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**BIODIVERSITY
CONSERVATION IN NEPAL
A SUCCESS STORY**

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Preface

In last three active decades on biodiversity conservation, the country has set up various institutions to deal on conservation, many policies were implemented and a strong legislation is into effect. With this on the backyard, it has still not been able to fully tackle the growing threat to biodiversity conservation that needs better coordination, cooperation, public participation, effective resource mobilization as well as strong trans-boundary and international support.

Despite of crunch in resources, many good initiatives were taken in the past and many succeeded. Conservation of endangered species like Rhino and Tiger were into the focus while executing a number of programs across the protected areas. Likewise, the country celebrated 2011 as the 'zero poaching year' as there was no poaching of rhino from 3 January 2011 to 3 April 2012, which is a milestone achievement in rhino conservation history. There was major achievement in wildlife crime control and significant numbers of criminals were arrested in last few years. As per the decision of Cabinet meeting chaired by Rt. Hon. Prime Minister on Mangsir 5, 2067 (21, November 2010) Wildlife Crime Control Coordination Committee and Bureau at different levels were established as statutory bodies to curb ongoing wildlife crimes.

In an effort to document on the on-the-ground experiences, current issues, achievements, opportunities, and way forward; this publication "Biodiversity Conservation in Nepal: A Success Story" has been put forward by Department of National Parks and Wildlife Conservation (DNPWC). This special edition contains ten papers from conservationists; scientists and field implementers directly involved in Biodiversity conservation practices in Nepal from policy level to implementation level.

The first paper highlights on policy advances in biodiversity conservation in Nepal and its developmental process has been analyzed. It concludes that protected areas management in Nepal has progressively marched from a top-down nature of management in which concerns of local people living in or around the national parks or reserves were largely ignored to a more participatory and people-oriented approaches to conservation.

Paper two stresses on community participation in conservation and specifically analyses how the conservation approach shifted from strict government authority control to the community participation in long run of conservation history in the country. Similarly, chapter three is about human wildlife conflict in Nepal and measures for reducing rift between park authorities and local communities. It also describes on how it could be addressed and the harmony could be developed between human and wildlife.

Paper four, focuses on recent institutional setup established in last two years to curb wildlife poaching and trade of wildlife body parts. The paper emphasizes on efforts and achievements in wildlife poaching control in the country. It says that the initiation of the government to establish the several committees at national and local level has helped to gather information about the poachers as well has increased the coordination among the various agencies at national and local level to effectively control wildlife crime.

In paper five, the authors have explained on how the conservation at species level is ongoing in the country and the described how several wild animals have been kept in breeding centers to help in conservation. It mainly focuses on elephant conservation and breeding center, Chitwan, Vulture Conservation and Breeding Center and Gharial Breeding Center, which mainly helps in conservation of some key species which are threatened.

Paper 6 is about bird conservation in Nepal. It focuses on how bird conservation started in Nepal and details on what is happening in bird conservation arena have been provided by the authors. Though Nepal boasts 871 species of birds, negligible fund has been allocated for its conservation and it's still not in the priority of the government, however some good initiatives have been taken by the government for bird conservation that are highly appreciable.

Prospects on how tourism can help sustainable financing for conservation efforts in the conservation areas and uplift people's living standard through various ways of income generation has been described in paper 7. It also stresses that there is much to do to bring large number of tourists in the country but cautiously says economic activities should not underestimate core motive of conservation for which the protected areas were designed

Chapter 8 highlights financial and economic assessment of protected areas taking Bardiya National Park as a case study. The park provides a wide range of provisioning, regulating, cultural and supporting services. Of the 21 different ecosystem services recorded from Bardiya, six services (provisioning, recreational, carbon sequestration, biodiversity, soil conservation and option values) were important. The study further found that conservation costs is very low while societal benefits are high, thus creating an opportunity for significant welfare gains from increased conservation investment.

In paper 9, stresses on rhino conservation in Nepal and its present status where Chitwan National Park has been taken as major site for the study. It discusses the rhino counting 2011 methods and results and stresses on efforts and successes of rhino conservation in the country with special reference to Chitwan National Park.

Paper 10 focuses on tiger conservation efforts and the status of tiger in the country. Tiger is one of the major species which has been provided high importance by the government. Several activities have been implementing to conserve the species as it is under serious threat.

With the compilation of ten articulate papers, this book will be able to provide the general insights of the positive aspects on biodiversity conservation in Nepal that is believed to

have significant impact on enhancing the conservation efforts. Nepal is currently stuck with the plethora of priorities invited by political instability, poverty and development needs and even the reshaping of the administrative boundaries through state re-structuring. This book is thus considered timely and very useful for not only the conservationists, academicians and conservation policy makers but to politicians who can incorporate understanding of landscape conservation in the re-structuring process of the state.

TOC

Policy Advances in Biodiversity Conservation in Nepal

– Udaya Raj Sharma

Nepal has outstanding assemblages of plants, animals and ecosystems in a remarkable physical setting. The altitude increases dramatically from less than 100m above sea level in the subtropical terai in the southern part of the country to the highest point on the earth's surface (8848m) at the southern edge of the Tibetan plateau, all within a short horizontal distance of about 200km. Nepal has created impressive array of protected areas in order to include viable samples of biodiversity found in the country. There are 10 national parks, 3 wildlife reserves, 1 hunting reserve, 6 conservation areas and 12 buffer zones around the park and reserves, totaling more than 3.4 million ha of country's land, which counts to above 23 percent of the land of Nepal directly committed to biodiversity conservation (DNPWC 2012).

Management of protected areas has gone through several major phases. These phases are shaped primarily by two aspects that have proven particularly challenging: Reconciling the needs and aspirations of local people with Protected Area (PA) management, and secondly, harnessing the economic opportunities offered by tourism with its associated threats (Wells and Sharma 1998). A review on the evolution of PAs in Nepal would show that Nepal has progressively marched from a top-down nature of management in which concerns of local people living in or around the national parks or reserves were largely ignored to a more participatory and people-oriented approaches to conservation.

RANA TIMES (1846-1951)

Nepal's conservation history dates back to ancient times, but a formal approach started much later. Lowlands of Nepal were all forested and only indigenous ethnic groups resided near rivers despite the malaria infestation in the area. People lived in groups hunted in the forests, fished in the lakes and rivers and practiced subsistence farming. The occasional visitors were rulers, royalties and their foreign guests, who came to hunt the prized game such as tigers and rhinos (Smythies 1942, Gurung 1980).

For the large portion of country's population, the preferred places to stay were in the middle hills as malaria was less prevalent there; subsequently, the terai forests remained intact only traders moved between towns to bring supplies from India during winter. Rana rulers fancied hunting and wanted to protect selected sites in terai to protect prized game animals and had introduced several strict rules and administrative orders to punish those found hunting in these forests.

Ranas were overthrown in 1951; the period thereafter was followed by uncertainties and quagmires including a short period of 18 month old democratically-elected government. Encouraged by gradual eradication of malaria from lowlands during 1950s, land hungry migrants arrived from Nepal's hills in large numbers. Partly encouraged by the state and largely due to lawlessness, the people cleared most of the fertile lands for settlement and farming. The forests were cut indiscriminately and were further damaged by excessive grazing and fires.

PANCHAYAT ERA (1961-1991)

In the Panchayat system of government, the political parties were banned and state power became centralized in the hands of the royalties. Because royalties traditionally liked hunting and did want to maintain their hunting paradises, they took special interest in wildlife conservation (Sharma 1995). The royal interest paved the way for a new era of wildlife conservation in Nepal. The rhino sanctuary in Chitwan became Royal Chitwan National Park (now renamed as Chitwan National Park), other hunting sites declared as Royal Bardia National Park (now renamed as Bardia National Park) and Royal Shuklaphanta Wildlife Reserve (now renamed as Shuklaphanta Wildlife Reserve). The work of rhino patrol, a special squad of armed forest guards to protect rhinos in Chitwan created in 1959, was transferred to the regular army.

This period was particularly favorable to wildlife conservation as the above decisions by Panchayat government had helped to restore the endangered wildlife in the country's lowlands. Especially since 1970s the national parks and reserves were increasingly managed for protecting the entire ecosystems rather than for selected large mammals. The control of livestock grazing in these national parks and reserves and controlled access of local people for harvesting wild resources restored the vegetation and wildlife in the parks and reserves. The National Parks and Wildlife Conservation Act was passed in 1973, which established the legal framework for Nepal's protected area system as it exists today.

Several policies adopted during the Panchayat era, under the direct supervision of King Birendra and Prince Gyanendra, have set a high standard for conservation in Nepal; following brief provides glimpse of achievement (revised from Sharma 1995):

- ➔ Creation of the network of national parks and reserves in all major ecological regions of the country.
- ➔ Establishment of Department of National Parks and Wildlife Conservation directly under the Ministry of Forests and Soil Conservation.
- ➔ Projection of Nepal in international area for its achievement in wildlife conservation, and considerable success in soliciting financial support for nature conservation and long-term research from INGOs, bilateral and multilateral development organizations.
- ➔ Establishment of King Mahendra Trust for Nature Conservation (now renamed as National Trust for Nature Conservation), an influential national NGO dedicated for nature conservation.

- Development of a core of well-trained and experienced park managers and researchers.
- Launch of a more people-oriented approach to protected area management, including the concept of conservation area in the country.

Two policies, in particular, introduced during this period have remained controversial and set a wrong legacy in PA management: Firstly, the involvement of regular units of Nepalese Army in 1975 replacing the armed forest guards and then gradually the army taking over the responsibility for law enforcement in most parks and reserves. The army's perspective on conservation is not always compatible with that of the park managers, often resulting in a lack of coordination between the battalion commanders and the park managers (see Sharma 1995 and Wells and Sharma 1998 for detailed discussion). Secondly, the precedence of leasing park land to seven large resorts in Chitwan National Park alone. Such hotels have set a double standard, the exploitation of resources that are denied to local people is provided at throw away prices to resort owners. Such resorts should have been ideally situated outside the park and the use of parks by tourists should have been strictly regulated.

RESTORED DEMOCRATIC PERIOD (1991-Present)

Several trend-setting people-oriented conservation related policies were launched in this period. The Annapurna Conservation Area (ACA) initiated in 1986 as a pilot project in an area of 200 sq km was expanded rapidly due to tremendous interest of local communities to an area of 7,600 sq. km covering 59 VDCS in 5 districts (Bajracharya 1995). The ACA is the largest protected area in Nepal, gazetted in the year 1992, is managed on the concept of integrated conservation and development (ICDP). Five other CAs have been established since then, including Kanchenjunga CA and Manaslu CA. ACA concept got rapid recognition internationally.

The conservation area is managed based on integrated conservation and development concept, where community-based conservation programs can be complementary to the local development efforts. After government declares an area as CA, Conservation Area Management Committees (CAMC) are formed, which take the responsibility of protecting and managing the resources. The harvests are equitably distributed among members. The CAMCs are provided appropriate backstopping by government or by NGO especially in providing training to increase villagers' skills and explore new income generating initiatives.

The fourth amendment of the National Parks and Wildlife Conservation Act in 1993 introduced the concept of buffer zone that could be declared around national parks or reserves. The Buffer Zone (BZ) policy emerged in Nepal in early 1990s based on the impact zone concept (Sharma and Shaw 1992, 1995, 1996) to address the fallacies of traditional conservation model. The buffer zones are declared by the government, which consist of government forests, settlements, agriculture lands and other public and private holdings. A 30-50 percent of the park/reserve generated revenue can be retained at the source and spent by the BZ Council for the development of buffer zones. Later, Buffer Zone Regulations 1996 and Buffer Zone Guidelines 1999 were introduced, which provide policy and legal frameworks for the program.

The BZ initiative in Nepal focuses on local committees as the guardians and beneficiaries of the area. The concept calls for strict control of forests in the park, together with intensified agriculture and forestry on public and private properties outside the park with intension of increasing the production of natural resources that are in local demand (Sharma 1991). The park authority helps form User Committees and User groups. The experience of buffer zone management since the first one in Chitwan was declared in 1996 is critically summarized in Paudel et al. (2008).

Over the last two decades reserve design concepts and principles are evolving. Many believe the future of biodiversity conservation remains on how the existing protected areas are interlinked by biological corridors. This is largely because the forests are disappearing rapidly and there have been increasing tendencies to intensify and diversify agricultural practices. All factors are leading to increased fragmentation of remaining wild areas in Nepal and further isolating the existing PAs. On the side, community forestry can provide a best compatible mechanism for potential biological corridors.

The examples of landscape level transboundary conservation in the context of Nepal are Terai Arc Landscape, Kanchenjunga Landscape, Sacred Himalayan Landscape and Kailash Sacred Landscape: Kanchenjunga Landscape complex is shared by Bhutan, China, India and Nepal and was originally proposed as 11,500 km² (WWF and ICIMOD 2001). Later, ICIMOD studied the southern portion of the landscape and has proposed 14,432 km² after adding few other sites of importance (Sharma and Chettri 2005). The proposed complex includes 15 protected areas, Kanchenjunga Conservation Area in Nepal and eastwards up to Toorsa Strict Nature Reserve, and has proposed 6 corridors, which together make about 51% of the landscape. The Sacred Himalayan Landscape is proposed by Government of Nepal as an area covering 39,021 km² and falls in Nepal, India and Bhutan. The SHL extends from Langtang National Park and eastwards to Toorsa Strict Nature Reserve in western Bhutan (GON 2006). Both complexes represent the unique landscapes of Eastern Himalayan Ecoregion.

Terai Arc Landscape encompasses the last remaining natural forests in the lowland Himalaya extending from the Bagmati River in Nepal to the Yamuna River in India, and the landscape covers an area of about 49,500 km², comprising 11 protected areas and forest corridors (GON 2004). The alluvial grasslands and subtropical deciduous forests of TAL harbor the second largest population of the greater one horned rhinoceros and other prized large mammals such as tiger, elephant, Gangetic dolphin, and swamp deer. The Government of Nepal has initiated this effort with the support of the WWF Nepal and other donors since 2001; it aims to maintain key ecological processes in the landscape while ensuring livelihoods of the people living across the landscape (Gurung 2005). The Kailash Sacred Landscape is another cultural and religious landscape having unique ecological diversity. The total area of the landscape proposed is 31,252 km². This transboundary initiative has been lunched as a collaborative effort of ICIMOD, UNEP and three regional countries, China, India and Nepal, to maintain the cultural and environmental integrity of the sacred areas of the Kailash (ICIMOD 2010).

PARADIGM SHIFT

The above historical development review of conservation of wildlife and management of protected areas in Nepal over three decades shows that Nepal has passed through four major paradigms in biodiversity conservation:

1. Informal protection based on traditional values and practices

Conservation of nature, its plants and animals, is considered a sacred act in several Asian cultures. In Nepal the Hinduism and Buddhism have emphasized conservation and many holy scripts provide details on the importance of such work and have encouraged devotees to plant trees, love animals and pay respect to the laws of nature. Various gods and goddesses manifesting various components of plants or animals, their associated stories in Purans, and folklores amply speak and influence people towards conservation.

2. Biodiversity conservation based on protective model

Since the enactment of National Parks and Wildlife Conservation Act (1973), several national parks and reserves were established based on traditional model of national park. In “setting aside” these parks/reserves human settlements were relocated in many places or the rights of nearby communities to the access of the resources in the park/reserve were completely or partially cut. Regular army was deployed in many parks and reserves in small groups to protect the resources of PAs from the neighboring communities. Local communities were denied of their rights and privileges to use the resources that are now within the national park or reserve.

Although the strict protection showed some successes, it was soon realized that without people-oriented conservation practices the momentum to achieve effective wildlife conservation could not be continued. The Department of National Parks and Wildlife Conservation introduced several management changes to foster better relations with the communities: National parks and reserves situated in the lowlands started to allow local people to collect grasses, reeds and binding materials from the grasslands and forests within the protected areas. In Chitwan National Park alone, on an average 60,000 people harvested thatch grasses, reeds and binding materials in about two weeks, each year, bringing home resources worth half a million US dollars (Sharma 1991). All parks and reserves started to call regular meetings with the local communities to improve park-people relationships and create public awareness about conservation and on-going activities of the park or reserve. In mountain national parks the local communities were granted access to natural resources to meet their basic needs and honored the local people's traditional practices. For example, in Sagarmatha National Parks the villagers living in the enclaves within the park boundary and those living in the neighborhood of the park were allowed access to rangelands for livestock grazing, collection of dead and fallen branches of trees for firewood, collection of trees for house construction or repairs for the residents, and quarrying of stones for building houses. These provisions were legitimized by incorporating them in Himalayan National Park Regulations 1979.

3. Participatory approach in biodiversity conservation

A formal start of participatory biodiversity conservation in Nepal started in 1990 with the third amendment of National Parks and Wildlife Conservation Act, which made provision for the creation of conservation areas in Nepal. The concept of conservation area provided two distinct opportunities for participatory conservation: Non-governmental organization could be trusted for the management of a conservation area, a type of protected area. This started with the gazettment of ACA and signing contract with the KMTNC for ten years for management. Second was local villagers could be grouped to form conservation area management committees which are responsible for the implementation of conservation and development activities through user groups and mother groups. The money raised by ACA could be held in its entirety by the NGO and ploughed back to finance the annual programs of ACA. Two more CAs were created with similar concept in other mountain areas, Manaslu CA and Kanchenjunga CA. The KCA is even more advanced in some aspects as it has institutionalized the mother groups in the KCAM Regulations, 2006.

Another breakthrough came with the fourth amendment of National Parks and Wildlife Conservation Act in 1993, which was a major policy shift from traditional approach of management to participatory approach in which local people are recognized as partners in biodiversity conservation. Designated surrounding areas (usually up to 5 km) and any village enclaves within the major boundaries of the park are declared as the buffer zone of the park/reserve. The park helps form institutions such as user committees, user groups, buffer zone management committee to mobilize people and the share of revenue received from the park. The institutions with the help of the park warden implement activities for the local development and reducing impacts of the park on the people. To cite an example Chitwan National Park provided a large sum of nearly 177 million Nepalese Rupees to Buffer Zone Management Committee between the fiscal year 1995/96-2003/04; and could generate a community savings of 39 million NRS (Maskey and Bajimaya 2005). The community capital is generated through saving and credit program in which groups formed for various activities undertake savings and provides micro-finance for small enterprises. Each household makes periodic contribution to a common fund from which s/he can earn interest as well as become eligible to borrow money on comfortable interest rates. Mobilizations of self-generated funds and money received from the park for local development have strongly built relationships between the park and the people.

All parks and reserves except two are already surrounded by buffer zones and institutions formed for the buffer zone management in these areas have made parks and reserves a significant presence in their daily lives.

4. Landscape level conservation

Nepal has now progressed to managing protected areas at the landscape level as individual parks/reserves are too small to maintain genetically vibrant populations. A network of PA is best protected if they are connected by appropriate biological corridors. With the support of organizations like WWF Nepal, ICIMOD, TMI, and other multilateral donors, Nepal is playing its role in four major landscape complexes described above. However, much work needs

to be done to materialize the conservation at landscape level. Especially, the countries represented in the landscape must agree on a minimum set of regulatory framework for managing their protected areas and other areas in the complex. Usually the protected areas in the landscape (except China) are small in sizes and most of the PAs in the landscape are far small to adequately represent the important ecosystems they are required to conserve.

FUTURE POLICY DIRECTIONS

Nepal's protected areas are facing challenges which are at both implementation and policy formulations fronts. Keeping an ambition of declaring one-quarter of country's land, where a large number of people reside and depend on these resources for livelihood, is indeed a great challenge. Although we are close to achieving this ambition, the question still remains whether the under-represented ecological regions are included in the PA system. It seems, several eco-regions are still under-represented and some unique ecological areas fall outside the PA system. On the other hand, Allnutt et al. (2005) have analyzed to show that several PAs in Nepal, such as ACA, MBNP and SNP, include a large portion as the barren area. If these PAs were to include down-slopes they would have included areas having threatened biodiversity. The future efforts of designing and situating new protected areas should be with the aim to maximize biodiversity conservation. Similarly, a serious work on gap analysis would be beneficial to produce a complete picture of representativeness and work according to the agreed suitable plan of action to conserve key ecological processes and areas of high endemism.

Indigenous and Community Conserved Areas (ICCA) provide a new mode of governance of protected areas. Historically, we find that the conservation or sustainable use of natural resources has deep roots in our culture which are still thriving despite government's lack of support or recognition. It may be in the form of sacred forests around public temples, watersheds having sacred mountain peaks, religious ponds, lakes or river banks. Many of these sites are protected and managed by customary laws and other practices. Similarly, almost all highland pastures in Nepal have been governed by some form of customary laws. Such pastures have been exclusively used by identified communities; opening of grazing, duration of grazing and date of closure are controlled by customary laws. Community-owned forests, such as kpat, have their roots in ancient traditional practices, which are still being practiced despite government's decision to nationalize them more than five decades ago. In Nepal, despite international obligation, the ICCA continues to remain ignored and undervalued. Many institutions and indigenous practices having complimentary value to biodiversity conservation of the government's formal sector are eroding and there is very little encouragement or support from any quarters to maintain these institutions and initiations. The Government of Nepal should adopt appropriate policy to incorporate the concept of ICCA.

Another difficult challenge for the park authority is the issue of synchronizing their policies and programs with the policies adopted by the government with the passing of the Local Self Governance Act and Regulations in the year 1998. Through these laws the government has decentralized its authority to the local political bodies, such as District Development

Committee (DDC) and Village Development Committee (VDC). The Act stipulates that the forests within the area of VDC and DDC are the property of that VDC or DDC, “when granted by prevailing laws and GON.” The laws require that Village Environmental Plan (VEP) is formulated for each VDC. VEPs are compiled with the understanding of the natural features, process, and linkages in order to foster a sustainable development in the VDC. Management of protected areas, especially the buffer zones and conservation areas, is designed under a separate set of forestry policies, which give very little role to VDC or DDC. The confrontational situation must be resolved for the mutual benefits and for the continued efforts to conserve biodiversity.

On the aspect of human resource development two issues are very prominent. The protected areas in Nepal are currently run by very few park staff as the number of park-staff did not increase to the proportion of new areas added in the PA system. Secondly, many of the park staffs have yet to shed their traditional role emphasizing regulation and control. With the shift in paradigm towards community based conservation, the park officials need to change their role and foster a pro-public image. The institutional leaders should encourage their officials to assist the local communities to promote a sustainable development movement in the buffer zones and conservation areas as well as seek their cooperation in protecting the core biodiversity areas. The Department of National Parks and Wildlife Conservation should re-structure its organizational set-up in its headquarters and field offices. Specifically, as the buffer zone management has become a major task of the department, it should create a separate division in the department.

The eminent threat of global climate change on species and ecosystems of protected areas must be sufficiently addressed. There seems to be a clear policy gap in this respect in Nepal as the recently adopted Climate Change Policy (2011) (MOEST 2012) has not specifically addressed this issue. PA managers need to identify sensitive species and ecosystem susceptible to climate change. These components of biodiversity would require to be monitored through internationally recognized mechanisms such as Global Mountain Biodiversity Research Initiative in Alpine Environments (GLORIA) and Global Mountain Biodiversity Assessment (Hamilton and McMillan 2004). Also, the PA planners need to examine opportunities to maximize the effective size of the PA, to include a great range of elevation, slope aspects, habitat mosaics and connectivity to other protected areas. It is important to make use of uniform standards for the collection, analysis and storage of data in order to make credible conclusions of the effects of climate change after an extended period of research and monitoring.

In conclusion, it would be relevant to recall the advice of four broad categories proposed seven years ago (Sharma and Yonzon, 2005) in order to prepare Nepal to maintain leadership position in South Asia in the field of wildlife conservation: (1) Increase the capacity of managers and community workers to effectively manage protected areas, (2) Establish a science based knowledge foundation by accurately generating information on biological resources for ushering correct decisions, (3) Create sustainable funding mechanisms to manage protected areas, and (4) Distribute the benefits of conservation in ways to reach the poorest and disadvantaged segments of the human society.

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Community Engagement in the Protected Area Management in Nepal

*Fanindra Raj Kharel,
Shiv Raj Bhatta and Karan Bahadur Shah*

Abstract

This paper highlights the evolution of protected areas system globally and focused how Nepal took a path of people oriented protected area approach. A number of policies instruments are discussed with key features relating to bottom up approach. The paper presents several examples of local benefits of protected areas management and described how park has been benefited from local people contribution. It concludes that the local communities residing within and around the PAs of Nepal are strongly engaged in the protection of overall flora and fauna of the areas, when their actions are directed to the conservation of the umbrella, flagship and endangered species of fauna and their habitats. The results are obvious; the lost biodiversity of PAs is slowly regaining its originality by conserving flora and fauna.

Key words: Local community, PAs, biodiversity conservation, Nepal

Concept of the Protected Area

Protected area may be regarded as a generic term denoting any system of land tenure or zoning designed primarily to protect biogeographical or ecological resources of national or international importance and to preserve them in, or restore them; a regime characterized by minimal human interference with natural processes (Allin, 1990). This concept was initiated through the establishment of a national park at Yellowstone in remote corner of United States of America in 1872. Since then, most of the developed countries have recognized the value of protected areas for their people, demand placed by public, most often by affluent residence seeking pristine recreational areas, provided impetus for the establishment and development of protected areas (Allin, 1990). In less developed countries, the concept of preservation of natural resources came most often from foreign elites: colonial administrators, scientists, business people and affluent leisure seekers. During their period of hegemony, they were able to impose a variety of protected areas on indigenous people and cultures around the world. By the end of colonial era following world war II many former colonies adopted these protected areas with a belief that protected areas maintenance encourages science, tourism and the concomitant flows of hard currencies into these economically less developed countries (Allin,1990). The potential of protected areas for resource generation in the form of tourism, as well as the need for soil and water conservation promoted the creation of protected areas in other developing countries.

In Nepal, the concept of Protected Area (PA) initiated with a philosophy of preservation of living resources by acknowledging the PAs reflect the common heritage of all people, where people were not permitted to harvest in any resources in any form from PA as in the United States of America. To implement this pioneering concept, conservation approach began by establishing Chitwan National Park in 1973 where an area of 932 sq.km was designated as the park area. The main purpose of the declaration of park was to conserve habitat of species such as Rhinoceros Unicornis and Panthera tigris tigris. The history of PAs management formally began in 1973, when a landmark in legislation, the National Parks and Wildlife Conservation Act 2029 was enacted. Consequently a network of protected areas in all major ecological zones ranging from the mountain watersheds to the flood plains of Terai (Lowland) was established. This was a remarkable effort in elevating the increasing trend towards ecological imbalance. This was also an approach of recognition of the harsh socio economic realities faced by the people of Nepal which could be improved through maintaining ecological balance in different zones. Moreover, separate department for National Parks and Wildlife Conservation was established in 1980.

