example, if a certain place is good for nesting birds or bison or so on which in some recent times was deteriorated, then the management department can limit human movement in that area. Unregulated tourism should be discouraged since this can adversely impact the tourism management.

Besides, the hotels in the park should be regularly monitored. Land cover by such hotels and campsites in the park and their edge effects, their impact on resource uses, socio–economic benefit etc. should be studied as soon as possible before renewing the period of such contracts which is going to be ended in 2009.

6.2.7. Extending financial resources

The government should pay attention to sustainable financing to CNP. The government should allocate sufficient budget in order to enable the park management authority to carry out management activities efficiently and effectively. Furthermore, the financial resource generation (concessionaire fee) by the park should be adequately utilized for park management activities without any delay.

Moreover, the park income could be augmented by mobilizing elephants in tourism activities. It was reported that the park could not meet the visitors' demands for elephants (Field visit). So, the increasing number of elephants in the elephant breeding center could be best utilized in tourism activities. Thus the management should start training elephants by allocating sufficient staff and other requirements.

Some other potential arguments for sustainable financing could be made on the following:

- Debt for Nature Swaps: Since the park has several national and global significances this can be used for swap.[10] However, according to Moye (a WWF fellow), to be qualified for swaps, a country must have relatively stable political system and the ability to make good on its obligations. So, the government should think on this aspect now. The unstable political situation has impacted the protected area to a great extent.
- Bioprospecting Fees: The Park has several valuable rare medicinal plants. So the park could grant biotechnology company, pharmaceutical company the right to collect samples of such plants on payment.
- Pollution fines: Since many industries are polluting the water system of the park they should be charged (polluter pays). However, some industries might have some agreement of special payment to the government. This could be a potential source of fund. For this, a strong legal basis and authority should be delegated to the park management.
- Opportunity Cost: Another source of finance could be the opportunity cost. The changing land use pattern such as shifting grassland into forest land could be best used as opportunity cost for which research activities are to be carried out.

6.2.8. Implementing management plan

The management zones in the park as prescribed in the Management Plan should be taken into practice. Silmilarly, sectoral approach of management is to be effectively implemented with enough resources and this should be communicated to people.

[10] Thapa B., 2003, Ecotourism, Debt for Nature Dovetail in Nepal, Other Asian Countries in http://news.ufl.edu

I would also suggest that the concept of buffer zone be clarified. Does this BZ concept have primary focus on "to protect the protected area or to benefit local people residing near the protected area?" The review of 53 articles on buffer zone revealed the need of a clear definition of the objective of its implementation. It was reported that the failure of BZ was due to insufficient clarity on the concept of BZ (Martino D., 2001). Wells and Brandon (1993) mentioned that priority should be to protect the park and benefiting local people is a secondary function (Wells and Brandon 1993, in Martino D. 2001).

6.2.9. Strengthening communication and cooperation

The park management should pay attention to communication and coordination with all level of stakeholders. There should be strong team work between park management, army and the local people along with other organizations working

in this park. Regular meeting and interaction with nature guides also should be carried out from whom the management can receive much information regarding developments such as animal movement, animal sight seeing, status of forest, grassland, infrastructure etc. as they are the regular visitors in the park. This can help the park management use this information in appropriate planning. For example, the nature guides responded that the newly constructed view towers are not in the proper place. They reported that there was not any consultation with the nature guides during the infrastructure construction. Moreover, in my opinion, construction of such towers in the park should also be looked at from another angle. I see another potential problem of such infrastructure in the park. The unintended advantage could be taken by poachers or other park evils. However, there has not yet been any study on the impact of such infrastructures. So, it is very important to think on this aspect too. Too much infrastructure in the park should be controlled.

Relation of the method with the framework of IUCN-WCPA

The evaluation methodology was designed to assess various fields which signify broad indicators. These fields were further assessed on the basis of various variables (indicators). The variables of various fields assessed had encompassed some elements of the framework developed by IUCN-WCPA. The indicators such as finance, staff, and infrastructure covered the input element of the framework. The management plan of the planning field described the planning element of the framework. Similarly, habitat management, coordination and collaboration, research and monitoring were related with the process element of the framework. Biogeographical features, threats and legislation and policy gave some contextual briefing. Legal use and Illegal use field showed relation to output element of the framework.

Reflection on the methodology

Firstly, I would like to request to view the evaluation methodology applied here as an initial effort for the evaluation of protected area. As evaluation of protected area is a wide area which can be done on various aspects and scales, so this study of course, is not complete and has rooms to improve for further evaluation studies. However, I hope this initial effort will lead to developing suitable indicators for pragmatic assessment of any aspect of management of protected area in the upcoming days.

I found the methodology very stringent, encouraging profound analyses. It would be very helpful for protected area managers to do self assessment. However, it needs very sufficient knowledge on protected area management and enough relevant data to set and define various criteria to put on suitable rating system. Moreover, it is difficult to find every information in standard quantifiable form, so collective effort is needed for acceptable rating. If there is good plan with achievable targets within prescribed time period and has been well implemented, then the application of this methodology could provide comprehensive findings. In my opinion, this methodology is very suitable for protected area managers to undertake large and comprehensive evaluation for corrective and adaptive

management. The park management can go through thorough evaluation of any specific aspect, such as inputs provided for management, process undertaken for management, which would help make decisions on what and where corrective actions are to be undertaken. I hope this method and the study findings can be used for developing an evaluation system in the field of protected area management. The methodology can be used in the various fields as described below.

- The methodology and findings would be helpful in further process of evaluation of management effectiveness.
- It would be helpful to develop guidebook for selecting indicators for more pragmatic evaluation of protected areas.
- It could stimulate for further study on management effectiveness at both site and system levels. An individual protected area, buffer zone and overall protected area system can be evaluated for betterment.
- The thorough analysis and findings could be helpful to demonstrate the actual situation of the park to the community and other stakeholders and this helps to draw attention to the threats and need for supportive, collective effort for effective management.
- It would help to address practical challenges of management and identify special needs or appropriate approaches for better management.
- It would help to report to international conventions, donor agencies, government, and to the local community.

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Annex I

Status of crocodile survival in Crocodile Breeding Center

Year	No of eggs collected	No. of hatchlings	% of hatchlings	No. of hatchlings survived	% of survival
2000	214	141	67	30	21
2001	291	81	28	27	33
2002	445	229	52	178	78
2003	357	198	55	179	50
2004	521	298	57.2	290	97.3
2005	510	333	65.29	333	100

Source: Annual Report 2004/05 DNPWC

Appendix I

Staff to be transferred from various DFO to CNP

Name of DFO	Chitwan DFO	Nawalparasi DFO	Parsa DFO		Total
Name of UFO	Rapti UFO	Kawashoti UFO	Odar Range Post	Brahma Nagar RP	
No of AFO	1	1	-	-	2
No of Rangers	3	8	1	1	14
No of Ba.Ka.Sa	1	6	1	1	9
No of Forest guards	-	20	4	4	28
No of Khardar	-	1			1
No of Peons	2	2			4
Driver	1	1			2
Total	9	39	6	6	60

Source: Pers. Commun. January 2007