People Oriented Protected Area Management Approach

PA management should implement programs to produce fuel wood, fodder, and construction timber for local consumption on public and private lands outside the PAs by intensifying the land use. Providing access to PA resources can actually promote dependence on PAs that will inevitably grow beyond sustainability. Strict control over PA resources against exploitative pressures is essential in the long run to solve the conflict between PA authority and the locals. Effective law enforcement against the exploitation of PA resources motivates people to intensify the management of their own lands rather than relying on PA resources. The PAs established in the Terai region were historically uninhabited and resource use conflict was virtually nonexistent in the past. However, on one hand, the government relied upon national development as a source of income at the expense of the existing forest resources and on the other hand, due to poverty, increasing need of land as well as processes of development forced to encroach existing forested land. Consequently almost 57% of the land covered by the forest in 1961 was reduced to 29% by 1990s (Kharel, 1985). The loss of forest resources, largely limited to the Terai region was mostly the result of extensive clearing for agricultural and commercial timber operations added by an increased fuelwood demand from growing population.

Mountain PAs are characterized by many generations of human settlement and encompasses several villages inside the PA boundary, which rely upon its resources mainly for pasture and woods. Unless needs of these people are identified and appropriate alternatives are provided, there will be aggravation of conflicts between PA management authorities and the local population. The government has realized that if these needs were not addressed then efforts of the park authorities to conserve the area and wild species would be futile. Government also has realized that without good relations and cooperation with the local people, conservation would never be successful. As an initiation of people oriented approach in PA management, Government passed the Himalayan national parks regulations 2036 (1979). This provided access to the local people to national parks resources for subsistence living in mountain areas of Nepal.

Since the democratically elected government was established in the country, fourth amendment was made to the National Parks and Wildlife Conservation Act 2029, in 2049 (1993). Some of the substantial characteristics of the fourth amendment include:

- ➔ Provisions of declaring buffer zone areas to provide access to the local people for forest resources and plough back of 30-50% income earned by the national parks and reserves to the buffer zone communities; and
- ➔ Provision for the initiation of integrated conservation and development approach to achieve twin goals of conservation and development.

To implement these provisions of the fourth amendment, several regulations such as Buffer Zone Management Regulation 2052 in 1996; Conservation Area Management Regulation 2053; Conservation Area Government Management Regulation 2057 and Kanchanjunga Conservation Area Management Regulation 2064 were endorsed. Similarly, several guidelines such as Buffer Zone Management Guideline 2056; Conservation Area Management Guideline 2056 and Wildlife Damage Compensation Support Guideline 2066 were enacted. Declaration of 12 Buffer Zones of 9 national parks and 3 wildlife reserves covering an area of 5602.67 km² as well as 6 conservation area covering an area of 15425.95 km² are examples of initiation of people oriented PA management approach. As of Now, 10 national parks, 3 wildlife reserves, 1 hunting reserve, 6 conservation areas and 12 buffer zones have been established. These PAs cover 34185.52 km² of Nepal's total are (table 1).

Table 1: Summary of Categories of PAs in Nepal

Categories of PA	Gazetted	Area(km ²)	Locational Zones
National Parks			
1.Chitwan National Park (World Heritage Site, 1984)	1973	932	Inner Terai (Low-lands)
2.Langtang National Park	1976	1710	Mountain to high Himal
3.Rara National Park	1976	106	High Mountain
4.Sagarmatha National Park (World Heritage Site, 1979)	1976	1148	High Himal
5.Shey- Phoksundo National Park	1984	3555	High Himal
6.Khaptad National Park	1984	225	High Mountain
7.Bardiya National Park	1984	968	Terai to Inner Terai
8.Makalu Barun National Park	1991	1500	High Mountain to High Himal
9.Shivapuri-Nagarjun National Park	2002	159	Middle Mountain
10.Banke National Park	2010	550	Terai to Inner Terai
Sub total		10853	

Wildlife Reserve			
1.Suklaphanta Wildlife Reserve	1976	305	Terai (lowland)
2.Koshi Tappu Wildlife Reserve	1976	175	Terai (lowland)
3.Parsa Wildlife Reserve	1984	499	Terai to Inner Terai
Sub total		979	
Hunting Reserve			
1.Dhorpatan Hunting Reserve	1987	1325	High Mountain
Sub total		1325	
Conservation Area			
1.Annapurna Conservation Area	1992	7629	High Mountain to High Himal
2.Kanchanjunga Conservation Area	1997	2035	High Mountain to High Himal
3.Manaslu Conservation Area	1998	1663	High Mountain to High Himal
4.GauriShankar Conservation Area	2010	2179	Mountain to High Himal
5.Api Nampa Conservation Area	2010	1903	High Mountain to High Himal
6.Krishnasar Conservation Area	2009	16.95	Terai (lowland)
Sub total		15425.95	
Buffer Zones			
1.Chitwan National Park	1996	750	
2.Bardia National Park	1996	507	
3.Langtang National Park	1998	420	
4.Shey Phoksundo National Park	1998	1349	
5.Makalu Barun National Park	1999	830	
6.Sagarmatha National Park	2002	275	
7.Suklaphanta Wildlife Reserve	2004	243.5	
8.Koshi Tappu Wildlife Reserve	2004	173	
9.Parsa Wildlife Reserve	2005	298.17	
10.Rara National Park	2006	198	

11.Khaptad National Park	2006	216	
12.Banke National Park	2010	343	
Sub total		5602.67	
Grand Total		34185.662	
Total Percentage Coverage		23.23%	

Source: DNPWC Annual Report (July 2010 – June 2011)

Community Participation in Conservation: Programs and Ground Actions

Protected area network has great contribution in conservation of biodiversity, however several PAs have come under increasing pressure from expanding human activities outside the PAs. The establishment of networks of national parks and wildlife reserves may have resulted some socio-economic ramifications on the local communities. Conflict of interest aroused in many areas of the world and enforcement activities alone cannot be able to balance these competing objectives (Wells and Brandon 1992). Since the establishment of PAs, Nepal has taken following adaptive strategies, programs and activities.

➔ Jana Samunnaya Gosti (i.e. Public Coordination Meeting):

In early 80s, each year, the PAs had regular program in which the political leaders (then Pradhan-panchas – now Village Development Committee Chairman) from the surrounding areas used invited for interaction. Such activity provided an opportunity for the park management and local community to listen views of each other to solve the emerging problems. This was basically to address some of the local issues and improve park-people relationship.

➔ Thatch grass collection:

Local communities concerned for their basic needs of resources including the thatch for roofing and reeds for partitioning their houses were allowed to collect once a year from the core protected areas. The practice has been continued hither to.

➔ Provision of dead woods for the local community consumption:

The PA managers started to help local communities by providing dead woods from core area free of cost for community use, that includes construction of bridges, school buildings, temples and monasteries etc. Increased constructions activities placed heavy pressure on the PAs resources on later days, therefore the government gradually started discouraging such practices from the core areas of the PAs and using buffer zones as an alternate option to generate the necessary resources.

➔ Conservation education:

This is one of the major programs of the department to aware the locals and the general

public to safeguard the values of natural resources including the flora and fauna.

➡ Buffer zone program:

The buffer zone program has been considered as a long –term solution to integrate the issues rose by the local communities. After the 4th amendment of the act the PAs gradually started to declare buffer zone and initiated the buffer zone management program. To integrate the community issues of the mountain areas, the conservation area management approach had been initiated through the establishment of the Annapurna Conservation Area (ACA) in 1986. The sole objective of this initiation is to provide opportunity to those who are capable of managing such areas as per the objectives. On the basis of this philosophy, the ACA being managed by the national NGO, the National Trust for Nature conservation. In order to provide an opportunity directly to the local community, the Kanchanjunga Conservation area was handed over to local community for its management in 2006.

Implementation of the buffer zone program has been able to address different issues including human-wildlife conflict mitigation, income and employment generation, alternate energy promotion, community based tourism promotion, community development and improvement of infrastructures, education and awareness, capacity building of buffer zone institutions, habitat extension and improvements. More importantly, the change in governance of the PAs not only helped to generate people's participation but also helped to build capacity of local community institutions (Bhatta and Karki 2008).

Besides the regular conservation and development programs, Participatory Conservation Program (PCP) supported by the UNDP, Bardia Integrated Conservation Program (BICP) supported by WWF, Biodiversity Conservation Program (BCC) and Bardia Conservation Program (BCP) supported by NTNC, and Buffer Zone Development Program (BZDP) supported by CARE Nepal helped to institutionalize buffer zone activities.

The conservation approach in Nepal evolved from the strict protection approach to more participatory approach over the time. The participatory approach has several advantages over the traditional strict conservation approach. This change has helped to build capacity of local community and enhance biodiversity conservation. Later, the conservation approach has been shifted from the isolated patches to the landscape approach. The landscape approach in Nepal is one of the solution for the sustainable conservation and to minimize the potential threats to the biodiversity loss (Bhujju 2001, Bhatta, 2011). The Terai Arc Landscape and the Sacred Himalayan Landscapes are being managed in this approach. Anthropogenic pressure on forest resources is decreasing through creation of resource bases and alternate energy and some of the areas outside the PAs are now able to act as functional corridors (Bajimaya 2011). In this context, government, community and INGOs/NGOs partnership in Nepal is moving in a direction which can produce desirable results in long run.

Community Engagement in Species Conservation

The local communities residing in and around the Protected Areas (PAs) are true custodian of the natural resources including the flora and fauna. The communities are fully aware that they

are directly or indirectly benefited from these natural resources, therefore overexploitation, poaching and illegal collection of any taxa will ultimately threaten its survival in the nature. Prevailing traditional customs guided by strong religious and cultural beliefs have greatly contributed in maintaining harmony between humans and their surrounding biodiversity. The religious sentiments, taboos, strict ban imposed by local conservation bodies against deliberate killing of wildlife still exist within the Buddhist communities in the Annapurna, Manaslu, Gaurishankar conservation areas and Sagarmatha national park. According to Shah (2001) fish is regarded as “pannikokeera” (i.e. water insect) in the upper Mustang area of Annapurna Conservation Area, therefore the local communities do not consume fish of the local aquatic bodies.

In fact, these days traditional as well as modern conservation practices run side by side within the PAs. Hindu and Buddhist philosophies and their values respect nature as an integral part of the human life. Many animal species are regarded either as the incarnation of different deities and “Guru Rinpoche” (Buddhist spiritual leader) or animals directly associated with them. In upper Mustang area of ACA frog is considered as a god, therefore it is strongly believed that a person who kills frog becomes leper. Likewise, snow leopard is considered to be dog of Padamasambhava, it is strongly believed that any harm done to this rare cat will annoy the spiritual leader and this would ultimately invite natural calamities in the village (Shah, 2003). Even a most notorious poacher would not dare illegal hunting of wild animals and felling of a tree within the premises of a Hindu shrine.

Poaching of the wildlife especially for the economic gain, meat, medicine and recreational purposes started long before the present PAs were gazetted. High pricing of rhino horn, big cat’s (tiger, leopard and snow leopard) bones and pelts, elephant tusk, bear bile, musk pod, cordyceps and other medicinal plants in the world market intensified the poaching and illegal collection. Nowadays, community based conservation bodies had been formed within several PAs of the country and they are successfully working to safeguard precious flora, fauna and their habitats. Undoubtedly, after the successful efforts of these conservation bodies dwindling population of those threatened taxa had started increasing gradually.

Anti-poaching units, conservation subcommittees for snow leopard, red panda and musk deer and community based snow leopard and red panda monitoring system had been initiated in the PAs. Anti-poaching procedure was established in 1973 in Chitwan National Park with the financial support from Flora and Fauna Preservation Society (HMG of Nepal, 2003). It was intelligence network based on system of reward in neighboring villages and towns around the park in Chitwan. It is established fact that poaching cannot happen without the help of local villagers adjacent to PAs. Therefore, local inhabitants were involved as informers to curb the poaching of the wildlife especially rhino and illegal trade of its body parts. Based on the performance of the informers they were provided sufficient incentive. A handsome cash reward was announced by putting notice in public places for information that would lead to the capture of poachers with evidence or weapon, or rhino horns or parts and trophies, derivatives of endangered species. The notice became effective and 17 rhino poachers were arrested within the three months (HMG, 2003). A total of 76 poachers were caught in relation to rhinoceros and tiger poaching and trade between 1992 and 1997 (NBS, 2002).

Nepal government in collaboration with WWF-Nepal, National Trust for Nature Conservation and Buffer Zone Development Committee had established anti-poaching units in several other PAs of the country. These days the anti-poaching units are mainly successful due to involvement of local communities. This system has drastically reduced the poaching incidents of rhino and other endangered wildlife in the PAs.

The snow leopard is a highly threatened species of wild cat and found in 10 PAs in Nepal (Shah and Baral, 2012). Its survival in the Himalayan PAs has been threatened due to retaliatory killings and poaching for the economic gain. Snow leopard's skin and bones are highly sought by the illegal traders. Snow Leopard Conservation Sub-Committees (SLCC) have been formed in Shey-Phosundo, Sagarmatha, Langtang national parks and Annapurna, Manaslu and Kanchenjunga conservation areas to safeguard the species. SLCC is a community based snow leopard conservation body successfully active in majority of these snow leopard range PAs. The SLCC members routinely make visits to the snow leopard's potential habitats in their respective areas and check up any ongoing illegal activities concerning the species and its prey base. Traps, snares and enclosures set for targeting musk deer, blue sheep, Himalayan tahr and other wildlife are dismantled and destroyed. Sometimes poachers (locals, outsiders as well as foreigners) are caught red handed on the spot and handed over to the concern authority.

A community based snow leopard and red panda monitoring system has been introduced where selected local community members in Kanchangunja monitor population dynamics and other ecological activities of snow leopard and its prey species on the regular basis. Obtained information are made available for central database in Kathmandu. The community based monitoring of the wildlife proved to be very effective and the people begin to take ownership of the species. The local people who were once main threat to the snow leopard and red panda and their habitats, have become ardent supporters of saving them and their habitats.

The local communities in KCA and ACA are also involved in mitigating retaliatory killing of snow leopard by actively participating in the insurance and compensation schemes introduced in the areas (Shah and Baral, 2012). The Musk Deer Conservation Sub-Committees formed in Manang region of ACA and Red Panda Conservation Sub-Committees formed in Langtang National Park are successful in reducing poaching of musk deer, red panda and other wildlife in the area. The wildlife friendly activities conducted by these local conservation bodies are more or less similar to that of the SLCC members as mentioned above.

The Mother's Groups, Pasture Management Sub-Committees, Sub-committees related to management and utilization of NTFPs and *Cordyceps* are other community based bodies dedicated to the wellbeing of particular species or overall biodiversity inside the PAs. They regulate and control rotational grazing, overexploitation of timber woods, fuel woods, fodder and NTFPs, collection of Yarsagumba (*Codyceps sinensis*), traditional methods such as setting of indiscriminate fire in the belief of improving pasturelands, use of poisons in the aquatic bodies to kill fishes, and many other activities which are harmful to the nature and natural resources.

Langtang Area Conservation Concern Society (LACCOS) is a non governmental organization established by a group of young local residents in Dhunche, Rasuwa district. The main objective of LACCOS is to protect biodiversity of the area through several activities including biodiversity conservation awareness among the local people as well as native and foreign tourists who visit the park area. The society conducts plantation, anti-poaching, wetland restoration, conservation programs in the local schools, ecotourism related activities and publish conservation related brochures, information charts, books and installed sign posts and hording boards in several strategic localities. The society has used snow leopard as its official logo and initiated a Red Panda Trophy, which is yearly presented by Miss Nepal to the winner team of the competition during the celebration of wildlife week. Like LACCOS, elsewhere there are several other Eco-clubs and NGOs established by local people within the PAs and they are constantly working and greatly contributing towards safeguarding and revival of the lost biodiversity in their respective areas.

Finally, it is clear that the local communities residing within and around the PAs of Nepal are strongly engaged in the protection of overall flora and fauna of the areas, when their actions are directed to the conservation of the umbrella, flagship and endangered species of fauna and their habitats. The results are obvious; the lost biodiversity of PAs is slowly regaining its originality by conserving flora and fauna.

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Managing Human-Wildlife Conflict in Nepal

– *Shyam Bajimaya*

Abstract

Human-Wildlife conflict (HWC) has become a regular phenomenon. Its increasing trend turns out to be one of the most threatening obstacles in conservation. With the increasing populations of wild animals as well as of human and livestock combined with declining wildlife habitats, the chances of conflicts are in rise by many folds. The available data show that the elephant is the most pervasive species (42%) in this type of conflict resulting 70% human casualties in Nepal. The incidents of human encounters with common leopard are in rise both in Mountain and Terai. The HWC is becoming more imminent in all Terai protected areas as they are adjoining to large human settlements. The consequences of such conflicts are ruinous which could be key critical hindrances for reduced support from local people in conservation. For minimizing conflicts, favorable government policy, good management practices and approaches, low cost technologies, and a well equipped Emergency Response Team for wildlife emergencies and rehabilitation are the prerequisite. Based on the experience, short-term mitigation tools need to be combined with longer-term preventive strategies in resolving the conflicts.

Key words: Human-Wildlife Conflict, Electric fencing, Relief fund, Rescue operation

Introduction

Growing human-wildlife conflict (HWC) is one of the most threatening obstacles in conservation. It is particularly more serious in case of mega species like elephant, rhinoceros and big cats which require large areas as home range and for seasonal migration. With the increasing populations of wild animals as well as of human and livestock combined with declining suitable wildlife habitats, the chances of human-wildlife conflict are in rise by many folds. Thus, it has become a universal well known issue occurring throughout human history. The conflict ranges from simple nuisance to crop and livestock depredation to potentially human life-threatening emergencies.

The human-wildlife conflict, generally, is the interaction between human and wild animals with its consequential negative impact on people, their resources, or wild animals. The conflict crops up when humans or wildlife are having an adverse impact upon the other. It has been fallen a threat to the survival of many threatened species of wild animals, and jeopardized the normal life of local people. It is predominantly due to rural people's heavy

reliance on forest resources, poaching, retaliatory killing, habitat shrinkage and increase in wildlife populations due to strict protection.

In Nepal, human-wildlife conflict is becoming more imminent in all Terai protected areas as they are adjoining to large human settlements. Majority of the rural population rely on subsistence agriculture and animal husbandry there by heavily depending upon forest resources. The conflict has become more prominent due to poaching, waning forest resources outside protected areas, forest encroachment and continually increasing human and livestock populations surrounding Protected Areas. This paper intends to present brief account of human-wildlife conflict, mitigation measures undertaken and way forward in reducing conflicts in relation to protected area management of Nepal.

Background

It is obvious that human-wildlife conflicts are most intense where wildlife competes directly with a fast increasing human demand over scarce resources. For example, forest encroachment, persevere poverty, livestock grazing, forest fires, collection of NTFP, illegal removal of wood and offences, illegal trade in wildlife and tourism activities are some of the key reasons for amplifying the conflicts. Degradation of forest close to human settlements, diversion of forest areas for no-forestry use and shrinkage of village grazing lands has exerted more pressure on forests and protected areas creating more probability of conflict.

The habitat loss and fragmentation compel wild animals to stray into human settlements creating havoc in the rural communities and sometimes in urban areas too. Such conflicts lead to crop, property loss and injury to both humans and animals. The habitat loss eventually depletes natural prey then predators like tiger and co-predators are forced to encounter with human and livestock. Hence, the tiger-human conflict is usually credited to dependence of rural population on forests. The consequences of such conflicts are ruinous. Moreover, the park-people interface issues accelerate conflicts and become one of the most critical hindrances for reduced support from local people in conservation.

The traditional deterrent methods becoming ineffective since wild animals become used to and then often turn to be more aggressive and rowdy. The several studies reveal that the human-wildlife conflict is multifaceted: some are ineffective management practices, financially unsustainable, technologically complex and unaffordable to adopt. The crux of problem of the protected areas is primarily due to increased dependency on forests and lack of awareness about the sustainable use among people (Ramkrishna 1999). The loss of habitat, poaching, capturing of wild elephants for domestication and conflict with human are generally attributed to dramatic decline in wild elephant population in the range states (Sukumar 1989a, Blake and Hedges 2004, Pradhan 2007).

Types of conflicts and wildlife species involved

Different wildlife species found to be involved in human-wildlife conflicts depending upon the geographic situation and its distribution all over the world. Main wildlife species in conflicts

are wild elephants, big cats, rhinoceros, bears, water buffalo (Arna), crocodiles, wild boars, deer and monkeys. Most of these species are threatened and are vulnerable to extermination from poaching and retaliatory killing. The species which have rising demands for their body parts in international markets are more prone to poaching as illegal wildlife trade has become a lucrative business and an organized crime because of high profit and low risk of detection.

The type and extent of damage caused by wildlife to human differ from species to species and so is the revenge actions taken by human based on the severity of damage.

a. Wildlife to Human

Major wildlife species involved in damage are listed below:

1. Crop raiding: Wild Elephant, Rhinoceros, Water Buffalo (Arna), Black Bear, Spotted Deer, Black Buck, Blue Bull, Wild Boar, Barking Deer, Himalayan Tahr, Blue Sheep, Rhesus Monkey, Langur and parakeets
2. Livestock depredation: Tiger, Snow Leopard, Common Leopard, Black Bear and Wolf
3. Property damage (houses, grain stores, cash crops): Wild Elephant
4. Human injury and casualty: Wild Elephant, Tiger, Common Leopard, Black Bear, Sloth Bear, Water Buffalo and Wild Boar

b. Human to wildlife

Retaliatory killings- poisoning the kill, snaring and trapping, electrocution, and putting poison or hiding explosive inside edible substances called "Food Bomb"

Retaliatory killing of wild animals occurs as a result of loss of crop, livestock, property or human casualty or injury. Sometimes, rural people also set forests on fire to show their anger. Often, the situation worsens in the fringes of protected areas with the carnivore tagged as a "pest" and in due course of time is eliminated from revenge killing. Retaliatory killing and poaching of snow leopard for pelt and bone is still a major threat (Kattel and Bajimaya 1995). The severity of problem may instigate local people to assist poachers in killing the target animal.

Cases of human-wildlife conflicts

Human-Wildlife conflict has become a regular phenomenon. Two types of incidents entail in such conflict: a) wild animals straying out to villages or farmlands; and b) wild animals attacking people while collecting forest resources or fishing inside the forest or protected area. In high mountains, snow leopard is considered as a main problem animal for livestock depredations (Jackson 1995). Some 3000 South China tigers were killed in China as the species was declared "Pest Animal" in 1950s (Jackson 1999).

In Bangladesh Sundarban Reserve Forest, most of the tiger losses have transpired from retaliatory killing. It is reported that an annual average of tiger victims of 50 people from

1992-2002 and 168 people from 2003 to 2005. It is estimated that tigers have taken a toll of 1,000 human lives over the last fifty years (Dedatus 2003 and Halder 2005). Fishermen and honey collectors entering to the Indian part Sundarban have often created similar conflicts (Mukherjee 2003). Livestock depredation, poisoning tiger kills, problems of man-eater tigers, and poaching of tigers were reported frequently in India. Several man-eater tigers have been destroyed in the past as a part of conflict mitigation measures.

The study on the predation activity in Bhutan reveals that common leopards killing livestock was significantly high (70% of all kills), than tigers (19%), bears (8%) and snow leopards (2%). Several northern districts were identified as 'predation hotspots', where proportions of livestock lost to predation were considerable (Sangay and Vernes 2008).

In Kashmir, India, 29 people and 140 livestock were killed and 210 people were injured by bears from 2000 to 2006. Seventeen bears were killed and seven were captured (Akhtar and Chauhan 2010). The number of livestock killings by wild carnivores in Kibberin last five years since 1992 and persecution of the wolf in the area has increased significantly (Rodgers 1989; Saberwal et al. 1994).

In Zimbabwe, it has been reported that crop damage by African elephants is common and the problem is severe in the vicinity to protected areas. The retaliatory killing and poaching for ivory exerted pressure on the very survival of the species (Parker and Osborn 2006). In India, a railway track passing through the Rajaji National Park has been like a death trap to elephants and other wildlife species. An accidental death of 19 elephants in 1987 has been reported. Direct attacks on human beings, especially when they are solitary have occurred more frequently than in the past (Joshi 2010). In Sri Lanka also, frequent crop destruction and encounters with human by wild elephants in the rural areas are recorded (Jayewardene 1992).

In Nepal, wild elephants have killed 66 persons in five districts in east Nepal within one and half decades since 1987 and 23 elephants were killed in the same period (Yadav 2002). Similarly, 20 wild elephants were lost from Sarlahi to Kanchanpur districts of Nepal from 1994 to 2004. The wild elephant had killed one captive elephant and demolished several guard posts and damaged crops in the same period. Most of the elephants were electrocuted in retaliatory actions; few were killed by poachers or destroyed by the management (DNPWC 2004). However, the loss of 43 elephants is priceless and irreparable.

Similarly, in fiscal year 2003/04, 18 people were killed by three tigers and later those three tigers were destroyed by park authority. Five persons were killed and several persons were injured by rhinoceros during that period. Altogether, 356 goats, 70 pigs, 48 cattle, 12 buffalos have been killed by tigers and leopards in the park in last two years (BNP Annual reports 2010 & 2011). The last three years data show that the elephant is the most pervasive species (42%) among big seven resulting 70% human casualties in human-wildlife conflict in Nepal (Table 1). The incidents of human encounters with bear and common leopard are found to be in rise both in Mountain and Terai protected areas and forests.

Table 1: Number of Human Casualty and Injury in last three fiscal years

Species	Fiscal Year* 2066/067 (2009/010)		Fiscal Year 2067/68 (2010/011)		Fiscal Year 2068/069 (2011/012)		Total
	Casualty	Injury	Casualty	Injury	Casualty	Injury	
Wild elephant	26	3	4	2	14	14	63
Rhinoceros	5	8	2	13	4	1	33
Tiger	6	-	1	1	3	1	12
Common leopard	8	-	2	5	3	-	18
Wild buffalo	-	5	1	1	3	3	13
Bear	-	7	1	-	1	-	9
Gaur	1	-	-	-	-	-	-
Total	46	23	11	22	28	19	149

*Nepali fiscal year (B.S.) Source: DNPWC, 2011& 2012, and CNP Trimester Bulletin 2012

Wild elephants, rhinoceros, spotted deer and wild boars are still considered as crop raiding animals in Terai and Himalayan tahr, blue sheep, and black bear, barking deer, rhesus and langur monkeys in the Mountain protected areas.

On the other hand, infiscal year 2010/011, four rhinos, two water buffalos, three snow leopards, two mush deer and one tiger were killed by electrocution and gun shots. In few cases, gharial crocodiles were found to be entangled in gillnets drowning to death in Narayani River in Chitwan. In the past, man eater tigers were either transported to Central Zoo in Kathmandu or were destroyed depending upon the physical and health condition of the tiger.

Possibly, active maintenance of physical barriers and guarding of crops and prominently reducing habitat modification can help in reducing the conflict. If the traditional and new deterrents tools are not effective in controlling the conflict and if there is no other options, more invasive approaches such as regulated harvesting or translocation of wild animals depending on the species or voluntary relocation of human settlement should be considered. The solution is very complex but the appropriate mitigation measures can reduce conflict if reliable information of the species is made available.

Changing conflict to collaboration

The greatest challenge in human-wildlife conflict is to reconcile wildlife conservation with human needs with the growing human population and shrinking appropriate wildlife

habitats in the world. The utmost challenge in the big cat conservation is to reduce the conflict from killing since the predation can never be eliminated but should be brought to a limit that people are ready to accept (Jackson 1999). The big cat-human conflict requires top most priority in rectifying the problem and instant delivery of compensation to the loss (Gopal 2001). Managing conflict created by mega species like elephant is a daunting task since it covers large areas and probability of incidents is obviously high and so is the loss.

For minimizing conflicts, favorable government policy, good management practices and approaches, and low cost technologies are the prerequisite. A number of good practices such as electric/solar fencing, physical barriers, alarming system, changing cropping pattern, and sustainable compensatory or insurance system, community based natural resource management need to be scaled up. The two prone approaches should be implying in resolving human-wildlife conflict: short-term mitigation tools need to be combined with longer-term preventive strategies. In the meantime, the long term mitigation strategy should be directed toward identification of impact zones around protected areas, maintaining suitable wildlife habitats and corridors, and fostering participatory management and enhancing community livelihoods.

a. Global and regional practices

The various mitigation and compensatory measures found to be in practice to address the human-wildlife problems around the world. In Peru, local people were engaged in Vicuna recovery plan by paying cash compensation for allowing vicunas to graze in their land and involving them in translocation operations in late seventies (Prado, 1982).

In Bangladesh Sundarban, putting up net fencing at the periphery of the forest that very close to the villages or erecting natural barrier is in practice to control tigers from straying. It has given psychological effect to produce deterrent to tiger (Dedatus 2003 and Halder 2005). In Indian Sundarban, human dummies and masks as deterrent have been tried and there is no report of people wearing masks on the back of their head being attacked by tigers. Regulation of number of fishermen and honey collectors along with their entry time and designation of the areas of operations are some of the management measures undertaken to lessen the tiger-human conflict.

Also, the strayed tigers are captured and then released to forests depending upon the health condition of animals. Nylon net and vegetative barriers, fencing and solar lights were found effective in preventing the conflict (Mukherjee 2003). The study suggests taking conflict mitigation measures focus on common leopards to reduce predation on the vulnerable livestock and take measures to protect the larger and more valuable livestock in areas where tigers are abundant in Bhutan (Sangey and Vernes 2008).

In Zimbabwe, chilli (*Capsicum annum*), an unpalatable cash crop, is a popular crop to reduce human-wildlife conflict effectively and generate income to people. The study shows that chilli is less vulnerable to wildlife than other crops and is economically viable too (Parker and Osborn 2006). And one of the most effective ways to discourage the elephants from straying out of the forests would be to stop lopping and felling the fodder plants. Stopping

elephant poaching, creating water holes and restoring corridors are some other ways for conserving the elephants (Joshi 2010).

In Sri Lanka, cultivation of Caster (*Rhizinus communis*) in barren and unutilized land has been done to escape crop depredation from elephants and enhancing farmer's income. In several places, electric fence has been erected and cut deep drains anywhere doable to prevent elephants from crossing into the locality. The staff and farmers are provided training on methods of elephant control and conservation. Often, elephants are captured and translocated into a sanctuary considerably away or are trained for domestication. If all options failed, in such case the animals are destroyed as a last resort (Jayewardene 1992).

In Kashmir, about 20 bears have been rescued and 15 of them were released back to wild. Also proper disposal of leftover food and fruits is necessary to keep away bears. In rare cases, birth control measures on rhesus in Himanchal, India and among the hamadryan baboons in Saudi Arabia were taken on experimental basis to combat crop damage problem (Mohnot and Sahoo 2004).

In Bangladesh, compensation is paid to the victim's families in case of casualty only (Akhtar and Chauhan 2010). While in India, government compensates of Rs 20,000/- per person killed and Rs.10, 000/- for permanent disability and pays all cost of treatment for injured persons. The State government has also streamlined the payment procedure by decentralizing the authority to sanction at field level for instant paying on kills. The informers are also paid for instant information on kills from WWF- Tiger Conservation Project (Ramkrishna 1999).

In India, ecocodevelopment program was implemented around tiger reserves in 1995 to foster local communities' participation in conservation for their own better future and indirect compensation to their hardship from wild animals (Melkanani et al 1999). The program is focused on the where conflict is acute for protection, promoting cottage industries, improving agriculture lands, and livestock improvement, regulating grazing, and promoting use of alternate energy in interface to enhance capacity and livelihoods of local people (Gopal 2001). It is recognized that inter country cooperation is essential to control human-elephant conflicts (Talukdar 2005).

b. Nepal's approach

Broadly speaking, most of the efforts are toward harmonizing park-people relationships. The traditional practices of resources utilization by local people were restricted after the establishment of protected areas creating difficult situation. In mountain protected areas, local people are given privilege to collect firewood, fodder for domestic use and livestock grazing on rotational basis. Whereas in Terai, protected areas are used to open for certain period to collect thatch grasses and reeds annually.

The human-wildlife conflict began to rise with the increase of wildlife population. Various conventional and new measures were tested in mitigating the conflicts. The barbed wire fences with trenches were erected in most of the Terai protected areas and later it was replaced by game-proof fencing but none of those structure last long because it became barrier to both wildlife and human.

Other measures like watch towers (Machan) on farmlands were constructed for night watch and provided with torch light, siren and alarming bell to keep away wild animals. Stone walls were constructed in Shivapur-Nagarjun and Rara National Parks. Fire cracker, Fire flame and even blank fire were practiced to drive away wild elephants but later they did not afraid of from such devices. Sometimes, Shikaris (hunters) were engaged in Langtang National Park to control wild boar from crop raiding. Later, government declared wild boar as vermin and allowed farmers to kill the animal while in their farmlands.

The National Parks and Wildlife Conservation Act 2029 (1973) amendment in 1993 was a milestone in conservation provisioning buffer zone and plough back of up to 50% of park/reserve income for local community development. The program was initiated in 1996 aiming to resolve the contesting issues of conservation like human-wildlife conflict and enhancing communities' livelihoods. Now, 12 parks/reserves have buffer zones covering over 5423 sq. km and serving 7,00,000 populations. More than a sum of NPR 397548403.44 has been released to buffer zone program still fiscal year 2011/012.

In 2010, government endorsed Wildlife Damage Relief Guidelines 2066 to provide support to wildlife victims. The amount for human casualty is NPR 150,000.00 per person and a maximum of NPR 50,000 for human injury caused by seven specific species namely Tiger, Rhino, Elephant, Common Leopard, Snow leopard, Bear and Arna (DNPWC 2012). A total of NPR 13.8 million has been claimed for compensation for all types of damages but so far only NPR 8.8 million has been paid to claimants by the end of the fiscal year 2067/068 according to the Department of National Parks and Wildlife Conservation.

Besides, more than 30 scholarships have been awarded to school children of wildlife victims. Health centers and veterinary service centers have been established at places in buffer zone. Different awareness programs are conducted through 383 Eco-Clubs in TAL (WWF NP 2011). The management of wildlife habitat has been intensified to maintain the quality and palatable grasses for herbivores and promoted alternative energy like solar, biogas (1371 plants) and ICS (1075) to reduce the consumption of forest resources and green enterprises to enhance livelihoods of local communities. To reduce human-elephant conflict, 12 elephant handlers were given Kunkie training to drive wild elephants and one mobile squad at park headquarters and 56 anti-depredation squads at village levels have been formed (WWF Annual Report 2011). For example, over 2000 HHs are benefited from NTFP based enterprises like Marmelos (Bel) tree. Also, construction of bio-fence around national and community forests is encouraged. Various training on community capacity building including wildlife attack precautionary measures is conducted. Some of the best practices in reducing Human-wildlife conflict are illustrated below:

Best practices

a. Solar/Electric fencing

The electric fencing along the interface of protected areas and villages is found to be very effective to protect crop depredation from mega species like elephants and rhinoceros. It has also reduced property damage as well as human casualty or injury and getting rid of

overnight watching of crops. The farmers are benefitted with the increase in production and income. More than 77 km of electric/solar fencing has been erected in Suklphanta, Bardia, Chitwan and Koshi Tappu protected areas. The construction of solar/electric fencing in collaboration with local communities is cost effective and there is less chance of vandalizing such infrastructure. It has reduced crop damage significantly and communities are actively engaged in conservation.

b. Change in cropping pattern

The cultivation of medicinal and aromatic plants is beneficial to communities in both ways. It is not eaten by wild animals and has become a good source of income to communities through diversification of crops. It has also reduced human-wildlife conflict in the area. The communities are busy in cash crop productions like Mentha (*Mentha arvensis*) Chamomile (*Matricaria chamomilla*), Pamarosa (*Cymbopogon martini*), Lemon grass (*Cymbopogon flexuosus*) and Citronella (*Cymbopogon winterianus*) in buffer zone. The farmers' groups have established and operating several distillation plants. They have established market linkage for selling their products. More than 4000 people are involved in cultivation of forest crops with the support from different projects. Of those people involved in such cultivation, more than one third (34.5 percent) are in Chamomile cultivation followed by lemon grass (27.2 percent), mentha (19.7 percent) and Pamarosa (11.2 percent), and 298 HHs produced 2594.15 kg mentha and earned 3.5 million rupees in 2011 as per Western Terai Landscape Project.

c. Creation of Buffer Zone Relief Fund

In 1998, Chitwan National Park Buffer Zone, for the first time, initiated relief support to the wildlife victims by creating relief fund. The relief support was NPR 25,000/- for human casualty, NPR 10,000/- for handicapped, NPR 500/- to NPR 2000/- for ordinary injuries and 1/4 of the market price for livestock killed. In 2003/04, Chitwan Buffer Zone paid NPR 1627061/- for wildlife victims (CNP Annual Report 2004). Later, the support amount has been doubled in Chitwan and similar relief funds have been created in other protected areas from project support and community contribution. For example, Bardia and Suklaphanta Buffer Zones have now relief funds amounting NPR 36,41,057/- and NPR 2150000/- respectively in 2010/11 (BNP& SWR Annual reports 2011).

d. Snow Leopard Conservation Fund

The community based snow leopard insurance scheme is in place in Kachenjunga Conservation Area with the seed money of NPR 1,200,000 provided by WWF Nepal. About 400,000.00 of the seed money have been invested on 12% interest to borne the cost of travel in remote areas from the interest earned and 550 HHs are benefitted from this scheme. Based on the number of livestock, owners are required to pay premium of NPR 55.00 for three years to become eligible to claim compensation for livestock killed by snow leopard. The deposited amount is returned after 3 years with 3% interest from the interest generated from the seed money deposit. It is agreed to pay an amount of NPR 2500.00 as compensation to livestock killed since mostly yak calves are killed by snow leopards.

Remaining amount is distributed among the farmers who have not received compensation depending upon the number of yak insured. It has reduced the retaliatory killing since carcass need to be saved or submitted as evidence to Investigation Committee for claiming compensation. Consequently, it has stopped retaliatory killing by poisoning, increase snow leopard population; generate income, enhance capacity and provide soft loan etc. The fund is administered by Snow Leopard Conservation Committee based on the principle of community participation, ownership and management (Digo Jibikoparjan 2007).

e. Rescue operation of problem animals

Often problem animals create havoc and put people's life at risk. In such cases, it becomes utmost urgent to rescue the problem animals to save human live as well as animals. This is particularly true when wild elephant become rowdy and tiger turn into man-eater. The incidents of common leopard straying in urban area and entering to houses and villages in mid-hills become more or less common. For this purpose, a well equipped team of technicians is required to control or capture and transport the problem animals to a safe place. Recently, a well equipped rescue team has been formed in Central Zoo, Kathmandu for animal rescue operation in the country. Such operation has been successful in relieving people from fear of attack and saving the animals, and establishing good public relationships. A well managed animal rescue center is required for handling and rehabilitation animals in future.

Conclusion

It is obvious that human-wildlife conflicts will not be eradicated only be reduced. For this, a better understanding of conflict management options is crucial. In order to crack this conflict cycle, there is an urgent need to protect and reduce vulnerability of rural livelihoods to wildlife depredation, educate public and foster community-based conservation. The sustainable approach will be to ensure the local economy development through benefit sharing of conservation. To make conservation more effective, management should be on sound scientific knowledge combined with practical knowledge of local people and their collaboration.

Providing adequate and instant compensation can also help affected families and change their attitude toward wild animals. Further, inter-sectoral coordination and collaboration is required for effective implementation of mitigation measures. The lessons learned in managing human-wildlife conflicts around the world should be useful in improving relief/compensatory policy and mechanism.

Way Forward

Following recommendations are made for managing human-wildlife conflicts in days to come:

- ➞ Promote electric/solar fencing in collaboration with communities and diversification of

cash crops as cost effective and sustainable means for preventing wild animals from crop raiding.

- Set community based relief fund or insurance scheme with sufficient amount and well written fund management protocol.
- Establish well managed rescue centers for rescued problem wild animals and orphans, and release captured animals after treatment as early as feasible.
- Establish well equipped Wildlife Emergency Response Team that includes technician, immobilization drugs, equipment and transportation means for wildlife emergencies or for rescuing and rehabilitation. Advocate non-lethal solutions in controlling wild animals that are in conflict and destroy the animal only if there is no other option.
- Pay reasonable ex-gratia by the government in cases of attack or property loss instantly and simplify the government relief policy 2066 for prompt and sufficient amount delivery to the victims.
- Bring biological corridors under the legal protection to stop further alternation for other development purposes and employ intensive monitoring.
- Retain and maintain wildlife habitat quality by managing grasslands and water holes.
- Conduct study on behavioral ecology of the prioritized wildlife species and rigorous monitoring of the target species and educate people to change their attitude toward animals.
- Improve paddock/corral design strong enough to protect livestock from depredation.
- Designate proper disposal of leftover food and fruits in the campground and protected areas and discourage night camping in core areas except for the management purposes.
- Regulate entry in term of number and time to protected areas and forests to reduce the conflicts.
- Promote collaborative management and empower community through various capacity building and livelihood enhancement programs.
- Generate strong inter-institutional and governmental support for concerted effort to mitigate human-wildlife conflict.
- Foster in country and transboundary cooperation to control human-wildlife conflicts.
- Formulate conflict mitigation plan by taking holistic approach.

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Paper 4

Controlling Wildlife Crime in Nepal: Sharing Experiences

– K.P. Acharya and P. Kandel

Abstract

Poaching and illegal trade of wildlife body parts are major challenges for biodiversity conservation in Nepal. Nepal is one of the countries where there is significant problem of poaching and unfortunately, it has also become a transit point for illegal trade of wildlife body parts. Despite several challenges to curb the problem, inadequate resources has remained as one of the biggest challenge for the country.

However, recent government initiatives have yielded significantly good results. There was no poaching of rhinos in between 3 Jan 2010 to 3 April 2012 (15 months) which is one of the most successful periods of rhino conservation in the country. So, sharing the strategies and measures applied in achieving 'Zero Poaching of Rhino in the year 2011' would be helpful to formulate a long term future strategies in combating illegal trade and poaching. This paper aims to share successful measures, strategies, programs and activities initiated by Department of National Parks and Wildlife Conservation.

From experiences, it has been proved that involvement of multi-agencies in controlling illegal trade would be highly successful. Establishment of various national institutions like National Tiger Conservation Committee, Wildlife Crime Control Coordination Committee and the Wildlife Crime Control Bureau at center and district level- that includes representatives of all the enforcement agencies has significantly contributed to achieve extraordinary success in wildlife crime control. Similarly, establishment of separate 'Wildlife Crime Pillar' under the Central Investigation Bureau of Nepal Police played a vital role too. Controlling wildlife crime remains a major priority of the enforcement agencies and their dedication for this cause has proved to be highly effective. Provided continuation of these efforts and human and institutional capacity of the enforcement agencies be strengthened, effective coordination and collaboration among and between various enforcement agencies would certainly be more successful to control wildlife crime in Nepal.

Key Words: Poaching and trade, Wildlife Bureau, Capture, Nepal

Background

Nepal is blessed with remarkably rich biodiversity. The amazingly diverse climatic and topographic variations within the country have provided a variety of forest and ecosystem types with unique wildlife habitats. Comprising only 0.1% of the total land area on the

global scale, Nepal has contributed significantly to the conservation of global biodiversity. More than 23 % of the country's landmass has been set aside for perpetual conservation purposes. The unique bio-geography of the country is home to over 187 species of mammals, many of them globally threatened, such as Royal Bengal Tiger, Greater One-horned Rhinoceros, Asian Wild Elephant, Snow Leopard, Red Panda and Gangetic River Dolphin. Nepal's unique habitats also provide homes to over 871 species of birds – resident as well as migratory species, including the endemic Spiny Babbler. This splendid nature gifted nation however has been continuously suffering from poaching and illegal trade of its magnificent varieties of flora and fauna by some of the national and international illegal traders for their earnings.

Except for few legally permitted animals for hunting like Blue Sheep and Thar in Dhorpatan Hunting Reserve and some common species in specified forest areas, killing of other wild animals in Nepal is a serious crime. Wildlife crime refers to deliberate evasion of any domestic or international law concerning wildlife, be it hunting for fun or food or poaching to supply an illegal wildlife trade or by possessing illegal material or smuggling it across borders (Pandey, 2009). The UN General Assembly, UN Commission on Crime Prevention and Criminal Justice and The International Criminal Police Organization (INTERPOL) have all recognized wildlife crime as a form of serious, organized transnational crime with devastating global effect. INTERPOL defines wildlife crime as the taking, trading, exploiting or possessing of the world's wild flora and fauna in contravention of national and international laws (INTERPOL 2012).

The wildlife crime is no longer a localized crime carried out for food, fun or other local consumption. It has become an organized* crime operated by well-established structured network in a professional and planned manner.

INTERPOL ranked the illegal trade of wild flora and fauna and their parts to be third largest illegal trade in the world after drug trafficking and arms dealing. An estimated value on trade of wildlife and their product worth up to USD 20 billion per year (Chungyalpa 1998) and a quarter of this is estimated to be illegal. The Rapid Response Report (2012), entitled 'Green Carbon: Black Trade' by United Nations Environment Programme (UNEP) and INTERPOL estimated that the illegal timber trade by organized crime groups is estimated to be worth between USD 30 and 100 billion annually.

The high profit and low risk (of being detected, apprehended and convicted) nature of wildlife crime has made it attractive among criminals and proceeds of wildlife crime may even be used to finance other forms of serious crime. The routes used to smuggle wildlife across countries and continents are often used to smuggle weapons, drugs and people.

*The UN Convention Against Transitional Organized Crime in article 2 (a) defines 'organized criminal group' as – a group of three or more persons that was not randomly formed; existing for a period of time; acting in concert with the aim of committing at least one crime punishable by at least four years' incarceration; in order to obtain, directly or indirectly, a financial or other material benefit. (<http://www.unodc.org/unodc/en/organized-crime/index.html>)

Indeed, wildlife crime often occurs hand in hand with other offences such as passport fraud, corruption, money laundering and murder (INTERPOL, 2012) as well as drug and weapon transactions. It has been recognized that the transitional criminal organizations involved in wildlife crime are likely to be involved in arms, narcotics and human trafficking as well (Lin, 2005).

Illegal wildlife trade in Nepal

While rich in biodiversity, the Himalayan region is relatively less developed area where livelihood of local people is inextricably linked with natural resources obtained from forests and where cultural diversity has promoted the use of these resources in a diverse way. Nepal carries a long history of using wildlife and their parts for various purposes like religious and cultural purposes as well as for medicinal and decorative uses.

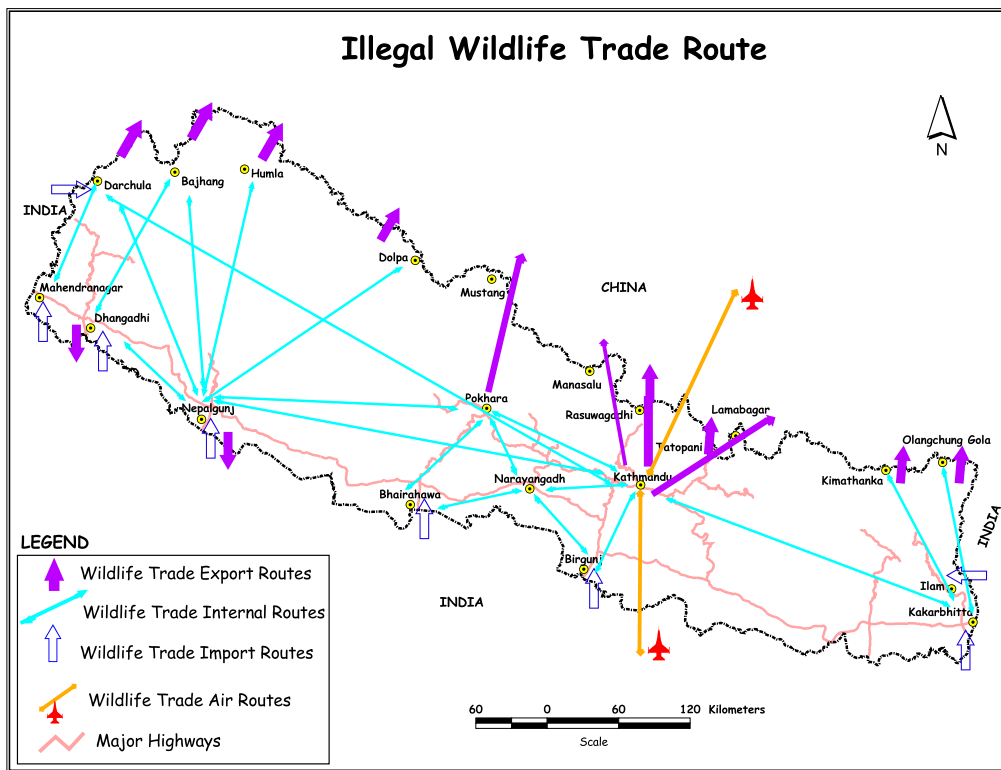


Figure 1: Nepal, a transitional hub for the international illegal trade of wild animals' parts and products

Moreover, Nepal is claimed to be a transitional hub for the international illegal trade of wild animals and their parts for decades now. There existed thriving trade of products of wildlife like fur coats in tourist shops in Kathmandu since many decades, which was brought into light for the first time by Barnes (1989). The markets of Nepal, China and South East Asian countries are the biggest consumers of these products. The animals are either poached in

Nepal or wildlife products are brought to Nepal from other countries where Nepal serve as a transitional hub and then through a well established channel it reaches to its final destination (Figure 1). The cities like Kathmandu, Pokhara, Nepalgunj and Dhangadi are the major centers for illegal wildlife trade in Nepal. Since decades, the illegal trade of wildlife and their products are being flourishing in the country which the present institutions, staffs and infrastructure find challenging to counter.

Illegally traded key species in Nepal

Lucrative prices offered in national as well as international market for wild animal skins, bones, musk, bear bile and other wildlife products as well as endangered species of butterfly, birds and plant products have significantly enhanced the pecuniary gains of illegal trade within and outside the country. Various species of wild animals are poached for consumption, religious, medicinal and decorative purposes within Nepal only. A good portion of wildlife products like Rhino's horn, Tiger's skin, bones and other body parts, Common leopard's skin and bones, Elephant hairs, Pangolin's scales, Birds and Turtles are imported to Nepal from India and other species like Sea horse is brought to Nepal from other countries as well. From Nepal, these products are smuggled out to China and other South East Asian countries where these products have huge demand.

Key wildlife species on trade comes from all regions of Nepal.

- ➔ Rhino and Tiger from Terai region
- ➔ Pangolin and Common Leopard from Mid-hills
- ➔ Red Panda, Himalayan Bear, Musk Deer, Snow Leopard from Himalayan region

Besides these, every year few other species like Deer and Wild Boar are also poached within Nepal for local consumptive purpose (i.e. for meat). Also, several Non-Timber Forest products have strong trans-border movement.

Wildlife crime control mechanisms in Nepal

Traditionally, the activities of controlling wildlife crime such as poaching were looked after only by National Parks and Wildlife Reserves of the country. The mechanisms involved were the use of informants for information collection and operation against those engaged. However, due to inadequate infrastructure available with the Government of Nepal, and considering the national as well as international ramifications of wildlife crime, urgent need was felt to have an organization with statutory powers to effectively deal with wildlife related crimes. As per the decision of Cabinet meeting chaired by Hon. Prime Minister on Mangsir 5, 2067 (21, November 2010) Wildlife Crime Control Committees at different level was established under the Ministry of Forest and Soil Conservation to curb ongoing wildlife crimes. They are:

- ➔ National Wildlife Crime Control Coordination

- Wildlife Crime Control Bureau at central level
- Wildlife Crime Control Bureau at district level

National Wildlife Crime Control Coordination Committee (NWCCCC)

Chaired by the Minister of Forest and Soil Conservation, NWCCCC has members, the secretaries from different ministries (like Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, and Ministry of Forests and Soil Conservation), Chief of Nepal Army, Inspector General of Police (IGP) of Nepal Police and Armed Police Force, Chief of National Intelligence Department and Director General (DG) of Department of National Parks and Wildlife Conservation (DNPWC) as a member secretary (Annex 1).

The major duties and responsibilities of NWCCCC are given below:

- Formulating essential policies, legislations and directives to enhance coordination and collaboration among various inter-governmental and non-governmental organizations so as to control wildlife crime.
- Fostering coordination, collaboration and cooperation at national and international level.
- Monitoring and evaluating the activities of Wildlife Crime Control Bureau.
- Arranging essential human resources, technical support and financial resources for the Wildlife Crime Control Bureau.
- Providing essential instructions and suggestions to Wildlife Crime Control Bureau to control crime related to wild flora and fauna.

Wildlife Crime Control Bureau at central level (WCCB)

In its organizational structure, central level WCCB has DG of DNPWC as a coordinator and DG of Department of Forest (DoF), DG of Department of Customs (DoC), Brigadier General of Nepal Army, Deputy Inspector General (DIG) of Crime Investigation Bureau (CIB), DIG of Armed Police Force, Investigation Director of National Investigation Department, two representatives from NGOs working for wildlife conservation in Nepal and DDG of DNPWC as the member secretary (Annex 2). The secretariat of central level WCCB is at Department of National Parks and Wildlife Conservation.

Major duties and responsibilities of central level WCCB are given below:

- Controlling poaching and illegal trade of wildlife and their body parts under the instruction of NWCCCC.
- Coordinating and collaborating among different enforcement agencies and stakeholders to control poaching and illegal wildlife trade.
- Regularly monitoring the activities so as to combat poaching and illegal trade of wildlife and their body parts.

- To carry out above mentioned activities, if necessary, forming and regulating district level WCCB.

Wildlife Crime Control Bureau at district level (WCCB)

District level WCCB involves officers from District Forest Office, District Police Office, National Parks and Wildlife Reserves as well as representative of Nepal Army who are assigned for the security of the related Protected Areas. Along with them, District Administration Officer (DAO), Government Attorney and officer from Customs are also involved. For the National Parks and Wildlife Reserves, which covers more than one district, every district level WCCB must involve representatives from all related National Parks and Wildlife Reserves. The staffs of this unit are sent to deputation.

The major duties and responsibilities of district level WCCB are given below:

- Controlling poaching and illegal trade of wildlife and their body parts under the instructions of central level WCCB.
- Coordinating and collaborating among different enforcement agencies and stakeholders to control poaching and illegal trade of wildlife and their body parts.
- Regularly monitoring the activities so as to combat the poaching and illegal trade of wildlife and their body parts.
- Providing necessary suggestions regarding improvement in policies, legislations as well as institutional reforms to Government of Nepal to strengthen the mechanism to combat illegal wildlife poaching and trade.
- Submitting timely work progress to central level WCCB.

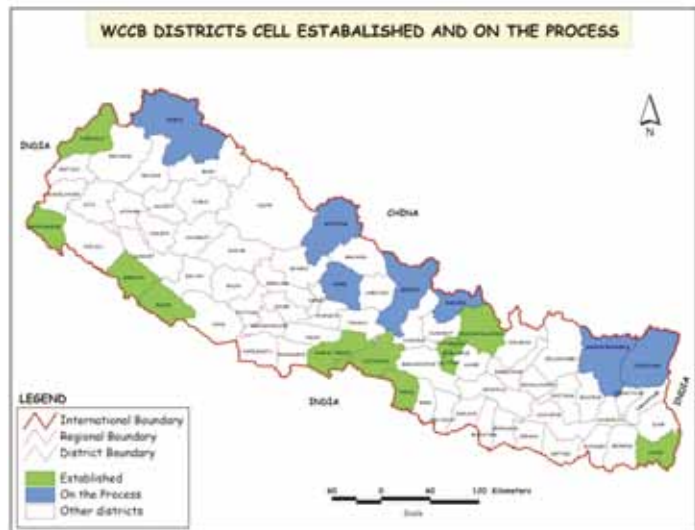


Figure 3: Districts where WCCB has been formed and where it is yet to be formed

The Cabinet meeting decided to establish district level WCCBs in 13 districts of Nepal viz. Kathmandu, Lalitpur, Bhaktapur, Chitwan, Nawalparasi, Bardia, Sindhupalchok, Mustang, Rasuwa, Darchula, Kanchanpur, Kaski and Banke. However, the first meeting of central level

WCCB increased the number of districts to 15 by adding Taplejung and Jhapa. Similarly, third meeting of central level WCCB decided to add Sankhuwasabha, Humla, Gorkha and Parsa thereby making 19 districts in total (Figure 3).

Curbing wildlife crime in Nepal

Together with other factors, the establishment of number of institutions including the National Tiger Conservation Committee, Nepal (NTCCN), chaired by the Prime Minister of Nepal; the Wildlife Crime Control Coordination Committee (WCCCC), chaired by the Minister of Forests and Soil Conservation, and the Wildlife Crime Control Bureau (WCCB) at central and district level which includes representation of all the enforcement agencies, has attributed to achieving success in effectively and sustainably combating the illicit trafficking of protected species of wild flora and fauna in Nepal. For instance, for the first time in the history of wildlife conservation in Nepal, Nepal celebrated 2011 as a 'Zero-Poaching' year as not a single Rhino was poached for the period of 15 months i.e. from 3 Jan 2011 to 3 April 2012. This is a landmark achievement of Government of Nepal together with various other national and international conservation dedicated organizations, local communities and security forces of the country.

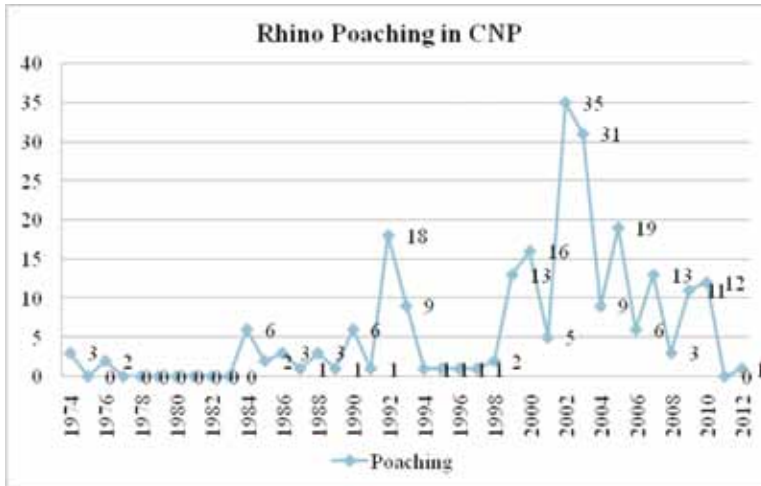


Figure 2: Rhino poaching in Chitwan National Park

This remarkable progress in combating illegal wildlife poaching and trade in Nepal in recent years could be attributed to the following factors:

Formation of wildlife crime controlling units

Various cells or units developed under various organizations like Nepal Police, National Intelligence Department, and Department of Forests worked actively to abate wildlife related crime in Nepal.

Wildlife Crime Pillar III formed under the Central Investigation Bureau (CIB) of Nepal Police has been working remarkably for curbing illegal wildlife trade in Nepal. Mainly, it looks after illegal hunting and trade of 'big fives' viz. Rhino, Asian Big Cats (ABC), Wild Elephant, Deer and Red Panda. Within the short time span of its establishment, pillar III has been successful in carrying out many of the big operations resulting significant arrests of some notorious wildlife traders and seizures of significant amount of wildlife derivatives (Annex 3).

Capture and Seizures

After establishment of the institutions like NWCCCC and WCCB, in the fiscal year 2067/068, 102 people under Department of National Parks and Wildlife Conservation, more than 220 people under Department of Forests and in the fiscal year 2068/069, 138 people under Department of National Parks and Wildlife Conservation were arrested as per National Parks and Wildlife Conservation Act, 2009. These people were involved in poaching and illegal trade of wild animals and their parts and products at different level. Some of them are notorious wildlife criminals whose arrest warrants have been pending for 10 years or more. In addition, special attention was given to capture traders - most wanted criminals in Kathmandu having international linkages, so that existing market link could be collapsed. Out of 5/6 wildlife criminal groups active in Nepal, 4 are under custody and rest are passively working with limited scale. It will take few more years to develop similar linkages of the criminals as some notorious ones have already been arrested. Wildlife Crime Control Bureau at central and district level have also played significant role in making important seizures of the wildlife parts and derivatives. 16 people involved in illegal trade of wildlife products were arrested along with the wildlife parts from Kathmandu in the fiscal year 2068/069. Wildlife parts like Rhino horn, Musk pod, Bear's gall bladder and Leopards' skin were confiscated from them. Within the span of 1 year i.e from Mangsir 2067 to Mangsir 2068, more than 241 numbers of Gunpowder Gun, 5 rhino's hide, 2 fake rhino horn, 5 tiger's skin, 17 Kg tigers' bones, 2 leopard's skin as well its bones along with 27 lakh rupees were confiscated from illegal wildlife traders.

The recent captures of most wanted high profile international traders has undoubtedly affected their networks and slowed down their operations. This has resulted in significant reduction in illegal wildlife trade in Nepal in recent years as it takes longer time to form a network and carry out the new operations for the illegal traders.

Commitment, Coordination and Communication

Together with important seizures and arrests of illegal wildlife traders, Wildlife Crime Control Bureau has played significant role in bringing commitment and dedication among several institutions to work rigorously to protect wild animals, their rights to survival and their role in ecosystem and environment conservation. It has also played important role in fostering cooperation, coordination and collaboration among relevant national agencies and stakeholders who have capacity, expertise and skills to combat illegal wildlife trade in

Nepal. It has enhanced the communication between various related institutions who work to control wildlife crime in Nepal thereby sharing and updating information and resources. The improved coordination and communication among enforcement agencies have made field actions faster and convenient. Moreover, it has brought the issue of wildlife crime at the highest political level thereby bringing huge attention to wildlife crime at the national level. As a result, combating wildlife crime in Nepal is a high priority for the enforcement agencies and their dedication to this cause has clearly proved to be highly effective in curbing illegal wildlife trade in Nepal.

Local community engagement

The local ownership by community and their cooperation is essential for successful biodiversity conservation. The National Parks and Wildlife Conservation Act 2029 has provisioned mechanism of Buffer Zone as a strategy to engage local community for conservation of parks and reserves. Using Buffer Zone framework, Chitwan National Park, Parsa Wildlife Reserve, Shuklaphanta Wildlife Reserve and Banke National Park have formed 22, 13, 9 and 3 community based anti-poaching sub-committees respectively forming one such sub-committees in each buffer zone user groups. Similarly, Bardia National Park has formed 35 ward level communities based anti-poaching units, specifically focused on engaging youths. In case of some mountains parks, like Langtang National Park, such community-based units are functional whereas many of them lack such anti-poaching units. There is a greater need of developing such committees in all national parks meeting specific local situation. These community based sub-committees have been instrumental in providing information, facilitating illegal guns handover to park authorities, extension activities, joint patrolling and monitoring, removal of traps, facilitating operations. In addition, these communities are acting as watch dogs for law enforcement processes and moral supports to enforcement authorities. The challenge is to develop a sustainable financial mechanism for such community based anti-poaching units.

International Institutional Arrangements

South Asia Wildlife Enforcement Network (SAWEN), a regional network of eight countries of South Asia - Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka has contributed significantly in controlling illegal wildlife trade in Nepal. Established on January 28-29, 2011 on the Second Meeting of the South Asia Experts Group on Illegal Wildlife Trade held in Paro, Bhutan, the meeting agreed to establish SAWEN secretariat in Nepal to be hosted by the Government of Nepal. SAWEN secretariat is located at the Department of National Parks and Wildlife Conservation and Director General of DNPWC is the "Chief Enforcement Coordinator (CEC)" of the secretariat. Since illegal wildlife trade goes beyond the boundary of only one nation, this regional network aims to facilitate coordination and collaboration among the member countries to control illegal trade and poaching activities in South Asia. The establishment of SAWEN and its secretariat is an important development for wildlife law enforcement cooperation in Nepal and has created additional sensitization

on enforcement agencies for illegal wildlife trade control mechanism. It provided a common platform for South Asian countries to strengthen their efforts to conserve biodiversity and control wildlife crime and also to share and learn best practices among the region.

Nepal has always been a member country in various international treaties and agencies like Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), International Police Criminal Organization (ICPO-INTERPOL), World Custom's Organisation (WCO) etc which have played active role in combating illegal wildlife trade worldwide. The launch of International Consortium to Combat Wildlife Crime (ICWC) – an initiative of Interpol, CITES Secretariat, World Custom's Organisation, UN Office on Drugs and Crime and the World Bank Stolen Assets Recovery Division in 2010 has also made huge and positive impact on the abating illegal wildlife trade. These five major international agencies have met to seal a powerful alliance to fight wildlife crime effectively and discuss collective actions to stop the key drivers that are bringing the largest of the wild cats to the brink of extinction: poaching, smuggling and illegal trade. Together with these, the Global Tiger Initiative (GTI), established in 2008, is also widely recognized for taking a lot of initiatives for protecting tigers in tiger range countries. Strengthening wildlife crime control, capacity building for detection of trafficking and raising public awareness on tiger trade ban are few to list among those initiatives. These initiatives have undoubtedly played significant role in curbing illegal trade of tiger parts in all tiger range countries.

The responsibility of controlling the poaching and wildlife trade in a country cannot be confined to a single body. In our context, the Department of National Parks and Wildlife Conservation and Department of Forest, the Department of Plant Resources, Nepal Army, Nepal Police, Armed Police, Customs Administration, Post Office Administration, National Forensic Laboratory and the Natural Science Laboratory are key institutions to control and regulate the trade in the country. Conservation partners including WWF Nepal and National Trust for Nature Conservation are providing supports in various stages of law enforcement. The WWF Nepal supports include regular anti-poaching operations assistance through Terai Arc Landscape Programme, MIST implementation, formation of WCCB, capacity development, documentation assistances, UAV lurching, maintenance of informants and operations assistances to park/reserve and district forest offices and Central Investigation Bureau of Nepal Police. Similarly, NTNC is supporting anti-poaching operations, logistics supports and capacity development activities.

Finally, together with these, the roles of media in controlling illegal trade of wildlife parts and products cannot be understated.

Ways Forward

- ⇒ Since organized crime has three well defined layers of operation viz. source, interim transactions involving processing-transportation and the final consumption, the bureau should possess the competence to effectively combat all the three fronts.
- ⇒ A proper mapping of trade network of wildlife crime mafias should be done so as to

track their networks and people involved in wildlife crime.

- The bureau should involve experts from multidisciplinary backgrounds like police, custom, lawyers, conservationists etc.
- Intensive training should be given to frontline staffs for appropriate investigation skills.
- Proper database management system should be developed and adopted for the updated information on wildlife crime and criminals.
- Detail investigation of cases should be done and regular follow- up monitoring of the activities of wildlife criminals after the release from jail should be carried out.
- Forensic lab should be set up for the wildlife crime investigation.
- Identification manual of key traded species with clear and figurative information should be made and distributed to responsible agencies like customs, immigration, police etc.
- Instead of taking some actions after the poaching and illegal wildlife trade, strategies to prevent poaching should be adopted.
- Together with Department of National Parks and Wildlife Conservation, the ownership and responsibilities regarding protection of wildlife should also be taken by the Department of Forests which would strengthen its capacity to combat illegal hunting and wildlife trade.
- Assessment of performances of district units has to be regular and strategy should be developed accordingly.

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ANNEXES

Annex 1: Organizational structure of NWCCCC

1	Minister, Ministry of Forest and Soil Conservation	Chair person
2.	Secretary, Ministry of Home Affairs	Member
3.	Secretary, Ministry of Defense	Member
4.	Secretary, Ministry of Finance	Member
5.	Secretary, Ministry of Law & Justice	Member
6.	Secretary, Ministry of Forests and Soil Conservation	Member
7.	Chief NC, Nepal Army	Member
8.	Inspector General of Police, Nepal Police	Member
9.	Inspector General of Police, Armed Police Force	Member
10.	Chief, National Intelligence Department	Member
11.	Director General, Department of National Parks and Wildlife Conservation	Member Secretary

Annex 2: Organizational structure of central level WCCB

1.	Director General, Department of National Parks and Wildlife Conservation	Coordinator
2.	Director General, Department of Forests	Member
3.	Director General, Department of Customs	Member
4.	Brigadier General, Nepal Army	Member
5.	Deputy Inspector General, Crime Investigation Bureau, Nepal Police	Member
6.	Deputy Inspector General, Armed Police Force	Member
7.	Investigation Director, National Intelligence Department	Member
8.	Two representatives from NGOs working for wildlife conservation in Nepal.	Member
9.	Deputy Director General, Department of National Parks and Wildlife Conservation	Member Secretary
10.	Chief, National Intelligence Department	Member
11.	Director General, Department of National Parks and Wildlife Conservation	Member Secretary

Annex 3: Wildlife crime control operations carried out by CIB (Pillar 3) in the fiscal year 2068/2069

Operation	Date	People arrested	Confiscated items	Amount	Confiscated from
1	2068/6/2	2	Leopard's skin and bones	1 skin and 4.5 kg bones	Abukhaireni 4, Tanahu
2		2	Red Sandalwood	170 kg	Chuchhepati, Kathmandu
3	2068/6/9	6	Red panda's skin	2	Jaya Bageshwori, Kathmandu
4	2068/6/14	1	Snow leopard's skin	2	Bidur Municipality 11, Nuwakot
5	2068/7/1	3	Indian Notes	13000	Kathmandu
6	2068/7/23	2			Birendranagar Bus Park, Surkhet
7	2068/8/12	6	Kalij Pheasant, (Lophura leu-comelanos)	12	Bhaktapur
8	2068/9/11	1	Cordyceps sinensis, orchid, restricted mushrooms and money	Cordyceps 150 gm, orchid 70 gm, mushroom 910gm and 22 lakh 50 thousand rupees	Kathmandu
9	2068/9/22	1			Kathmandu
10	2068/9/25	3	Bear's gall bladder and musk pod	Bear's gall bladder 73gm and Musk pod 45gm	Bhatbhateni area, Kathmandu
11	2068/9/29	2	Leopard's skin	2	Chabhil, Kathmandu
12	2068/10/13	5	Leopard's skin	1	
13	2068/10/24	1	Bear's gall bladder	2	Kathmandu
14	2068/11/28	3	Musk pod	1	Kathmandu

Operation	Date	People arrested	Confiscated items	Amount	Confiscated from
15	2068/12/13	2	Leopard's skin	1	Sipatol, Bhaktapur
16	2068/12/15	3	Leopard's skin	2	
17	2069/1/4	2	Rhino horn	1	
18	2069/1/5	4	Rhino horn	1	
19	2069/02/08	2	Musk pod	1	

Species Conservation and Breeding Centers in Nepal

*Maheshwar Dhakal, PhD and Jhamak Bahadur Karki,
Kamal Gaire and Bed Bahadur Khadka*

Abstract: The government of Nepal has initiated both in-situ and ex-situ conservation approaches. Establishment of Protected Areas is an example of in-situ conservation while establishment of conservation breeding centers are an example of ex-situ conservation. This paper attempts to highlight three breeding centers of critically endangered species; elephant of mammals, crocodile of reptiles and vulture of birds. Unlike in-situ conservation, the government program still gives less priority to ex-situ conservation. These breeding centers are also limited to Chitwan National Park while it is essential to expand other parts of the country to secure the population of endangered species and side by side aware to the people in conservation. Breeding centers are also observed best destination to both domestic and foreign tourists, which observed reliable financial sources to the park authorities. The papers observed government commitment itself and desire to coordinate to its conservation partners is equally crucial for breeding center sustainability. The experiences from three breeding centers further revealed that ex-situ conservation always requires higher level of investment, skillful knowledge and advance technology. Linkage of ex-situ conservation to research activities is equally prerequisites.

Ex-situ species conservation in Nepal

Nepal is a small and landlocked country, but highly rich in faunal and floral bio-diversity. Climatic variations such as temperature, weather, relative humidity and rainfall in one side and geographical variations such as elevation, aspects and soil on the other have wider effects on this rich bio-diversity. Nepal possesses more than 181 species of mammals, 871 species of birds and 118 species of reptiles. Similarly, 6500 species of flowering plants and more than 635 species of butterflies have been recorded. The government of Nepal has been implementing various conservation activities where the support from various conservation partners is significant. However, due to natural and anthropogenic activities, these invaluable resources are depleting whereas species are under threat.

The situation is highly critical in umbrella and mega species like elephant, tiger and rhino in mammals, Gharial crocodile in reptile and vulture in birds. Scientists believe that habitat loss in terms of degradation, shrinkage and fragmentation, poaching and illegal trade, and human-wildlife conflicts are major underlying causes for this decline. In order to secure viable population of each species that are under threat due to rapid decline in number, the government of Nepal has applied two conservation approaches which are in-situ and ex-situ conservation. Establishment of Protected Areas (PAs) is proven evidence of in-situ

conservation while establishment of conservation breeding centers is ex-situ conservation. In-situ approach largely follows eco-system and wilderness loom while the later approach promotes viable population of the species. The government of Nepal has established three breeding centers following the principle of ex-situ conservation in order to secure the viable population of three endangered species. This article focuses on three conservation-breeding centers.

Elephant Conservation and Breeding Center

The Asian Elephant (*Elephas maximus*) is native to Nepal. It is the largest animal of terrestrial ecosystem in Nepal (Fig. 1). It requires territory in order to search food, water. The estimated wild elephant population ranges from 107 to 145 in Nepal (Pradhan, 2007). In the past, the dense forests in lowland from east to west as a single block was regarded as the elephant habitat (Karki, 1985). However, this single block is now highly fragmented resulting to small patches and thus has created obstacles free movement of elephant herds. Literature review revealed that the present wild elephant population is fragmented into four small groups: eastern (7-15), central (25-30), mid western (60-80) and far western (15-20) (Shrestha & Gairhe, 2006, Pradhan et al., 2011).



Fig.1. Wild elephant arriving the breeding center

On the other hand, there are 215 captive (domestic) elephants in Nepal (Gairhe, 2012) out of which the government owns 94 while remaining 121 elephants are owned by private organizations and individuals. The government has established Hatisars in all of its five parks in lowland and wildlife reserves (Koshi Tappu Wildlife Reserve, Parsa Wildlife Reserve, Chitwan National Park, Bardia National Park, and Shuklaphanta Wildlife Reserve) to keep captive elephants. These elephants are largely used in patrolling and ecotourism activities. The only one elephant breeding center of Nepal is located at Chitwan National Park (Fig. 2).



Fig. 2. Breeding captive elephant in EBC

Along with habitat fragmentation and scarcity of food and space, human-elephant conflict is rapidly increasing with significant number of human casualties every year (Fig. 3a and 3b). The Government of Nepal has been applying sufficient efforts to protect elephants where establishment of breeding center to furnish captive elephant population one of those efforts that avoids capture from the wild. Elephant Conservation Action Plan is another tool developed by NG to protect the existing wild population and restore through breeding in captivity (DNPWC, 2009).

Fig. 3. Human casualties in Chitwan area (F/Y 2011/12)

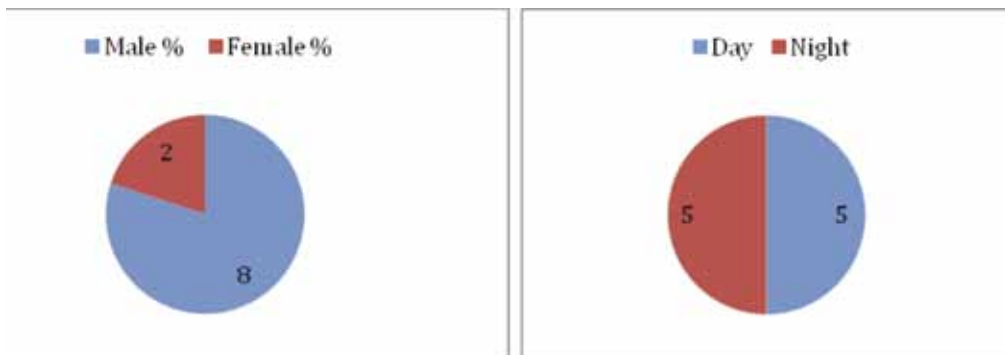


Fig. 3a. Human casualties in Chitwan area

3b. Elephant attacks during day and night

Elephant Breeding Center

The Elephant Breeding Center (EBC) is located in Chitwan National Park at Khorsor (Fig. 4). This breeding center was established in 1986 following the recommendation of a commission on management of captive elephants in 1984 (Gopali, 2006; Kharel, 2001). The center aims at scientific breeding, research and retention of traditional skills on management of elephants. It was initiated with 20 (16 Indian, 2 Thai and 2 Burmese) elephants (WWF, 2003).



Fig. 4. Elephant Breeding Center

Since its establishment, 36 live elephant calves have been produced at EBC (Fig. 5). Among the total calves, 24 are male and 12 are female. At the beginning, dead calves were given birth particularly by primiparous cows. In more than two decades of its establishment, only three calves have died; two from infectious disease and one due to training injuries. Breeding elephant bulls are difficult to manage in captivity due to their seasonal musth behavior.

Three staff (Mahout, Pachuwa and Phanit-elephant driver and care takers) are deployed to take care of each adult elephant. Unpredictable behavior and aggressiveness of many elephants often causes injuries to handlers and the huge cost of food supply both to elephant and handlers always pose problems in management. In many instances, elephant staffs are unaware of several biological aspects of elephants since most of them are illiterate.

Breeding between domestic male and female is expected in the breeding center. However, it is quite often that the wild bulls visit the center and mate with the captive female elephants. Such phenomenon not occur at elephant breeding center only, but also in Hattisars of lowland protected areas. In few cases, even some semi-wild situation was also created

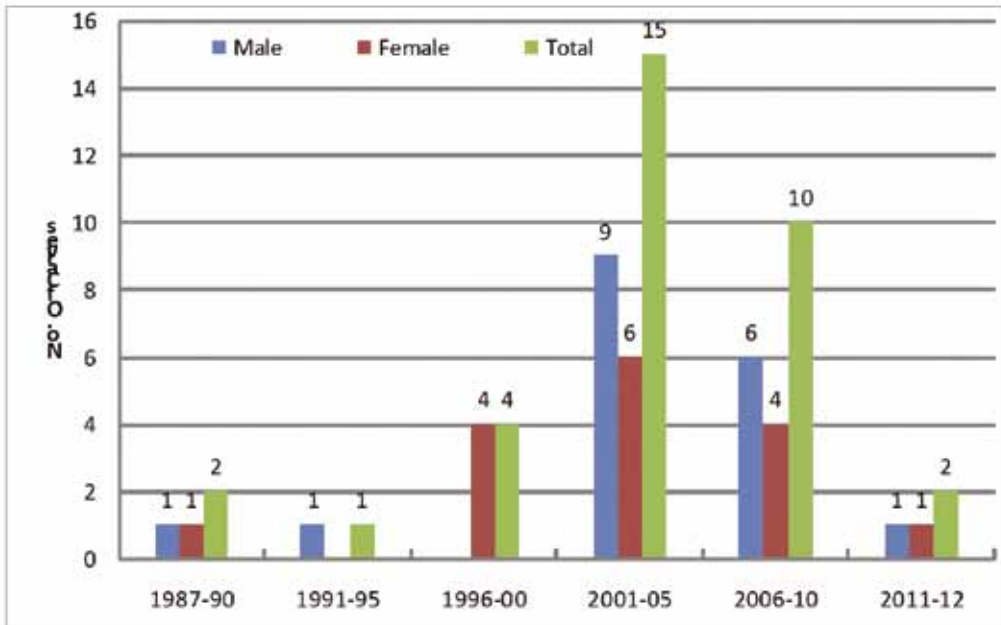


Fig 5. Elephant calves birth at EBC

for elephant breeding. Such was reported in Koshi Tappu Wildlife Reserve when Ganesh elephant was at his prime age in the 1980s and it mated with several captive elephants and produced eleven live calves. Elephant breeding has also occurred in all of the Hattisars of lowland parks and reserves as well as in jungle lodges and hotels who have kept captive elephants for tourism purposes.

Vulture Conservation and Vulture Breeding Center in Nepal

According to latest data, Nepal boasts 871 species of birds while some of the birds are migratory from various parts of the world. Following the diverse geographical variation, the distribution of birds is also spatial. Even though forests and protected areas are considered as the prime habitat for birds, human settlements are also considered as good habitats as birds get water and foods from agriculture field. Birds play very important role in ecological balance through pollination. Since birds have various species, they have unique behaviour in food chain and food web or ecological system as a whole.

Among various bird species, vulture is an apex species in ecological system. This species has astonishing role in ridding environment of dead animals and keep the environment clean. Vultures are also known as scavengers as they eat animal carcass preventing other living beings from disease. Out of sixteen species of vultures in the world, nine species are resident to South Asia and Nepal alone boasts nine species (Table 1). Among the nine vulture species, six species namely White-rumped vulture (*Gyps bengalensis*), Slender-billed vulture (*Gyps*

tenuirostris), Egyptian vulture (*Neophron ercnopterus*), Red-headed vulture (*Sarcogyps calvus*), Himalayan griffon vulture (*Gyps himalayensis*) and Lammergeyer vulture (*Gypaetus barbatus*) are resident to Nepal. Eurasian griffon vulture (*Gyps fulvus*) is winter visitor and Cinereous vulture (*Aegypius monachus*) is passage migrant. The Long-billed vulture (*Gyps indicus*) is resident to South-Asia, but not particular in Nepal.

Three species (white rumped, slender-billed and long-billed vulture) are in observed critical condition as their population has declined by 97% in South-Asia. In India alone white-rumped vulture was declined by 99.9% from 1992 to 2007. Even-though there is no systematic vulture monitoring, biologists also largely believe that vultures declined in Nepal too by more than 90% until 2001. Inclusion of three *Gyps* vulture species mentioned above which are listed as critically endangered in 2000 in IUCN Red Data list also proves that the population of vulture is constantly declining globally. Scientists believe that the non-steroidal anti-inflammatory drug (NSAID) called Diclofenac, used as a veterinary drug in livestock, is the major cause of the death of vultures. Livestock treated with the drug have lethal levels of Diclofenac in their tissues for a period of 72 hours after treatment. If the livestock die during this time and vultures have access to the carcass, death can occur within a few days of consuming the contaminated tissues by the vultures.

Vulture populations has declined to the extent that some species are likely to be extinct if urgent measures are not taken. In Nepal Vulture Conservation Action Plan (2009-2013) thus considered captive breeding as one of the strategy to ensure survival of the vultures.

Table 1. Vulture status in Nepal

Species	Global Status	Status in Nepal	Estimated Population	Population Trend
Lammergeier	Least Concern	Vulnerable	<500	Declining
Himalayan Vulture	Least Concern	Vulnerable	<10000	Declining
Egyptian Vulture	Endangered	Endangered	<1000	Declining
Red-headed Vulture	Critical	Critical	<500	Declining
White-rumped Vulture	Critical	Critical	<2000	Declining
Slender-billed Vulture	Critical	Critical	<50	Declining
Long-billed Vulture	Critical	Not assessed	Not known, <50?	Not known
Eurasian Griffon	Least Concern	Not assessed	Not known	Not known
Cinereous Vulture	Near-threatened	Endangered	<250	Declining

Source: DNPWC, 2012

Vulture Breeding Center

Vulture Conservation and Breeding Center (VCBC) was established in Chitwan National Park aiming to ensure long term survival of two species of Gyps vultures (Slender billed vulture – *Gyps tenuirostris* and Oriental White-rumped vulture – *Gyps bengalensis*). This project is a joint undertaking of the Government of Nepal (DNPWC), National Trust for Nature Conservation (NTNC), Bird Conservation Nepal (BCN), Zoological Society of London (ZSL) and Royal Society for the Protection of Birds (RSPB). Given the precarious situation of these species, breeding center was established to house vultures in the most favourable conditions. Major efforts have already been made to capture and conserve these critically endangered species of birds in Chitwan. The center is situated at Kasara, covering an area of 6,375 square meters adjacent to the Gharial Breeding Center. It currently has a vulture breeding aviary, two holding aviaries, and one staff quarter cum office building. One veterinary doctor and four full-time staff (keepers) are working at the centre.



Fig. 6. Vulture Breeding Center at Kasara

Gharial Conservation and Breeding Center in Nepal

Twenty-one species and seven sub-species of crocodiles are found globally where Nepal boasts only two species which are Gharial or Long-snouted crocodile (*Gavialis gangeticus*), and Marsh Mugger or Marsh Crocodile (*Crocodylus palustris*). Gharial crocodile that has undergone both chronic long-term and rapid declines has been listed as a critically endangered species in IUCN Red data list. The name of Gharial originated from GHADA, and largely found in fresh-water. This species has already extinct in Bangladesh, Burma and Bhutan. In Nepal, it is mostly found in Koshi, Narayani, Karnali and Mahakali Rivers. Gharial

is one of the world's longest crocodylian with long slender snout, which can reach up to 7 meters in length. Marsh crocodile on the other hand lives in lakes, reservoirs and slow flowing rivers. Marsh mugger is shorter, aggressive by nature and is excellent in swimming and normally eats fish.

Estimations before 1980s showed that Nepal has the population of about 57 gharials while its population globally was just around 200 in the wild. The species is included in CITES Appendix-I, critically endangered in IUCN Red Data List and as the protected species on reptile category in the National Park and Wildlife Conservation Act, 1973.

Gharial Breeding Center

The Gharial-Breeding Center was established in 1978 aiming to produce and re-introduce Gharials in rivers for maintaining river and aquatic ecosystems. In addition, the center was aimed to maintain Gharial population in the nature. It was also aimed to act as to scientific research center and help in capacity building activities of wildlife biologists. Though the center was established with external support initially, the government has fully owned in later days and provides budget from its internal sources nowadays. Currently, eleven staff are working at the center headed by Assistant Conservation Officer of the Chitwan National Park. The center has set an example by operating breeding activities very successfully as the survival rate of Gharial is more than 60 % in the center.

Hatching started from 1978, immediately after the establishment of the center and major success was recorded from 2004 where 76 individuals were successfully hatched. The total hatchling success increased to more than 300 in 2011 and the stock reached 611. There are 157 hatchlings, 132 juvenile, 307 sub-adult and 15 adults reared in 26 pools (Fig. 7 and 8). In addition, the first batch of 20 hatchlings in 2012 emerged from eggs collected in the breeding pool. As of 2010, around 761 Gharials were released in the wild, but only 102 survived. It is largely believed that due to higher-level of water current, the released Gharials are swept away to India and rarely return back to Nepal. Joint monitoring and research are essential to understand the large gap between released and surviving number.

The collection of eggs from the river-bank, keep them in safe place with appropriate temperature and take care during hatching period, the task is risky in one side and requires high technique with intensive care. The field level staffs, basically technicians are highly committed, dedicated, laborious and hard working. They are temporary in job and are low paid staffs These staff are They are from local communities, conduct regular awareness program in the field including alternative livelihood programs for the fish dependent communities in order to secure the food for Gharial.

Even though the management of Breeding Center is excellent in technical and financial sustainability part, the released Gharials are facing various threats in the rivers. The water current in rivers is high, polluted by industrial sewage; and frequent floods occur especially in the summer season. As a result, Gharials have been facing crisis in finding natural prey. Poaching and collection of eggs for traditional medicinal purpose and over fishing are often realized major threats. Therefore, there is no more than 1% survival in natural habitat.



Fig. 7. Gharial breeding center at Kasara

Breeding Center Management

Staff management: Among eleven staffs, two fishermen involve in feeding live fish to baby Gharials on daily basis. One staff collects aquatic animals such as snails, crabs, crustaceans and frogs for mugger crocodile. Six staffs are engaged in ponds clean up and maintenance (sanitation). Remaining two staffs are involved in monitoring wild crocodiles in the Narayani river. Based on the field requirements, they may be assigned on rotation basis.

Eggs collection: April and May are the best months for crocodile egg collection. During the season, ten nest watchers/nest collectors are hired for two months. Four are deployed in Narayani, 4 in Kali Gandaki and 2 in Rapti rivers. They are responsible for identifying nests in the rivers, watch nests and collect egg for breeding center.

Water management: In order to supply water to the pond on regular basis, it is essential to run two pumping sets for the daily supply of water from waterhole to different ponds.

Feeding to Crocodiles: Large size fishes are purchased twice a week in summer season from village pond to feed large adults and sub-adults. Small size fishes are purchased from local fishermen for small crocodiles. The metabolism rate of crocodile is very low in cold season and non-active. Gharials eat very little in winter but highly active during summer.

Gharial Monitoring: Crocodiles favor sunlight than food in the winter when they come out of water for sun basks making their counts feasible. Boat and boatmen are used from Sauraha to Tribeni and to Amaltari once a month for each site for counting.

Gharial release: Gharials are released once they reach about 2m in length. They can survive in natural habitat if we can release between early winter to early spring. Fresh water having slow water current is taken as suitable condition for its release in river.

Maintenance works: Regular maintenance is highly essential part of the breeding center which includes maintenance of enclosure, water piping system, umbrella shade houses, visitor toilets and kitchen room, gate roofing work and signage. Regular purchase of wire brushes, sweeping materials for ponds clean up, electric equipment especially heating for hatchling pool / enclosure of baby Gharials during winter and gate valves are required.

Future of ex-situ conservation in Nepal

In order to secure the viable population of critically endangered and vulnerable species, ex-situ conservation is the best alternative to conservationists. However, it requires strong political will, creation of local institutions and capacity of those local institutions. Similarly, external support from conservation partners is equally essential. Conservation is a complex task which requires huge amount of financial resources, robust institution and well-equipped and skillful technicians. In Nepal, what we observed from the three breeding centers is that even though the government looks enthusiastic in ex-situ conservation, it hasn't been able to allocate sufficient budget and design robust institution to materialize it in practical. The financial mechanism developed in elephant and crocodile breeding centers need to be strengthened and legalize it. Permanency and incentive schemes to the local technicians are very important factors to strengthen the breeding centers.

Development of insurance scheme for field technicians can help to boost up their motivation. It is also essential to develop the breeding centers as the research laboratory where national and international researchers can contribute and be a part of conservation efforts. In overall, experiences from three breeding centers revealed that ex-situ conservation always requires higher level of investment and advance skill with well equipped technologies. Working with wild animals is a risky job and therefore working staffs need to be well trained. Even though breeding center requires huge amount of financial resources and well equipped technicians, it is the best solution to secure the life of critically endangered and endangered species.

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Paper 6

Status and Conservation of Birds in Nepal

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Laxman Prasad Poudyal and Raju Acharya*

Abstract

Nepal is exceptionally rich for avian fauna with a total of 871 species recorded in just about 200 years of modern ornithological research. Bird conservation is deeply rooted in Nepali people's culture, tradition and religion. Government of Nepal, from time to time, has initiated many important conservation initiatives reflecting its commitments towards bird conservation. The most important government steps include setting aside over 20% of the country's land for as the protected landscapes, listing selected bird species under strictly protected faunal species under the National Parks and Wildlife Conservation Act 2029, endorsement of vulture conservation action plan, starting vulture conservation breeding centre, production of postal stamps featuring birds, etc. Nepal has also signed numerous international agreements and treaties including Convention on Biological Diversity, CITES, Ramsar Convention, etc. Several important bird studies have been completed in Nepal. These studies, however, have been mostly focused towards globally threatened species. Many species that are of high importance at national level including Spiny Babbler *Turdoides bengalensis* and Danphe *Lophophorus impejanus*, are not studied. Funding opportunity for studying birds in Nepal is largely driven by donors' interest outside Nepal whose main priorities are to conserve globally threatened species and globally important sites. Funding agencies within the country for initiating and supporting study of birds that are of national value are lacking. In spite of the untiring efforts by the government and several non-governmental conservation organizations, bird populations have continued to decline in Nepal. Periodical assessments of bird species show that nationally threatened species' list continues to grow with more and more species listed as threatened. Recommendations have been made for restoring habitats that are threatened, providing appropriate protection to species and habitat especially during breeding, starting of funding mechanism at national level to study birds of national and global importance, revisiting the protected area boundary to ensure functional unit of ecosystem for sustenance of species and habitat, exploring and taking in new concepts for bird conservation.

Introduction

Birds have played an integral role in tradition and culture of Nepal. Religions practiced here are aligned with conservation of wild birds: Hindus and Buddhists worship many species of birds as Gods and Goddesses. Religious, cultural and traditional values of Nepali people have always been linked with birds in some way or other. These traditional values and harmonious



River Mopwing. By Darren Clarke

living with birds have been a long conservation heritage of Nepali people. According to one estimate, as many as 700 bird species are described in Sanskrit literature (Dave 1985); some literature such as the Rig Veda, the earliest of Hindu record - perhaps as old as 6,500 years (Debroy and Debroy 1994) - mentions about 20 species of birds (Dave 1985).

Nepal has 220 years of recorded scientific ornithological research work. The most important ornithological contributions came in the mid-19th century by Brian H Hodgson (Cocker and Inskipp 1988). Hodgson's contributions to Nepal's ornithology remain unparalleled. Various contributions have been made since then significantly by various authors. Fleming et al. (1976) produced the first field guide of the birds of Nepal. Many of the facts in guide described about birds of Nepal arising from their own studies of birds in Nepal. Carol and Tim Inskipp contributed several books and papers further updating status of Nepal's birds. A guide to the birds of Nepal with two editions (1985, 1991) became the most authentic source on the status and distribution of Nepal's birds and continues to be the main source of reference to this day. The work also compiled a huge amount of bird literature related to Nepal and this work is still ongoing and significant new literature is still being

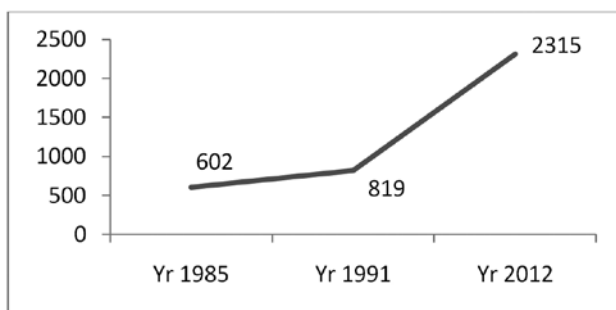


Figure 1. Literature growth on birds, y-axis showing number of available literature (source Inskipp and Inskipp 1985, 1991, 2012)

added, and as a result, a separate Nepal bibliography has been published (Inskipp and Inskipp 2012). Literature after 1990 and especially after the publication of Danphe in 1992 by Bird Conservation Nepal now includes research work by many Nepali researchers. The figures indicate a three-fold increase in the number articles of bird literature (Figure 1). Most of these works remain as unpublished reports, some are scientific papers and a few are books and online sources.

A total of 871 bird species has been recorded in Nepal (BCN and DNPWC 2012). Many of these species are facing enormous pressure from increasing human population in the country. A total of 149 species of birds has been identified as nationally threatened in 2010 (BCN and DNPWC 2011). An alarming number - 99 species - are Critically Threatened or Endangered, a worrying figure indicating the need for urgent intervention to halt their decline. Continuation of threats will lead to local extinction of these species or may reduce certain bird populations to the point where they are no longer viable. A recent paper has also discussed potential impacts to Nepal's birds due to changing agriculture practice (Inskipp and Baral 2011). This paper refers to threats to all nationally and globally threatened species. In Europe and some other countries, bird studies have revealed reductions in populations of a large number of species, which were previously thought to be common and widespread, as a result of agricultural pressures. Many of these species have not declined to the level where they are nationally threatened in European countries but their numbers are greatly reduced. Could these impacts also be happening in Nepal? This seems likely as agricultural changes in Nepal have been dramatic, especially since the 1970s as described in the paper. Monitoring of farmland birds is urgently needed on agricultural land with traditional and intensive farming system..Most fieldwork and initiatives to date have been on globally threatened and to a lesser extent nationally threatened species.This may be yet another serious issue for conserving birds of Nepal and requires urgent attention in this field. Unless interventions based on sound scientific knowledge are in place on time, some of the birds may disappear as Nepal cannot afford resources to patch up the damage like some of the more developed countries have done.

Government Initiatives for Bird Conservation

The Government of Nepal has been promoting conservation of birds in the country. Danphe *Lophophorus impejanus* known as Himalayan Monal or Impeyan Pheasant has been aptly chosen as the national bird of Nepal. Soon after the dawn of democracy in Nepal in the 1950s, government ministers and policy makers planned for the establishment of Nepal's first few protected areas. The Ministry of Forests and Soil Conservation maintained a separate cell to look after wildlife affairs until the early '70s.

Government produced postage stamps featuring Danphe as a token of appreciation of birdlife in early 1959. Since then Nepal's Postal Service has continued producing bird stamps and so far 18 bird species are already featured in Nepal's postage stamps (Table 1. In 2012, stamps of two more bird species, both critically threatened species at national level, one also threatened at global scale, have been produced. These are White-rumped Vulture *Gyps bengalensis* and Nepal Rufous-vented Prinia *Prinia burnesii nepalicola*. White-rumped Vulture is chosen because once this species was the most common bird of prey in

the lowland Nepal before the veterinary drug diclofenac wiped out most of its population (BCN and DNPWC 2011). This species has been listed as Critically Endangered since the year 2000 by BirdLife International and IUCN, the global red list authorities (BirdLife International 2000). Nepal Rufous-vented Prinia was described as a new subspecies to science from Nepal very recently (Baral et al. 2007, 2008). This subspecies is known to occur only in Koshi Tappu Wildlife Reserve with a very small population; publication of the postage stamp will pay a special tribute for Government's commitment towards the conservation of this endemic subspecies to Nepal. It is a Critically Endangered species at national level (BCN and DNPWC 2011).

Table 1: List of bird species on Nepal stamps with their date of publication and unit prices produced by Nepal Postal Service

English Name	Nepali Name (adopted from Nepalka Charaharu)	Scientific Name	Date of publication	Price	Occasion
Himalayan Monal	Danphe	Lophophorus impejanus	1959.04.19	Rs. 1 & 2	Not Known
Satyr Tragopan	Munal	Tragopan satyra	1960.04.13	Rs. 5	Not Known
Himalayan Monal	Danphe	Lophophorus impejanus	1968.06.11	15 P	King Mahendra's 49th Birth Day
Great Hornbill	Raj Dhanesh	Buceros bicornis	1977.09.17	5 P	Birds Series
Cheer Pheasant	Cheer	Catreus wallichii	1977.09.17	15 P	Birds Series
Green Magpie	Hariyo Lampuchhre	Cissa chinensis	1977.09.17	Rs. 1	Birds Series
Spiny Babbler	Kande Bhyakur	Turdoides nipalensis	1977.09.17	Rs. 2.30	Birds Series
Great Grey Shrike	Raj Bhadrari	Lanius meridionalis	1979.11.23	10 P	International World Pheasant Association Symposium
Fire-tailed Sunbird	Lalpuchhre Bungechara	Aethopyga ignicauda	1979.11.23	Rs. 10	International World Pheasant Association Symposium
Himalayan Monal	Danphe	Lophophorus impejanus	1979.11.23	Rs. 3.50	International World Pheasant Association Symposium
Himalayan Monal	Danphe	Lophophorus impejanus	1985.05.06	Rs. 10	Sagarmatha National Park Special
Pintail Green Pigeon	Suiropuchhre Haleso	Treron apicauda	1992.12.20	Rs. 1	Birds Series
Bohemian Waxwing	Himali Mukchari	Bombycilla garrulous	1992.12.20	Rs. 3	Birds Series
Rufous-tailed Lark	Agni Bhardwaj	Ammomanes phoenicurus	1992.12.20	Rs. 25	Birds Series
Great Barbet	Nyahuli Chara	Megalaima virens	1996.11.20	Rs. 5	Butterflies and Birds Series

Sarus Crane	Sarus	Grus antigone	1996.11.20	Rs. 5	Butterflies and Birds Series
Bengal Florican	Khar Mujur	Houbaropsis bengalensis	2000.11.14	Rs. 10	WWF Annual Convention
Lesser Adjutant	Bhundiphor Garud	Leptoptilos javanicus	2000.11.14	Rs. 10	WWF Annual Convention
White-browed Piculet	Sasiya	Sasia ochracea	2004.11.03	Rs. 10	Biodiversity Series
White-rumped Vulture	Dangar Giddha	Gyps bengalensis	2012.07.29	Rs. 10	Biodiversity Series
Nepal Rufous-vented Prinia	Nepali Kailo Ghansephisto	Prinia burnesii nepalicola	2012.07.29	Rs. 10	Biodiversity Series

(source: Nepal Postal Service and www.rajana.com)

Department of National Parks and Wildlife Conservation (DNPWC) was established in 1973 as a separate department to look after the welfare of wildlife. Although initially it focused mainly on charismatic large mammals, reptiles and birds, now department emphasize on all forms of life. There are now 10 national parks, three wildlife reserves, six conservation areas and one hunting reserve covering over 20% of Nepal land area. All, except Annapurna, Gaurishankar and Manaslu Conservation Areas, are managed by DNPWC. These three areas are managed by National Trust for Nature Conservation(NTNC), a major helping hand to the DNPWC. Birds are an important and integral part of Department's planning and conservation approach these days and increasingly they are featured in many of the in-house publications and planning documents. Department publishes newsletters and occasional bulletins e.g.



Sarus Crane. By Kushal Bista

Samrakshan Samachar (bi-monthly in the Nepali language), Wildlife Nepal (bi-monthly in the English language) and Biodiversity Conservation Efforts in Nepal (Wildlife Week series) featuring articles on birds and other wildlife conservation issues.

National Parks and Wildlife Conservation (NPWC) Act 2029 (1973) has listed nine species of birds in Schedule I under strict protection (Table 2). All nine species represent non-passerine families: three birds are from Phasianidae; two birds are from Ciconiidae; two birds are from Otidae; and one each are from Gruidae and Bucerotidae. At the request of the DNPWC, a project supported by the Critical Ecosystem Partnership Fund/WWF Nepal was launched with an aim to update the list of the protected animals. A total of 92 species of birds was recommended to be included within the Act at its next revision (Shah and Baral 2010); this list is currently being further reviewed by Government of Nepal.

Table 2. Birds listed in schedule I of NPWC Act 2029 (1973).

White Stork <i>Ciconia ciconia</i>
Black Stork <i>Ciconia nigra</i>
Himalayan Monal <i>Lophophorus impejanus</i>
Satyr Tragopan <i>Tragopan satyra</i>
Cheer Pheasant <i>Catreus wallichii</i>
Bengal Florican <i>Houbaropsis bengalensis</i>
Lesser Florican <i>Sypheotides indica</i>
Sarus Crane <i>Grus antigone</i> ¹
Great Hornbill <i>Buceros bicornis</i>

¹ *The scientific name printed on gazette is Grus grusis a mistake and belongs to Common Crane*

Department and Ministry for Forests and Soil Conservation are the focal point for many of the international conventions and treaties that Government of Nepal has ratified; these include the Convention on Biological Diversity (CBD), CITES, the Ramsar Secretariat, the Convention on Migratory Species (CMS) etc. Wide-ranging activities carried out by Department also include education and awareness, managing species and habitat, implementing the Act etc. (Poudyal 2007).

The Government of Nepal has endorsed Nepal's first bird focused national level plan Vulture Conservation Action Plan for Nepal. This is a great milestone in terms of bird conservation for Nepal and has opened up avenues to prepare action plan of other bird species. Bengal Florican can be the next species for action plan as it is Critically Endangered and BirdLife International has embarked on a project in the Indian subcontinent (Ian Barber pers. comm. 2012).

Department of Forest manages forests of various sizes in 74 districts of Nepal with the major objective of sustainable utilization. Recently, under the Forest Act, some patches of forests

in the lowlands and midhills have been declared as Protected Forests. Examples include the Basanta Corridor Forest that lies within the Terai Arc Landscape in Kailai District and Panchase Hill Forest of Kaski District. The effect of such declaration is yet to be seen but many regard this initiative by Ministry of Forests and Soil Conservation as a positive step for wildlife conservation.

International Treaties and Priorities

Nepal has been at the forefront of signing important treaties and conventions that directly affect the welfare of birds. The country has also placed much emphasis on international priorities regarding research and conservation.

Ramsar Convention

The convention on wetlands (the Ramsar Convention) was held in 1971 in Ramsar, Iran. It is an inter-governmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance. Furthermore signatories agree to plan for the wise use or sustainable use, of all of the wetlands in their territories. Nepal ratified Ramsar Convention on Wetlands of International Importance especially for its Waterfowl Habitat on 17 December 1987, at the same time Koshi Tappu was added to the List of Wetlands of International Importance. Nine wetlands have been designated as Ramsar Sites in Nepal with total area of 34,455 hectares (Kafle and Savillo 2009). DNPWC is the focal department for implementing Ramsar-related work in Nepal. All wetlands in the lowlands, and Rara Lake in the higher hills, are especially important as resting, feeding and breeding places for water birds.

Table 1: List of bird species on Nepal stamps with their date of publication and unit prices produced by Nepal Postal Service

Ramsar Sites	District	Location	Ratification date	Area (ha)	Zone	Elevations (masl)
Koshi Tappu	Sunsari, Saptari and Udaypur	26°39' N 086°59' E	17/12/1987	17500	Terai	90
Jagadishpur Reservoir	Kapilvastu	27°35' N 083°05' E	13/08/03	225	Terai	195
Ghodaghodi Lake Area	Kailali	28°41' N 080°57' E	13/08/03	2,563	Terai	205
Beeshazari and Associated Lakes	Chitwan	27°37' N 084°26' E	13/08/03	3,200	Terai	285
Rara Lake	Mugu	29°30' N 082°05' E	23/09/07	1,583	Himal	2990
Phoksundo Lake	Dolpa	29°12' N 082°57' E	23/09/07	494	Himal	3610

Ramsar Sites	District	Location	Ratification date	Area (ha)	Zone	Elevations (masl)
Gosaikunda and Associated Lakes	Rasuwa	28°05` N 085°25` E	23/09/07	1,030	Himal	4700
Gokyo and Associated Lakes	Solukhumbu	27°52` N 080°42` E	23/09/07	7,770	Himal	5000
Mai Pokhari	Ilam	27°00'00"N 87°55'00"E	20/10/2008	90	Midhill	2122

(Sources: www.wetlands.org, www.nepallake.gov.np)

Convention on Biological Diversity (CBD)

Nepal ratified the CBD on 23 November 1993. Nepal Biodiversity Strategy (NBS) and Implementation Plan has been produced as part of the commitment of Government of Nepal to the protection and wise use of its biological diversity and resources on sustainable basis for the benefit of the people of Nepal. It honours its obligations of the Convention on Biological Diversity, to which Nepal is a signatory. Biological diversity in Nepal is closely linked to the livelihood of many people and their economic development, and touches upon agricultural productivity and sustainability, human health and nutrition, indigenous knowledge, gender equality, building materials, climate, water resources and the aesthetic and cultural well-being of the society. These issues are regularly reflected in the strategy, planning and reports to the CBD by the Government.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Nepal became a signatory of CITES in the year 1975. The CITES bill is in its final constitutional stages and needs to be passed by parliament as an Act before it comes into force. For some time now, DNPWC has a dedicated CITES Section within its office premises. Until the mid 2012, a total of 108 species that occur in Nepal (12% of Nepal's total birds) has been listed in various appendices. 12 species of birds are in Appendix I, 95 species in Appendix II and one species is listed in Appendix III.

A further analysis of the birds covered by CITES reveals 105 species representing non-passerine families and only three birds belonging to passerine families. Accipitridae represented 47 species (43% of total birds listed in CITES from Nepal) followed by Strigidae 18 species (17 %), Falconidae 11 species (10%) and so on. The five families under the birds of prey umbrella (Pandionidae, Accipitridae, Falconidae, Tytonidae and Strigidae) constitute 79 species (73% of total CITES listed birds from Nepal) indicating the scale of international trade in these species. Accipitridae was also the family with the highest number of birds in Appendix 1 (five out of 12 species) followed by Phasianidae (3 out of 12 species).

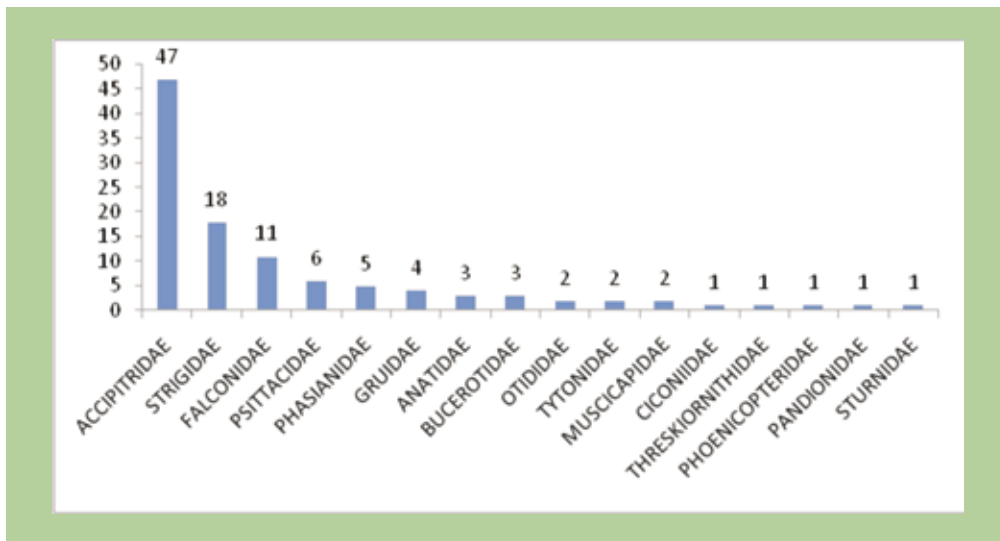


Figure 2. Bird families found in Nepal showing their members (species) listed in CITES, y-axis showing bird species number

Convention on Migratory Species (CMS)

Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an inter-governmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 116 Parties from Africa, Central and South America, Asia, Europe and Oceania, as of 1 July 2011.

As the only global convention specializing in the conservation of migratory species, their habitats and migration routes, CMS complements and cooperates with number of other international organizations, NGOs and partners in the media as well as in the corporate sector. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each state joining the convention, CMS promotes concerted action among the range states of many species.

Nepal government signed a Memorandum of Understanding (MOU) on the Conservation of Migratory Birds of Prey in Africa and Eurasia on 22 October 2008 (CMS 2011). A total of 43 species of birds of prey including four owl species is listed under the Raptors Species List by CMS. The following species of birds of prey are protected under CMS Agreements and MoUs of which Nepal is a signatory country.

Table 4. List of Raptors occurring in Nepal and listed by CMS for Conservation of Migratory Birds of Prey in African and Eurasia

FALCONIFORMES/Pandionidae
Pandion haliaetus (Linnaeus, 1758)

FALCONIFORMES/Accipitridae
Accipiter badius (Gmelin, 1788)
Accipiter gentilis (Linnaeus, 1758)
Accipiter nisus (Linnaeus, 1758)
Accipiter virgatus (Temminck, 1822)
Aegyptius monachus (Linnaeus, 1766)
Aquila chrysaetos (Linnaeus, 1758)
Aquila clanga Pallas, 1811
Aquila heliaca Savigny, 1809
Aquila nipalensis Hodgson, 1833
Aquila rapax (Temminck, 1828)
Aviceda jerdoni (Blyth, 1842)
Aviceda leuphotes (Dumont, 1820)
Buteo buteo (Linnaeus, 1758)
Buteo hemilasius Temminck & Schlegel, 1844
Buteo rufinus (Cretzschmar, 1827)
Circaetus gallicus (Gmelin, 1788)
Circus aeruginosus (Linnaeus, 1758)
Circus cyaneus (Linnaeus, 1766)
Circus macrourus (S. G. Gmelin, 1770)
Circus melanoleucos (Pennant, 1769)
Circus pygargus (Linnaeus, 1758)
Gyps fulvus (Hablizl, 1783)
Haliaeetus albicilla (Linnaeus, 1758)
Haliaeetus leucoryphus (Pallas, 1771)
Hieraaetus pennatus (Gmelin, 1788)
Milvus lineatus J. E. Gray 1831
Milvus migrans (Boddaert, 1783)
Neophron percnopterus (Linnaeus, 1758)
Pernis ptilorhynchus (Temminck, 1821)
Spizaetus nipalensis (Hodgson, 1836)

FALCONIFORMES/Falconidae
Falco amurensis Radde, 1863
Falco cherrug Gray, 1834
Falco columbarius Linnaeus, 1758
Falco naumanni Fleischer, 1818

Falco peregrinus Tunstall, 1771
Falco severus Horsfield, 1821
Falco subbuteo Linnaeus, 1758
Falco tinnunculus Linnaeus, 1758

STRIGIFORMES/Strigidae
Asio flammeus (Pontoppidan, 1763)
Asio otus (Linnaeus, 1758)
Ninox scutulata (Raffles, 1822)
Otus sunia (Hodgson, 1836)

IUCN / BirdLife International Red List

The International Union for Conservation of Nature (IUCN) is the world's oldest and largest global environmental organization. It was founded in 1948 as the world's first global environmental organization. Today IUCN is the largest professional global conservation network and a leading authority on the environment and sustainable development. It has more than 1,200 member organizations including more than 200 government and more than 900 non-government organizations. IUCN has over 11,000 voluntary scientists and experts, grouped in IUCN's six commissions in some 180 countries. IUCN assess various forms of life on the earth and their status to produce Red List of species. BirdLife International is a global partnership of bird conservation organisations that strives to conserve birds, their habitats and global biodiversity. BirdLife carries out assessment of birds for IUCN to produce the Red List for birds of the world.

About 36 species recorded in Nepal are listed in IUCN Red List of globally threatened birds according to BirdLife International, the IUCN Partner for assessing status of world's birds (BirdLife International 2012). This list is updated every year by IUCN through assessment of status provided by BirdLife International involving a competitive and reliable network of bird experts. The major change in 2012 update was upgrading of Black-bellied Tern *Sterna acuticaudata* endangered from its near threatened status, Long-tailed Duck *Clangula hyemalis* vulnerable from least concern and Baer's Pochard *Aythya baeri* from endangered to critically endangered. Black-bellied Tern and River Tern *S. aurantia*, both species breeding along various river courses of Nepal, have been on the nationally threatened species list since 2004 (Baral and Inskipp 2004, BCN and DNPWC 2011).

Table 1: List of bird species on Nepal stamps with their date of publication and unit prices produced by Nepal Postal Service

English Name	Species	Category	Comments
Pink-headed Duck	<i>Rhodonessa caryophyllacea</i>	CR	Probably extinct from the world

Baer's Pochard	<i>Aythya baeri</i>	CR	
Bengal Florican	<i>Houbaropsis bengalensis</i>	CR	
White-rumped Vulture	<i>Gyps bengalensis</i>	CR	
Red-headed Vulture	<i>Sarcogyps calvus</i>	CR	
Slender-billed Vulture	<i>Gyps tenuirostris</i>	CR	
Long-billed Vulture	<i>Gyps indicus</i>	CR	
White-bellied Heron	<i>Ardea insignis</i>	CR	Extirpated from Nepal, 1846 last record
Lesser Florican	<i>Sypheotides indicus</i>	EN	
Black-bellied Tern	<i>Sterna acuticauda</i>	EN	
Greater Adjutant	<i>Leptoptilos dubius</i>	EN	
Egyptian Vulture	<i>Neophron percnopterus</i>	EN	
Saker Falcon	<i>Falco cherrug</i>	EN	
Swamp Francolin	<i>Francolinus gularis</i>	VU	
Cheer Pheasant	<i>Catreus wallichi</i>	VU	
Long-tailed Duck	<i>Clangula hyemalis</i>	VU	Less than five records in Nepal
Rufous-necked Hornbill	<i>Aceros nipalensis</i>	VU	Extirpated from Nepal, 1846 last record
Great Slaty Woodpecker	<i>Mulleripicus pulverulentus</i>	VU	
Sarus Crane	<i>Grus antigone</i>	VU	
Black-necked Crane	<i>Grus nigricollis</i>	VU	Less than five records in Nepal
Wood Snipe	<i>Gallinago nemoricola</i>	VU	
Indian Skimmer	<i>Rynchops albicollis</i>	VU	
Pallas's Fish-eagle	<i>Haliaeetus leucoryphus</i>	VU	
Greater Spotted Eagle	<i>Aquila clanga</i>	VU	
Indian Spotted Eagle	<i>Aquila hastata</i>	VU	
Eastern Imperial Eagle	<i>Aquila heliaca</i>	VU	
Lesser Adjutant	<i>Leptoptilos javanicus</i>	VU	
Kashmir Flycatcher	<i>Ficedula subrubra</i>	VU	
White-throated Bushchat	<i>Saxicola insignis</i>	VU	
Grey-crowned Prinia	<i>Prinia cinereocapilla</i>	VU	
Bristled Grassbird	<i>Chaetornis striata</i>	VU	
Jerdon's Babbler	<i>Chrysomma altirostre</i>	VU	
Black-breasted Parrotbill	<i>Paradoxornis flavirostris</i>	VU	Extirpated from Nepal, last recorded in the 19th century
Slender-billed Babbler	<i>Turdoides longirostris</i>	VU	
Yellow Weaver	<i>Ploceus megarhynchus</i>	VU	
Yellow-breasted Bunting	<i>Emberiza aureola</i>	VU	

Red List for the Birds of Nepal/The State of Nepal's Birds

On October 4, 2009, DNPWC made an important step towards assessing major animal taxa in Nepal. A steering committee was formed under the chairmanship of the Director General of DNPWC including national experts of the subject (DNPWC 2009). As part of the first project, status of all mammal species known to occur in Nepal have been assessed (Jhawali et al. in press). IUCN regional guidelines for threat categories and criteria have been used to assess all animal taxa discussed in this paper.

Bird Conservation Nepal has been producing national red list of birds since 1996 with support from the DNPWC (Baral et al. 1996). This document was revised in 2004 (Baral and Inskipp 2004) and another update was published in 2011 (BCN and DNPWC 2011). The 2011 document was a comprehensive and more detailed work, more concerned with assessing threatened bird species of Nepal than previous documents. Periodical assessments have shown that more species are being threatened every year. Birds that are dependent on wetlands have experienced rapid population declines compared to other habitats in recent years (Baral and Inskipp 2004 and BCN and DNPWC 2011, see also Figures 3 and 4).

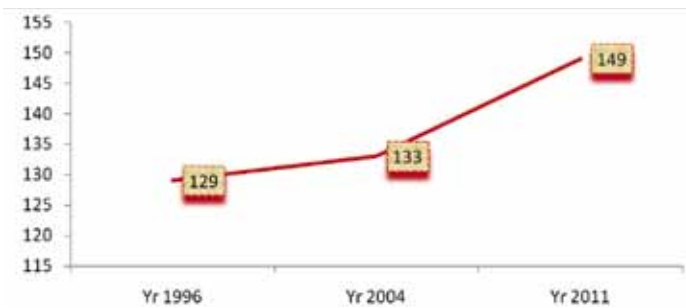


Figure 3. Increasing number of species on the nationally threatened bird list, y-axis showing bird species number (source Baral et al. 1996, Baral and Inskipp 2004, BCN and DNPWC 2011).

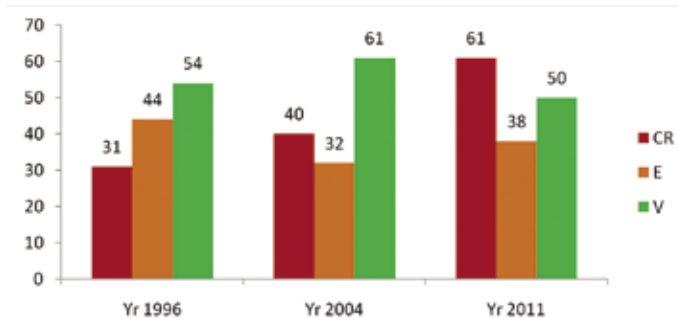


Figure 4. Comparison of bird species in different IUCN threatened Categories between different years, y-axis showing bird species number (source: Baral et al. 1996, Baral and Inskipp 2004, BCN and DNPWC 2011)

Publication of the State of Nepal's Birds 2010 was an important document detailing the plight of birds in Nepal. Based on the success of this project, and to complete the assessment of all taxa under the Committee formed by the DNPWC, important work has been initiated by the DNPWC: to assess status of all known bird species in Nepal. This work is funded by National Trust for Nature Conservation and Zoological Society of London (ZSL). Other

organizations actively supporting the work are IUCN Nepal, WWF, and Himalayan Nature as the work advances several other organizations mentioned below are likely to join and provide further support.

Supporting bird conservation in Nepal: Initiatives from the NGOs and Academic Institutions

Several bird focused organization support the work of government. Studies on birds have contributed to the understanding of their status, distribution and ecology. Several species of birds are better known in recent years in terms of their population and distribution. Bird monitoring has been an integral part of several organizations, and now important contributions come from bird-focused smaller charities (NOU 2012). Bird status checklists have been published for several protected areas contributing to the understanding of the current status of bird species. Bird Conservation Nepal is the most important organization working for bird conservation, which represents the BirdLife International, an authority on the status of world's birds (BCN 2011). Established for more than 30 years, the organisation has championed many conservation projects. It works on species and habitats, the latter mostly focused on Important Bird Areas (IBAs)- sites that are critical for conserving Nepal's birds (Baral and Inskipp 2005). A total of 27 IBAs that are critical to conserving Nepal's birdlife has been identified.

It has been actively engaged in monitoring Important Bird Areas (IBAs), surveys of poorly known IBAs e.g. Dang Deukhuri foothill forests (Thakuri 2009), Mai valley (Robson et al. 2008), Kanchenjunga Conservation Area (Inskipp et al. 2008), the Darwin Ecosystem Services Project which has been successfully carried out in Shivapuri-Nagarjun National Park, Koshi Tappu Wildlife Reserve, Rara National Park and Phulchoki Mountain Forest. These initiatives demonstrate the value of IBAs and encourage involvement of local communities in biodiversity monitoring (BCN 2012). BCN has also successfully implemented creating civil society networking programme for conservation of two important bird areas in eastern Nepal; Kanchenjunga Conservation Area and the Mai Valley Forests (BCN 2009). BCN has established a Nepalese Bird Conservation Network (NBCN) by strengthening grassroots conservation groups at various IBAs (Thomas and Thapa 2011), surveys of globally threatened species e.g. White-throated Bushchat in 1998 (Baral 1998) and in 2010 (Thakuri 2010.), a range of conservation awareness initiatives including quarterly newsletter Munal in Nepali language, annual street exhibition and public awareness campaign on World Environment Day in Kathmandu, regular Saturday birdwatching excursions in Kathmandu Valley (BCN 2011), and also conservation awareness programmes at various places in Nepal e.g. in the Mai valley Important Bird Area, Ilam District in 2009 (Ghimire 2009), also Dharan forests IBA, Sunsari District in 2011 (Ghimire 2011).

The vulture conservation work and community stewardship programmes led by BCN have been very successful (BCN 2011). In 2007, community managed vulture restaurants were started and within a year -replication of this successful programmes were taken up by BCN and various other conservation organisations. Currently, there are half a dozen restaurants established in various parts of the country.

The vulture conservation work and community stewardship programmes led by BCN have been very successful (BCN 2011). In 2007, community-managed vulture restaurants were started and within a year this successful approach was adopted by various other conservation organisations. Community leaders are trained to carry out vulture conservation related work including the provision of safe feeding sites for vultures in such places. This concept also promoted tourism in the area and improved livelihoods of local people. Currently there are half a dozen restaurants established in various parts of the country. Bird Conservation Nepal has published important publications such as the State of Nepal's Birds 2010 summarizing threatened species at national level and assessing their status (BCN and DNPWC 2011). Information on species' status contained in this document has been taken from studies carried out by several researchers all over Nepal.

Similarly, Chitwan-based Bird Education Society (BES) has played a crucial role in bringing awareness about, and understanding of, eco-farming to communities living in Chitwan (Bird Education Society 2012). BES has played an important role in documenting the avifauna of the entire Chitwan District and has been instrumental in promoting bird watching tourism and home-stay tourism in various parts of Chitwan District (Bird Education Society 2012). The society has been raising conservation awareness in Chitwan District including the Green Clubs initiatives in schools (Adhikari 2002). It has been involved in a new project - creating wetland areas to promote wetland bird conservation (Hem Sagar Baral pers comm. 2012 Basu Bidari).

Biodiversity Conservation Society Nepal (BIOCOS-Nepal) advocates equal importance of the existence of all species in the earth and makes its step into the world of conservation and works on wildlife and their habitats through various research activities (Anon 2012). Some of its important works are survey of Bengal florican *Houbaropsis bengalensis* (Poudyal et al. 2008), Lesser Adjutant *Leptoptilos javanicus* in Chitwan National Park (Poudyal and Nepal 2010), Swamp Francolin *Francolinus gularis* in Shukla Phanta Wildlife Reserve (Singh 2004, 2007, 2009), Bristled Grassbird *Chaetornis striata* and other lowland grassland birds in Chitwan (Singh 2010), and galliform communities at Pipar and Santel of Annapurna Conservation Area (Poudyal et al. 2009, 2011), Cheer Pheasant in Rara National Park and Dhorpatan Hunting Reserve (Singh 2009, Singh et al. 2011). This organization has been closely working with the World Pheasant Association, Oriental Bird Club and Nepalese Ornithological Union.

Friends of Nature (FON Nepal) has been playing a lead role in owl awareness programme in the country and has conducted many research and awareness programmes aiming to reduce the hunting and trade in owls of Nepal (Acharya 2010, Acharya and Ghimire 2009, Acharya and Ghimire 2009, World Owl Trust 2012). It works closely with World Owl Trust, UK, The Global Owl Project USA, The Houston Nature Center, USA and Nepalese Ornithological Union. Besides owls, pheasants and vulture species remain other areas of research for FON (Friends of Nature 2012).

Himalayan Nature has been actively pursuing work focused on threatened species of birds and carried out several important bird researches all over Nepal (Himalayan Nature undated). It has carried out important research on globally threatened vultures (Baral et al. 2011), Swamp Francolin (?), as well as Bengal Florican survey work in the Koshi area. Other

important work by Himalayan Nature include documenting local knowledge on birds via articles and papers, and sharing news with the media in all its forms. It works closely with Wetlands International for annual monitoring of waterbirds, the longest running annual bird monitoring programme in the country. Plans are underway to set up Nepal's first research station Kosi Bird Observatory (KBO) that will specifically focus on birds (Himalayan Nature undated). It will be a centre for wetland and grassland studies and will act as a research base for students and researchers from Nepal and international community.

Nepalese Ornithological Union (NOU) has conducted successful survey on two globally threatened species, Great Slaty Woodpecker *Mulleripicus pulverulentus* (Baral 2012) and Red-headed Vulture *Sarcogyps calvus* (Tulsi Subedi pers comm 2012 to Hem Sagar Baral). The main strength of the NOU lies in the research and monitoring of species; it also manages the Nepal Rare Bird Council (NRBC).

Students from universities are undertaking research in birds which is sometimes funded by various organizations working in bird conservation. Larger organisations like NTNC, WWF Nepal and IUCN Nepal have also carried out bird research work in Nepal but most of them have left bird conservation work to smaller, more bird-focused organisations.

Community Forest User Groups in many places have shown incredible enthusiasm to conserve wildlife. For example, many community groups regularly monitor forest birds and changes in vegetation structure over time (Baral et al. 2005, Thapa 2007). Community-managed vulture restaurants were successful in conserving vultures in their early years. An added benefit was the development of community leaders through this initiative. There are many to mention but conservation organisations working in the field and media are working effectively. This area needs further exploration as at present very little is known about how our common birds remain common and the role of forests and other habitat management groups play in this.

Monitoring the Himalayan galliforms has been focus for the World Pheasant Association in the Pipar area within the Annapurna Conservation Area since late 1970s (Poudyal et al. 2009). This is the longest-running bird monitoring programme in Nepal, and it has assessed periodically the status of Satyr Tragopan, Koklass Pheasant *Pucrasia macrolopha* and Common Hill Partridge *Arborophila torqueola* (Poudyal et al. 2011).

Species restoration programmes are unusual in Nepal. More directly habitat-related conservation was undertaken for Sarus Crane by the Lumbini Development Trust in mid90s. As part of the project, habitat improvement was carried out in a small area within the Lumbini Master Plan; this included the creation of wetland habitats for Sarus Cranes (Suwal 2002). Banning diclofenac, securing threatened vultures in captivity and establishment of vulture restaurant in various places of the country have been other examples of species restoration programmes (BCN 2011). A rising curve of nest numbers and their increased success has been shown for White-rumped Vulture in certain locations that operated vulture restaurants (BCN and DNPWC 2011). Currently ongoing is a grassland habitat restoration programme for Bengal Florican in Chitwan National Park; this is one of the few active habitat management activities being carried out in the country. Preliminary results indicate the need for a long-term active habitat management to sustain critical populations of Bengal Floricans (Baral et al. 2012).

Role of Media in Conservation

The media has played important role in raising awareness programme on bird conservation in the public. Media platforms include all types of print media, audio and audio-visual media-at national level and also at local level. Among the radio media, Panchhi Sansar, a fortnightly programme broadcast from Image FM 97.3 MHz; it has been an important milestone since 2006. This was initiated by Bird Conservation Nepal with the aim of improving awareness of birds and conservation in the general public (Ghimire undated). Regular news about the environment is broadcast from Sagarmatha FM 103.2, Nepal FM 90 MHz which helps to conserve Nepal's wild birds. Ujyalo Network is another important media that has been broadcasting news on birds regularly through its extensive networks of FM stations all over Nepal. As a result of all the media work, coordinated with organisations mentioned above, a large percentage of people in the country now are aware of bird conservation. Bird experts have started appearing at the district level which was focused in Kathmandu only.

As part of a project, BIOCOS Nepal has broadcast radio program entitled Hamro Suklaphanta Hamro Kharmjujur (Our Suklaphanta Our Florican) from the Radio Mahakali, Kanchanpur in 2008/09 and Hamro Cheer Hamra Panchhi (Our Cheer Our Birds) from the Radio Manakali, Kanchanpur and Radio Ramaroshan, Achham in 2009/10 to raise awareness on Bengal Florican, Cheer Pheasant *Catreus wallichii* and other globally threatened bird species in the far western Nepal.

International Organisations

World Pheasant Association's established in '70s was the first significant activity carried in Nepal for bird conservation. Pheasant communities were studied in central Nepal. The first International Pheasant Symposium was held in Kathmandu, Nepal and remains at the centre of WPA's activities. WPA has been working with communities in Annapurna Conservation Area at Pipar since 1983, opening up schools, education awareness, funding teachers' salary, sponsoring school children and basically all the vital tools needed to ensure that galliform communities thrived well higher up in the mountain forests. WPA has a long-standing commitment to education in Pipar's surrounding villages by funding teachers' salaries, and building and renovating schools and their classrooms.

Bengal Florican study was carried out in 1982 initiated by the Bustard Species Group and funded by BirdLife International (then known as International Council for Bird Preservation; it studied habitat conditions of birds (Inskipp and Inskipp 1983). BirdLife International systematically took part in the conservation of Nepal's birds with appointment of Bird Conservation Nepal as Country Representative in 1994. BirdLife not only helped BCN in various bird research activities but also strengthened the organisation to raise its profile to a national level. The Peregrine Fund, Royal Society for the Protection of Birds (UK), UNDP GEF, Critical Ecosystem Partnership Fund, Wildlife Conservation Society, Rufford Small Grants Foundation, Whitley Fund for Nature, BP Conservation Programme, Darwin Initiative UK, Oriental Bird Club, Wetlands International, World Owl Trust, Zoological Society of London --all have helped significantly by providing funds and support to bird conservation projects.

The Private Sector and Individuals

Private sector plays an important role in bird conservation. Companies like Tiger Mountain Pokhara Lodge, TigerTops, and Naturetrek are few major private companies contributing for bird conservation activities and supporting small projects at regular intervals. These institutions have invested tremendous amount of their resources (human/finance/materials) towards bird conservation in the country. There are also several other lodges mainly based around the edges of protected areas, mostly in the lowlands, that have contributed significantly to the conservation of birds. Travel and Tour as well as other trekking agencies have supported bird conservation work. A few large corporate agencies are also supporting bird conservation; these include some banks, pharmaceutical companies, supermarkets etc. As a whole, the role that private sector has played in bird conservation has been quite important. There is no involvement from multi-national companies known to promote corporate responsibility towards environmental conservation, and hence this is still very low key.

A few individuals have worked independently, conducting important bird research and contributing to their conservation enormously. These also include nearly a dozen bird photographers, few bird artists and most recently the writers of children’s stories (Baral 2012a).

Skewed Research Pattern

An analysis on the number of bird research projects carried out in Nepal shows these are largely focused on globally threatened species and mainly non-passerine species. Research focusing on globally threatened bird species/autecology started in Nepal with Bengal Florican survey in 1982 (Inskipp and Inskipp 1983). An analysis of published and unpublished literature (Inskipp and Inskipp 2012) indicates that about 164 individual articles and papers are available dedicated to 18 globally threatened bird species found in Nepal. All these studies were undertaken in Nepal and on occasions, one study has produced several pieces of literature. As a single species, Cheer Pheasant has topped the list with 30 items of literature available followed closely by the Bengal Florican (25) and the White-rumped

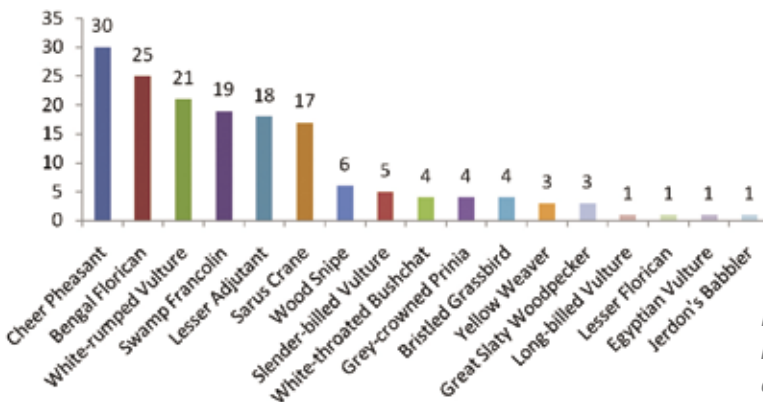


Figure 5. Number of bird literature available on different species in Nepal.

Vulture (21). Swamp Francolin, Sarus Crane and Lesser Adjutant *Leptoptilos javanicus* are the other well-studied birds in Nepal. Taking the literature on threatened species of vultures, when lumped together the total number reaches 28, although this is still below the number for Cheer Pheasant. However, for vultures as a group, which includes mostly threatened species (five species out of nine in Nepal are globally threatened), a total of 122 items of literatures is available –topping all other bird groups. This is closely followed by galliform groups with as many as 77 articles or papers available relating to pheasants and the Pipar Project initiated by the World Pheasant Association.

All major bird studies in the country have been made through support from outside funding agencies. Studies on the globally threatened species in the country have generated useful information for their conservation planning not only at national level but also contributing to global conservation movement.

There is no reliable estimate on the total investment on globally threatened bird studies in Nepal. This is mainly because often study reports are not published and are not shared widely; also in some cases researchers were secretive and did not want to expose their projector publish study reports. There have been some studies that is ongoing since late 1970s, for example, World Pheasant Association’s involvement. Most of the investment by the World Pheasant Association was not spent on globally threatened bird studies at that time as Pipar held none of the threatened galliforms. Investment through WPA and other funding agencies have come later on two threatened galliforms of Nepal of budget about 40,000 US \$.

A rough estimate of investment on species indicates that, the biggest amount of money that has come to Nepal is for vulture conservation. Most of this money channeled through Bird Conservation Nepal, reaches around 400,000 US \$ (Figure 6). Another significant chunk of money came for Sarus Crane conservation and for Bengal Florican. Most of the money for the former species came when the species was not listed as globally threatened.

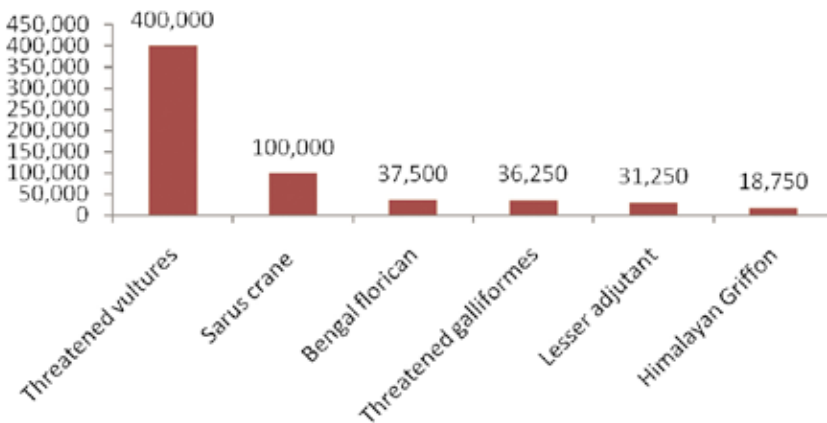


Figure 6. Showing invested financial resources for globally threatened species conservation in Nepal since 1982. Approximate figures in US\$

Lack of internal funding and international funders unwilling to fund national priority species have resulted in a dearth of information on many important species at the national level. For example, no reliable ecological studies have been conducted on species like Spiny Babbler *Turdoides nipalensis*, the country's only endemic bird. Similarly, Danphe (Himalayan Monal) the national bird and perhaps the best known bird to Nepali people has not been studied. Red Jungle Fowl *Gallus gallus*, the ancestral stock of domestic variety of chickens and most affordable source of protein to many people, remains unstudied. Likewise, there are other important species to Nepal and Nepali people that remain very little known; some of these include birds identified as Restricted Range species by BirdLife International and which have a large proportion of their range in Nepal, notably Hoary-throated Barwing *Actinodura nipalensis*.

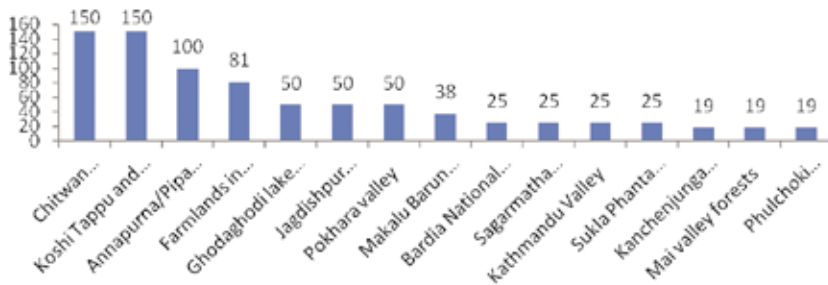


Figure 7. Financial resources spent since 1980 in 15 Important Bird Areas and other sites. Figures estimated based on research reports, funder's annual report, organisation's annual reports. Figures in US \$ thousands.

Site-wise Important Bird Areas and protected areas have received some attention. Most accessible protected areas are well studied. Sites like Lumbini, Mai Valley, Phulchoki, Ghodaghodi are better studied IBAs outside protected areas. Chitwan, Koshi, Bardia, Sukla Phanta, Annapurna, Sagarmatha and Langtang are the better-studied protected areas. Nearly the same pattern is also reflected in terms of resource investment when it comes to sites for bird research and conservation. Chitwan and Koshi Tappu are top of the list, followed by the Annapurna Conservation Area (Figure 7). Because of their wetland habitats, Lumbini, Ghodaghodi, Jagadishpur and Pokhara Valley are other unprotected sites that have brought much investment in terms of bird research and conservation.

The above facts illustrate that autecological research pattern (not so much habitat research) is highly skewed towards where international priorities lie, and this is where resources including finance are allocated. In a country like Nepal, most people cannot afford to undertake bird research and conservation work despite their interest. Therefore, the significant amount of financial resources provided by donor agencies is extremely important. Currently, there is no funding mechanism at national level that promotes national priorities. For example many of the birds listed in 'The State of Nepal's Birds 2010' will not be studied as there is no internal funding to study. Prioritizing species for conservation is an important tool in planning but more or less neglecting birds that are supposedly 'common or safe' is a great fault in procedure. So, how best can common species be kept common all the time, and resources provided to study them before they become scarcer? It should be remembered

that good science often comes from studying a common species, and conclusions drawn can often be applied to scarcer species. Therefore, we must give some resources towards non-threatened species or nationally threatened species.

Conclusion and Recommendations

The very high level of poverty and illiteracy in the country are directly linked to environmental conservation in Nepal. In places where human population is high, coupled with poverty and illiteracy, bird and biodiversity conservation problems seem very severe. An example can be found at the most famous bird paradise in Nepal: Koshi Tappu. Waterbird populations have sharply declined in this important Ramsar Site. There is huge anthropogenic pressure to this Reserve to an extent that some people even refer to the Reserve as 'protected grazing land'. There is very little forest and natural resources accessible to the poorer communities living adjacent to the Reserve and they have no alternative options. Habitat and species management have been major issues for the management authority at Koshi Tappu. Darwin Initiative Grant from the UK Government provided support for Koshi project to promote sustainable livelihoods especially targeting those communities heavily dependent on wetland resources. The project demonstrated how pressure on wetland resources can be alleviated and tangible benefits provided to local people. This provided a good model (Buckton 2007, BCN and DNPWC 2011) but unfortunately the resources were not provided to extend the model to all Koshi communities, thus denying most of the Koshi residents from the long term benefit of improving their livelihoods.

In the fringes of the other protected areas, where human population is slightly better off and literacy rate higher, problems seem less severe. Therefore, the Government of Nepal should make its efforts to uplift the poor to a higher standard of living and provide education for all. If recommendations such as outlined here are positively taken then conservation of nature in all forms will be easier for all.

Despite the fact that our country has lost some of the prime bird habitats and few species of birds, there is still a lot of hope that the remaining bird species and their habitats can be adequately conserved. But this will only be possible if the multitude of threats our birds face can be minimised. Here are some general but achievable and pragmatic recommendations which, if followed, might downgrade the status of many of the currently nationally threatened birds from the National Red List.

- ➔ The Department of National Parks and Wildlife Conservation, which now manages more than 20% of country's land, should have adequate human resources. Its budget should be allocated in a way that activities are achievable, meaningful and productive. Manpower should be strengthened by giving employees appropriate training and allowing them to gain experience. Buffer Zone and Research areas need to be separately allocated within PA system so that reviews are fact-based and implementation is effective.
- ➔ The Ministry of Forests and Soil Conservation, through Department of National Parks and Wildlife Conservation, should start a scheme to fund bird conservation projects that are important at the national level. It could begin with just a few projects and its ambitions could be expanded later. National-level experts and, if needed, international

experts should be kept in its Steering Committee to help identify priority national conservation projects to fund.

- Research, monitoring and conservation of globally threatened species should be continued. Where Nepal contains a significant proportion of a globally threatened species listed in IUCN Red List, Government and conservation NGOs should partner with international agencies. Nationally threatened species' population and ecology should be studied in a way that it contributes to their conservation, with outcomes that help manage the species. Ultimately, this national level programme should be expanded regionally so that all parts of the country have some bird research and conservation projects.
- Habitat conservation, especially relating to wetlands, needs to be actively managed. Wetland and lowland grassland restoration should become priority work under active habitat management schemes.
- Fishing in protected wetlands should be further reduced and large scale fisheries in naturally occurring wetlands should be discouraged. Alternative arrangements should be made for people who actually depend for their livelihoods on fishing in these rivers. Engaging poor fishermen in the existing fish-depleted Nepal's wetlands means keeping them busy but not providing any meaningful livelihoods.
- Rivers and wetland welfare outside protected areas should be regulated by making appropriate legislation sympathetic to wildlife conservation and with sustainable harvesting plan. The proposed Wetland Act may prove to be useful in this regard (CSUWN 2011).
- The National Parks and Wildlife Conservation Act 2029 needs to be revised with inclusion of species recommended by Himalayan Nature, as per the request made by the DNPWC. Many of these birds are now listed in The State of Nepal's Birds 2010, an authoritative and accurate document produced by the DNPWC and Bird Conservation Nepal.
- School and University curricula should include bird studies, relating both to common and threatened species. If needed, regular revision should be made to include timely issues on birds.
- Bird conservation should be promoted through art, literature and culture. Every house in the country should be encouraged to feature birds: the harbingers of a prosperous life to us all. After all, only when the general public understand and appreciate the value of bird then only their future will be secure. Community participation and stewardship is needed so that bird conservation does not become an uphill battle.
- Provide special protection to birds during the breeding season. The laws that outlaw the hunting and trapping of birds should be strictly enforced.

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Appendix 1. Bird species recorded in Nepal and listed in CITES

English Name	Species	Category	Comments
ORDER/Familzy/Scientific Name	English Name	APPENDIX	Remarks on Status
CICONIIFORMES/Ciconidae			
Ciconia nigra (Linnaeus, 1758)	Black Stork	II	
CICONIIFORMES/Threskiornithidae			
Platalea leucorodia Linnaeus, 1758	Eurasian Spoonbill	II	
CICONIIFORMES/Phoenicopteridae			
Phoenicopterus ruber (=roseus)Linnaeus, 1758	Greater Flamingo	II	Recorded less than 5 times in Nepal
ANSERIFORMES/Anatidae			
Anas formosa Georgi, 1775	Baikal Teal	II	
Rhodonessa caryophyllacea (Latham, 1790)	Pink-headed Duck	I	Probably Extinct from the world
Sarkidiornis melanotos (Pennant, 1769)	Knob-billed Duck	II	
FALCONIFORMES/Pandionidae			
Pandion haliaetus (Linnaeus, 1758)	Osprey	II	
FALCONIFORMES/Accipitridae			
Accipiter badius (Gmelin, 1788)	Shikra	II	
Accipiter gentilis (Linnaeus, 1758)	Northern Goshawk	II	

<i>Accipiter nisus</i> (Linnaeus, 1758)	Eurasian Sparrowhawk	II	
<i>Accipiter trivirgatus</i> (Temminck, 1824)	Crested Goshawk	II	
<i>Accipiter virgatus</i> (Temminck, 1822)	Besra	II	
<i>Aegypius monachus</i> (Linnaeus, 1766)	Cinereous Vulture	II	
<i>Aquila chrysaetos</i> (Linnaeus, 1758)	Golden Eagle	II	
<i>Aquila clanga</i> Pallas, 1811	Greater Spotted Eagle	II	
<i>Aquila hastata</i> (Lesson, 1834)	Indian Spotted Eagle	II	
<i>Aquila heliaca</i> Savigny, 1809	Eastern Imperial Eagle	I	
<i>Aquila nipalensis</i> Hodgson, 1833	Steppe Eagle	II	
<i>Aquila rapax</i> (Temminck, 1828)	Tawny Eagle	II	
<i>Aviceda jerdoni</i> (Blyth, 1842)	Jerdon's Baza	II	
<i>Aviceda leuphotes</i> (Dumont, 1820)	Black Baza	II	
<i>Butastur teesa</i> (Franklin, 1831)	White-eyed Buzzard	II	
<i>Buteo buteo</i> (Linnaeus, 1758)	Common Buzzard	II	
<i>Buteo hemiliasius</i> Temminck & Schlegel, 1844	Upland Buzzard	II	
<i>Buteo rufinus</i> (Cretzschmar, 1827)	Long-legged Buzzard	II	
<i>Circaetus gallicus</i> (Gmelin, 1788)	Short-toed Snake-Eagle	II	
<i>Circus aeruginosus</i> (Linnaeus, 1758)	Eurasian Marsh-Harrier	II	
<i>Circus cyaneus</i> (Linnaeus, 1766)	Hen Harrier	II	
<i>Circus macrourus</i> (S. G. Gmelin, 1770)	Pallid Harrier	II	
<i>Circus melanoleucos</i> (Pennant, 1769)	Pied Harrier	II	
<i>Circus pygargus</i> (Linnaeus, 1758)	Montagu's Harrier	II	
<i>Elanus caeruleus</i> (Desfontaines, 1789)	Black-winged Kite	II	
<i>Gypaetus barbatus</i> (Linnaeus, 1758)	Bearded Vulture	II	
<i>Gyps bengalensis</i> (Gmelin, 1788)	White-rumped Vulture	II	
<i>Gyps fulvus</i> (Hablizl, 1783)	Griffon Vulture	II	
<i>Gyps himalayensis</i> Hume, 1869	Himalayan Vulture	II	
<i>Gyps indicus</i> (Scopoli, 1786)	Indian Vulture	II	Recorded recently on 1 December 2011
<i>Gyps tenuirostris</i> G. R. Gray, 1844	Slender-billed Vulture	II	
<i>Haliaeetus albicilla</i> (Linnaeus, 1758)	White-tailed Eagle	I	
<i>Haliaeetus leucoryphus</i> (Pallas, 1771)	Pallas's Fish-Eagle	II	
<i>Haliastur indus</i> (Boddaert, 1783)	Brahminy Kite	II	
<i>Hieraaetus fasciatus</i> (Vieillot, 1822)	Bonelli's Eagle	II	
<i>Hieraaetus kienerii</i> (Geoffroy Saint-Hilaire, 1835)	Rufous-bellied Eagle	II	
<i>Hieraaetus pennatus</i> (Gmelin, 1788)	Booted Eagle	II	
<i>Ichthyophaga humilis</i> (Müller & Schlegel, 1841)	Lesser Fish-Eagle	II	
<i>Ichthyophaga ichhyaetus</i> (Horsfield, 1821)	Grey-headed Fish-Eagle	II	

<i>Ictinaetus malayensis</i> (Temminck, 1822)	Black Eagle	II	
<i>Milvus migrans</i> (Boddaert, 1783)	Black Kite	II	
<i>Neophron percnopterus</i> (Linnaeus, 1758)	Egyptian Vulture	II	
<i>Pernis ptilorhynchus</i> (Temminck, 1821)	Oriental Honey-Buzzard	II	
<i>Sarcogyps calvus</i> (Scopoli, 1786)	Red-headed Vulture	II	
<i>Spilornis cheela</i> (Latham, 1790)	Crested Serpent-Eagle	II	
<i>Spizaetus cirrhatus</i> (Gmelin, 1788)	Changeable Hawk-Eagle	II	
<i>Spizaetus nipalensis</i> (Hodgson, 1836)	Mountain Hawk-Eagle	II	
FALCONIFORMES/Falconidae			
<i>Falco amurensis</i> Radde, 1863	Amur Falcon	II	
<i>Falco cherrug</i> Gray, 1834	Saker Falcon	II	
<i>Falco chicquera</i> Daudin, 1800	Red-necked Falcon	II	
<i>Falco columbarius</i> Linnaeus, 1758	Merlin	II	
<i>Falco jugger</i> Gray, 1834	Laggar Falcon	I	
<i>Falco naumanni</i> Fleischer, 1818	Lesser Kestrel	II	
<i>Falco peregrinus</i> Tunstall, 1771	Peregrine Falcon	I	
<i>Falco severus</i> Horsfield, 1821	Oriental Hobby	II	
<i>Falco subbuteo</i> Linnaeus, 1758	Eurasian Hobby	II	
<i>Falco tinnunculus</i> Linnaeus, 1758	Common Kestrel	II	
<i>Microhierax caerulescens</i> (Linnaeus, 1758)	Collared Falconet	II	
GALLIFORMES/Phasianidae			
<i>Catreus wallichii</i> (Hardwicke, 1827)	Cheer Pheasant	I	
<i>Ithaginis cruentus</i> (Hardwicke, 1821)	Blood Pheasant	II	
<i>Lophophorus impejanus</i> (Latham, 1790)	Himalayan Monal	I	
<i>Tetraogallus tibetanus</i> Gould, 1854	Tibetan Snowcock	I	
<i>Tragopan satyra</i> (Linnaeus, 1758)	Satyr Tragopan	III	Only bird in the Appendix III
GRUIFORMES/Gruidae			
<i>Anthropoides virgo</i> (Linnaeus, 1758)	Demoiselle Crane	II	
<i>Grus antigone</i> (Linnaeus, 1758)	Sarus Crane	II	
<i>Grus grus</i> (Linnaeus, 1758)	Common Crane	II	
<i>Grus nigricollis</i> Przevalski, 1876	Black-necked Crane	I	Recorded less than 5 times in Nepal
GRUIFORMES/Otididae			
<i>Houbaropsis bengalensis</i> (Gmelin, 1789)	Bengal Florican	I	
<i>Syphoeides indicus</i> (J. F. Miller, 1782)	Lesser Florican	II	
PSITTACIFORMES/Psittacidae			
<i>Loriculus vernalis</i> (Sparrman, 1787)	Vernal Hanging-Parrot	II	
<i>Psittacula alexandri</i> (Linnaeus, 1758)	Red-breasted Parakeet	II	

<i>Psittacula cyanocephala</i> (Linnaeus, 1766)	Plum-headed Parakeet	II	
<i>Psittacula roseata</i> Biswas, 1951	Blossom-headed Parakeet	II	
<i>Psittacula eupatria</i> (Linnaeus, 1766)	Alexandrine Parakeet	II	
<i>Psittacula himalayana</i> (Lesson, 1832)	Slaty-headed Parakeet	II	
STRIGIFORMES/Tytonidae			
<i>Tyto alba</i> (Scopoli, 1769)	Barn Owl	II	
<i>Tyto capensis</i> (A. Smith, 1834)	Eastern Grass Owl	II	
STRIGIFORMES/Strigidae			
<i>Asio flammeus</i> (Pontoppidan, 1763)	Short-eared Owl	II	
<i>Asio otus</i> (Linnaeus, 1758)	Long-eared Owl	II	
<i>Athene brama</i> (Temminck, 1821)	Spotted Owlet	II	
<i>Athene noctua</i> (Scopoli, 1769)	Little Owl	II	
<i>Bubo bubo</i> (Linnaeus, 1758)	Eurasian Eagle Owl	II	
<i>Bubo coromandus</i> (Latham, 1790)	Dusky Eagle Owl	II	
<i>Bubo nipalensis</i> Hodgson, 1836	Spot-bellied Eagle Owl	II	
<i>Glaucidium brodiei</i> (Burton, 1836)	Collared Owlet	II	
<i>Glaucidium cuculoides</i> (Vigors, 1831)	Asian Barred Owlet	II	
<i>Glaucidium radiatum</i> (Tickell, 1833)	Jungle Owlet	II	
<i>Ketupa flavipes</i> (Hodgson, 1836)	Tawny Fish Owl	II	
<i>Ketupa zeylonensis</i> (Gmelin, 1788)	Brown Fish Owl	II	
<i>Ninox scutulata</i> (Raffles, 1822)	Brown Hawk Owl	II	
<i>Otus bakkamoena</i> Pennant, 1769	Indian Scops Owl	II	
<i>Otus spilocephalus</i> (Blyth, 1846)	Mountain Scops Owl	II	
<i>Otus sunia</i> (Hodgson, 1836)	Oriental Scops Owl	II	
<i>Strix aluco</i> Linnaeus, 1758	Tawny Owl	II	
<i>Strix leptogrammica</i> Temminck, 1831	Brown Wood Owl	II	
BUCEROTIFORMES/Bucerotidae			
<i>Aceros nipalensis</i> (Hodgson, 1829)	Rufous-necked Hornbill	I	Extirpated from Nepal, no records since 1846
<i>Anthraceros albirostris</i> (Shaw & Nodder, 1807)	Oriental Pied-Hornbill	II	
<i>Buceros bicornis</i> Linnaeus, 1758	Great Hornbill	I	
PASSERIFORMES/Muscicapidae			
<i>Leiothrix argentauris</i> (Hodgson, 1837)	Silver-eared Mesia	II	
<i>Leiothrix lutea</i> (Scopoli, 1786)	Red-billed Leiothrix	II	
PASSERIFORMES/Sturnidae			
<i>Gracula religiosa</i> Linnaeus, 1758	Common Hill Myna	II	

(source: www.cites.org, CITES/UNEP 2012)

Tourism and Protected Areas of Nepal

Siddhartha B Bajracharya, PhD.

Abstract

The protected areas have become a major tourism destination in Nepal that the tourism industry promotes and sells as attractions. The importance of tourism in Nepal is underlined by the fact that the total contribution of travel and tourism to GDP of Nepal was 8.8 per cent in 2011. Protected areas have played a significant role in driving Nepal's tourism industry. However, there is unequal distribution of tourists among the protected areas where big pieces of a pie are shared by only a few protected areas. The trend of tourism in PAs for the last six years clearly indicates that the highest number of visitors is attracted by only 25% of PAs within the PA system of Nepal. But, there is tremendous potential to develop tourism in all the protected areas of Nepal which needs to be well explored. There is an opportunity to market the products particularly through 'word of mouth advertisement' approach. Experiences from some of the protected areas in Nepal have shown that tourism could be a major source of revenue for self and sustainable financing of protected areas. Therefore, the park management authority of Nepal must harness the potential of respective park to develop sustainable tourism strategy.

Introduction

Since the establishment of protected areas in Nepal more than three decades ago, these areas have been the major attraction for international and national visitors. IUCN define the protected area as 'A protected area is a clearly defined geographical space, recognised,



Fig 1. Gaurishanker Himalaya in Gauri Shankar Conservation Area

dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values' [1]. Protected areas aim to conserve unique natural features with diverse landscapes, rich biodiversity and prominent cultural resources. Besides protecting some of the most pristine ecosystems, protected areas also play key role in tourism development and promotion in Nepal. Chitwan National Park, Annapurna Conservation Area, Sagarmatha National Park, Langtang National Park, and Shivapuri-Nagarjun National Park are some of the most popular tourist destinations in Nepal.

Unique geological formation, magnificent landscapes, rich biodiversity, and scenic beauty blended with exceptionally diverse cultural heritage in the protected areas of Nepal attract tourists from all over the world. Tropical lowlands in the south to a dry alpine steppe environment in the north; the world's highest mountain, Sagarmatha to the world's deepest valley, the Kali Gandaki valley; the low land Bengal Tiger and One-horned Rhino to the Himalayan Snow Leopard and Red Panda; holy places like Khaptad Ashram, Muktinath temple to highly revered Buddhist monasteries are all housed within the protected area system of Nepal.

Nowadays, protected areas have a well-established connection with tourism [2] which is aptly reflected by the protected areas in Nepal. Tourists visit parks and protected areas

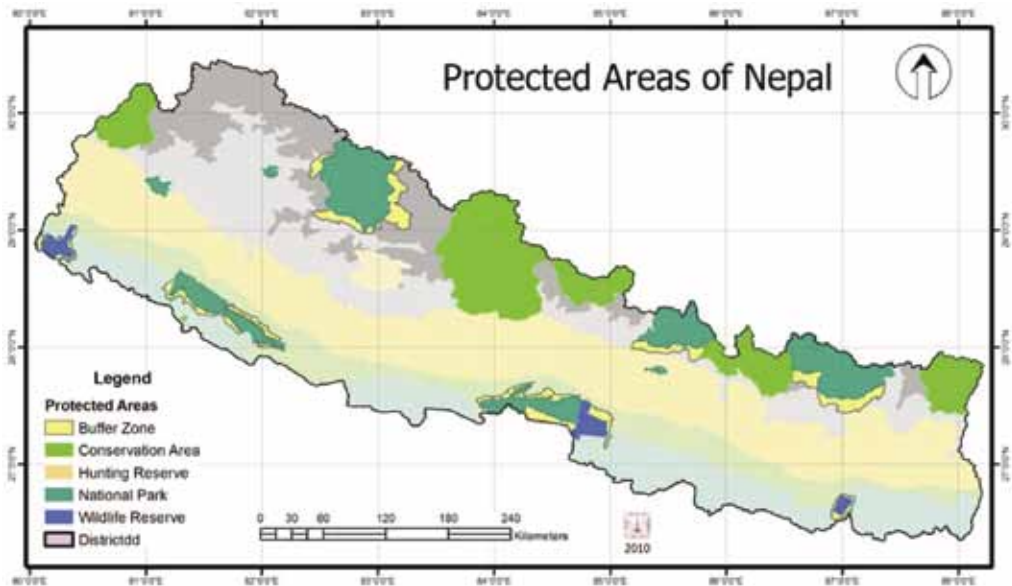


Fig 2. Protected Areas of Nepal

because such areas provide experiences that cannot be encountered elsewhere [3]. Tourism has rapidly become one of the most important development sectors in Nepal acting as the country's largest and most reliable source of foreign exchange earnings [4]. The importance of tourism in Nepal is underlined by the fact that the total contribution of travel and tourism to GDP was 8.8 per cent in 2011 [5]. As elsewhere in the world, protected areas have played a

significant role in driving Nepal's tourism industry [6]. However, there is unequal distribution of tourists among the protected areas where big pieces of a pie are shared by only a few.

There is tremendous potential to develop tourism in all protected areas of Nepal which needs to be well explored. If we look at the global trend, tourism has emerged as the fastest growing industry worldwide and has remained at the forefront of global economic growth [7, 8]. The World Tourism Organisation (2012) has reported international tourist arrivals are on track to reach the milestone one billion later this year which will generate more than US \$ one trillion in export earning [9]. "The past two years have shown healthy demand for international tourism out of many markets, even though economic recovery has been uneven. This is particularly important news for countries facing fiscal pressure and weak domestic consumption, where international tourism, a key export and labour intensive activity, is increasingly strategic to balancing external deficits and stimulating employment," said UNWTO Secretary-General, Taleb Rifai [10]. On the other hand, there is growing inclination towards nature-based tourism, particularly dramatic growth rates to visit parks in developing countries. Nature-based tourism is defined as 'any form of tourism that relies primarily on the natural environment for its attractions or settings. Therefore, the protected areas of Nepal are an obvious choice for the nature-based tourism. Nature-based tourism accounts for 20-40% of international tourists worldwide [11]. However, it is highly essential to formulate good tourism development policy, planning and marketing to promote the protected areas.

Tourism Distribution in Protected Areas

Nepal initiated formal biodiversity conservation by establishing protected areas in the early 1970s. During the last three and half decades, Nepal set aside 20 protected areas (PAs) of different IUCN categories representing all eco-regions, ecosystems, and most of the flora and fauna and their habitats in Nepal [12]. At present, Nepal has a fairly extensive network of protected areas that cover 23.23% (including buffer zone) of its total land area, which includes ten national parks, three wildlife reserves, six conservation areas and one hunting reserve [12]. All these PAs are endowed with unique tourism attractions and have great potential for tourism development and provide experiences that cannot be encountered elsewhere. Therefore, PAs in Nepal have become a major tourist destination and attract more than 50% of the total international visitors to Nepal [13]. However, tourism activities are concentrated only in few popular PAs, therefore, significant efforts have to be made to develop tourism infrastructures in all PAs. There is an opportunity to market the products particularly through 'word of mouth advertisement' approach.



Fig 3. Nature-based tourism in CNP

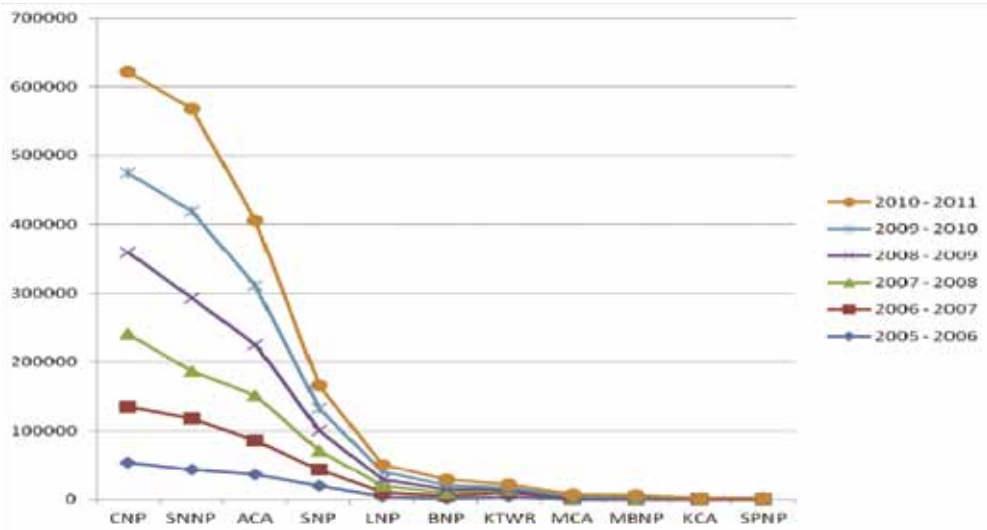


Fig.4 Visitors Trend in some PAs of Nepal (Data source: [12])

The trend of tourism in PAs for last six years clearly indicates that the highest number of visitors is attracted by only 25% of PAs within the PA system of Nepal. Chitwan National Park (CNP), Shivapuri Nagarjun National Park (SNNP), Annapurna Conservation Area (ACA), Sagarmatha National Park (SNP) and Langtang National Park (LNP). It should be noted that about 27% of the total visitors in CNP and about 90% visitors in SNNP are occupied by domestic tourists. The visitors to ACA, SNP and LNP are all international visitors including SAARC visitors. The trend of tourist flow in these five protected areas over the six year period also shows growing trend of visitors which means the popularity of the parks as a tourist destination is ever growing. Nonetheless, the park management should be cautious about the carrying capacity of the protected areas and possible negative impacts of visitors to these parks. Similarly, more attention should be given to market the remaining 75% of PAs within the system, and to develop tourism infrastructures and improve tourism service facilities.

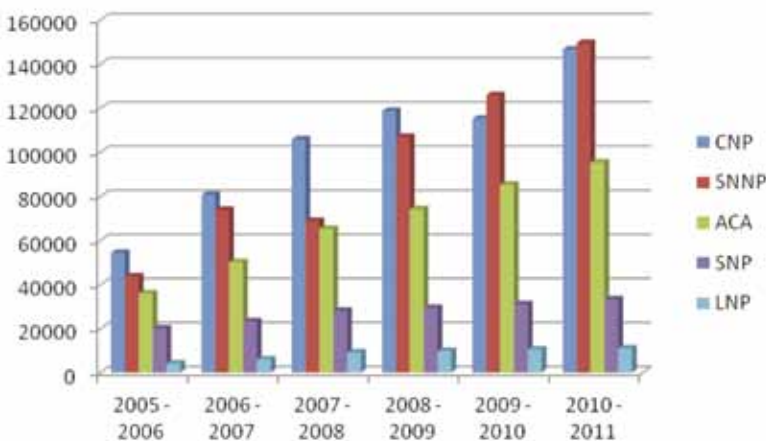
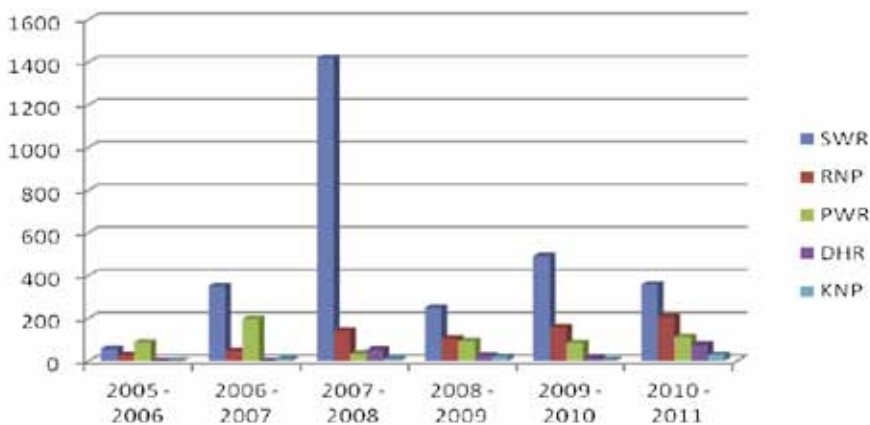


Fig.5 Top Five Tourist Destinations among the PAs of Nepal (Data source: [12])

Except these top five PAs, most of other PAs receive less than 500 tourists per annum. Shukla Phanta Wildlife Reserve (SWR), Rara National Park (RNP), Parsa Wildlife Reserve (PWR), Dhorpatan Hunting Reserve (DHR) and Khaptad National Park (KNP) are five parks receiving relatively less number of visitors per year. The analysis does not include recently declared PAs which are Banke National Park, Gaurishankar Conservation Area, Krishnasar Conservation Area and Appi Nampa Conservation Area. Whilst SWR, RNP, PWR, DHR and KNP provide some of the unique attractions for different groups of visitors, each of these PAs as a unique tourism product has not been well packaged and marketed. Likewise, rurality, limited tourism infrastructures and facilities, limited skills among local communities compounded by rural youth trend to leave their home and migrate to cities or abroad in search for better life and employment opportunities have contributed in unequal distribution of tourists in these protected areas. As a result, a tourism development gap is evident in these parks.

The recent changes in nature of tourism demand towards specialised forms of tourism in remote and unspoilt areas have aided opportunities to develop tourism in these parks. In reality, there is something particularly appealing about these parks, since these areas are seen as authentic, rich in symbolic representations of the unspoilt, the pristine nature and the traditional culture. The park locations with lakes, rivers, mountains, forests, rich nature and heritage, and picturesque villages provide relaxation and an appealing environment different to the pace and pressures of other parks. This also lays emphasis on the growing importance of public-private collaboration to develop and market tourism together with developing tourism infrastructures and improved tourism service facilities.

The significant differences in distribution of visitors to these ten PAs put highlight on the need for reviewing tourism development and management potentialities of all the parks of Nepal. More studies on tourism including visitors’ impact, tourist carrying capacity, tourism potentials, product packaging and marketing, etc. should be on high priority of the park managers in the coming days. There is also a clear lack of a tourism policy for the protected areas of Nepal. The present trend and distribution pattern of tourists also call for a strategic tourism assessment within the PAs system in Nepal.



*Fig.6 Top Five PAs with Low Volume of Tourists
(Data source: [12])*

Benefits from Tourism

Tourism in protected areas is considered to provide significant opportunities for economic advancement [3]. Tourist expenditure on routes to the park and in communities adjacent to or within the area may be significant, leading to increased income, alleviation of poverty and opportunities for vertical advancement in the tourism business [3]. People living in and around the main routes to ACA, SNP and LNP have received substantial income and employment benefits from tourism leading to improvement in the livelihood condition. More importantly, the fourth amendment of NPWC Act and Buffer Zone Management Regulation in 1993 allow sharing of 30-50% of the total income of PAs with the local communities to implement conservation and community development activities [13]. As a result, the communities living in and around PAs with significant tourism revenue generation such as CNP, SNP, ACA receive substantial benefits by sharing the income from these PAs. This is a clear example where tourism contributes directly or indirectly to participatory biodiversity conservation by protecting rare and endangered wildlife species and their habitats. Tourism is assisting in biodiversity conservation upon which it is based through generation of revenue for the park management agencies [3]. This is often one of the most powerful economic justifications for conserving biological resources through involvement of local communities in conservation.

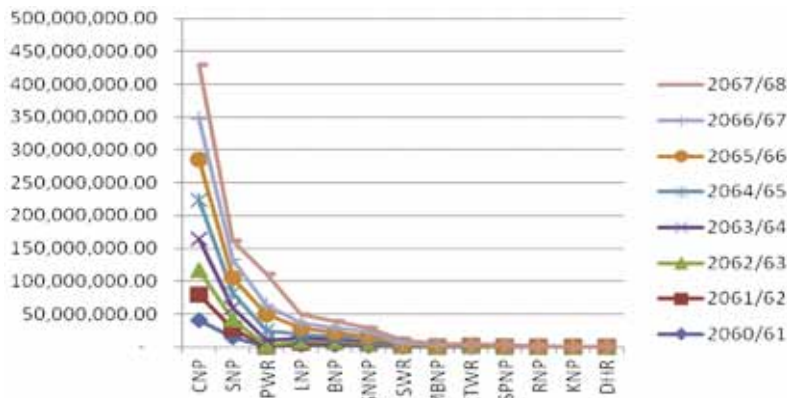


Fig.7 Total revenues generated by PAs in Nepal (in NRs) (Data source: [12]) (1 US\$ = NRs 85)

Figure 5 shows the total revenue generated by the major PAs and it indicates that the majority of PAs in Nepal do not generate substantial revenues. CNP is the only lowland park earning high revenue through tourist entry fee. In the fiscal year 2067-68 (2010-11), CNP generated slightly less than US \$ 5.3 million (US \$ 5,300,000). On the other hand, majority of the parks had income less than US\$ five hundred ninety thousand (US \$ 590,000) in the same fiscal year. Parks such as CNP, SNP, ACA and LNP generate relatively high annual revenue compared to other parks. Although tourism is one of the major sources of revenue for the parks in Nepal, more than three quarter of the total protected areas generate negligible revenue.

Major Sources of Tourism Revenues in the Parks (2009-10) Amount (NRs.) '000

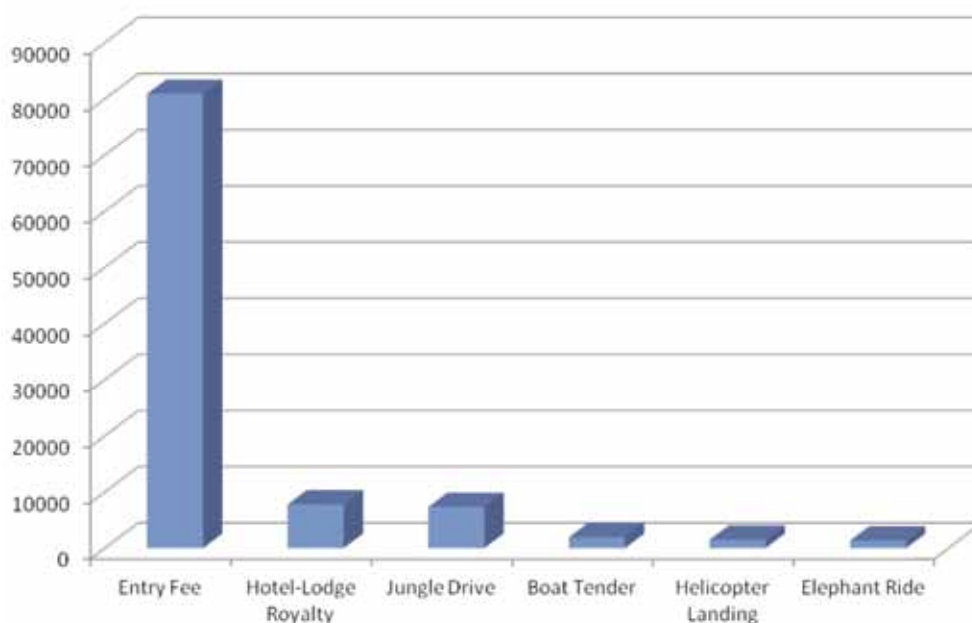


Fig.8 Major sources of tourism revenues in the Nepal PAs (Data source: [12])

At present, entry fee, hotel-lodge royalty, jungle drive, boat tender, helicopter landing, and elephant ride are some of the major sources of revenue through tourism activities. The entry fee or the visitors' fee is the most important source of revenue in PAs. The Government of Nepal generated about NRs. 800 million from the entry fee in different parks in the fiscal year 2009-10 which does not include the entry fee generated by ACA and Manaslu Conservation Area (MCA) [12].

ACA alone generated about NRs 150 million from the entry fee in the fiscal year 2009-10. In more than two decades (from 1989 to 2010), ACA was able to generate more than NRs 1.23 billion from the tourism revenue. Analysis of ten years trend in tourism revenues in ACA indicates a steady growth. The revenue generated from the entry fee has become a principal source of fund in ACA to implement various integrated conservation and development activities, and also directly contributed in sustainable financing of ACA which is the largest protected area of Nepal. ACA does not receive annual government budget as do other parks. ACA experience in sustainable financing of PA through tourism revenue must be explored in each and every park within the country. Likewise, tourism has a positive social contribution for the conservation of wildlife because the tourists involved are more sympathetic to the cause of biodiversity conservation.

Revenues Generated from the Entry Fee in ACA (NRs)

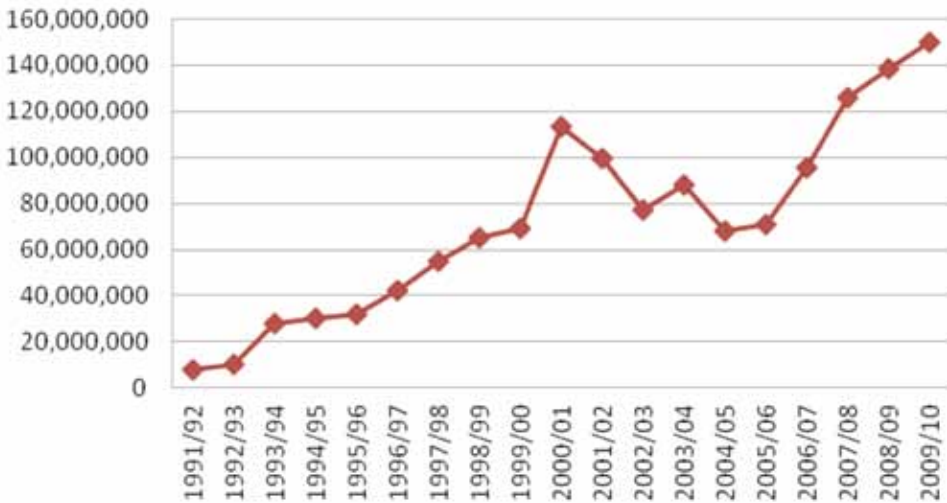


Fig.9 Revenues generated from the entry fee in ACA (Data source: NTNC) (1 US\$ = NRs85)

Tourism is a driving force for integrated conservation and development in PAs of Nepal. Significant investments have been made in community infrastructure schemes such as micro-hydro schemes, health centres, schools and bridges in ACA [14] and SNP [15]. Similar benefits from tourism in improving social services were reported from the buffer zone areas of other PAs with tourism. This suggests that tourism has helped to generate resources for these schemes and also increased the capacity of local communities to contribute to these schemes.

Negative Impact of Tourism

It is acknowledged that all forms of tourism produce negative impacts on the natural environment [16], PAs of Nepal are not an exception and monitoring its effects is on regular basis is needed. The impact of tourism on natural environment depends on the nature of the ecosystem as well as the human activity concerned [16], as well as the availability of facilities and the policies and regulations of the park and the nation [17]. These impacts may include: crushing or clearance of vegetation; soil modifications; introduction of weeds and pathogens; water pollution; visual impacts and disturbance to wildlife. However, a balanced interaction between tourism, parks and local communities or between biophysical resources and people is expected to provide mutual benefits for all [18].

When analysed, the average visitors of the last six years in the mountain protected areas, ACA, SNP and LNP received 67,684, 27,610 and 8,530 visitors respectively. In an average, each tourist bring along an average of at least one support staff as guide, porter or kitchen staffs which makes total outside visitors in the areas to about 135,000, 55,000 and 17,000 per annum respectively. These numbers are higher compared to the total population in

these protected areas. The data clearly indicates that impact from tourism is inevitable in ACA, SNP and LNP. For that reason, these parks may provide good case studies on tourism development and its impact in the protected areas.

One of the obvious negative impacts is deforestation or forest degradation caused by demands for fuelwood and construction timber which is largely generated by tourists and associated tourism activities [19, 20]. However, Bajracharya et al (2005) [21] have indicated that tourism in ACA does not have a significant impact on structure and composition of forests because various conservation activities including provision of alternative form of energy have been successfully introduced in ACA. Although tourism can have negative impacts on forests, these impacts can be reduced through careful planning and sensitive management of both natural resources and tourism [3].

Direct negative effect of tourist activity on wildlife depends largely on the intensity of tourism development, resilience of the species to the presence of tourists, and their subsequent adaptability [22]. Some negative impacts on wildlife observed in PA are; increase in illegal hunting, wildlife habituation to humans for food and behavioural changes in wildlife. Another visible tourism impact is on the physical environment. Construction of new tourist lodges or expansion of existing tourist lodges in ACA, LNP and SNP has increased. Construction of new buildings is a visible sign of land-use impact in many of the protected areas visited by tourists [23]. Tourism is also considered responsible for many socio-cultural changes, which may put traditional culture in jeopardy in the future. Tourism also generates both biodegradable and non-biodegradable wastes. Wastes, both solid and liquid, have increased significantly with the increase in number of tourists requiring food, beverages and other services. Deposition of solid wastes is a serious concern because decomposition is an extremely slow process particularly in the high mountain PAs.

Protected Area, Investment and Tourism

Government's investment in protected area management in Nepal is minimal in comparison to other sectors. The annual investment to manage the protected areas covering 23.23% of the total landmass of the country is only about 0.13% of the total annual budget. In fact, this is not enough to manage the PA system which represents the premier terrestrial biodiversity conservation investment. The park managers must look for options to seek out the win-win situation. It is widely acknowledged that investment in conserving biodiversity is insufficient, and that innovative approaches are required for generating additional financial support. There is need for significant investment in protecting ecosystem services and biodiversity in PAs.

Even if the protected areas of Nepal are providing tremendous benefits as elsewhere in the world, there is a significant funding gap for their management. As tourism has emerged as the fastest growing industry worldwide and has remained at the forefront of global economic growth [7, 8], it is an obvious choice and one of the means for sustainable financing of the protected area management. At the moment, tourism in some PAs in Nepal has a proven record of contributing effective conservation and sustainable development. Thus, tourism could be a powerful source for sustainable financing of all PAs of Nepal in

the future. Tourism has also provided direct or indirect economic opportunities to local communities and tourism entrepreneurs in the country and abroad. The government also receives significant amount of revenue from tourism in PAs.

Considering the opportunities and immense potential in tourism, it is critically important and equally challenging for the park authorities to develop market and manage sustainable tourism in all PAs of Nepal. Efforts should be on developing a win-win situation among local communities-tourists-park authorities by conserving environment, by enhancing and developing tourism attractions and infrastructures, and by enabling local communities to benefit from tourism. Nepal has rich experiences particularly in ACA, SNP and CNP which should be analysed, distilled and promoted in all the PAs.

Conclusions

Tourism is expected to continue as a major industry worldwide. With growing inclination towards nature-based tourism, the protected areas of Nepal will remain a major attraction for the international visitors. Tourism development in the protected areas of Nepal suggests that tourism helps conservation with economic justification and also strengthens the capacity of the park authority by bringing resources to conservation [18, 24, 25]. Despite high importance of protected areas in protecting ecosystem services and biodiversity, the government has not been able to allocate adequate budget for conservation. Experiences from some of the protected areas in Nepal have shown that tourism could be a major source of revenue for self and sustainable financing of protected areas. Therefore, the park management authority of Nepal must harness the potential of respective park to develop sustainable tourism strategy.

Strategic assessment of tourism in the PA system is crucial. Adequate consideration must be given to market eco-friendly tourism in the remaining 75% of PAs within the PA system in Nepal by attracting continuous investment in tourism infrastructures, local capacity to handle tourist, and improved tourism services based on tourism management plan. Due consideration must be given to systematically and scientifically reduce ever growing tourism pressure in Annapurna, Chitwan and Sagarmatha. More importantly, there is a dire need for diversification of tourism activities in each PA. In conclusion, there are tremendous tourism development opportunities in all PAs in Nepal. However, learning from the tourism development in some parks in Nepal, this paper emphasises to develop tourism in remaining parks through the concept of ecotourism and other similar sustainable tourism models that provide highest level of satisfaction to the visitors, provide economic opportunities, support biodiversity conservation and environment, and respect livelihood concerns of local people living in and around these parks.

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Economic Benefits of Managing Protected Area: A Case Study from Bardia National Park

Bijendra Basnyat and Krishna Prasad Acharya

Abstract

Protected Areas offers economic and environmental benefits to surrounding communities. However, only those benefits which are associated with extractive use of forests- like biomass products, fishery, eco-tourisms etc are generally taken into account. The environmental and economic benefits attached to non-extractive and non market values are simply overlooked. Therefore, undervaluation of benefits have affected in public finance allocation for effective management of the protected areas. Recognizing this dilemma, Western Teria Landscape Complex Project (WTLCP) commissioned study to assess the total economic benefits of Bardia National Park (BNP) with a view to sensitize stakeholders for making appropriate level of investment to sustain current level of benefits. This study has adopted Total Economic Value (TEV) approach for identifying, prioritizing and valuation of economic benefits.

BNP provides 20 different types of ecosystem services to local and global communities of which six services, namely forest products, recreational, biodiversity, carbon sequestration, soil conservation and habitat provisioning were prioritized for estimating total economic benefits. BNP has been offering annual gross economic benefits worth of NRs. 566 millions with resource value of more than 80 billions. Provisioning services remain main economic benefits derived from BNP followed by cultural and support services. Share of Government revenue is small of the total benefits offered by the park. Management of protected area is highly beneficial even when compared with other alternative land uses, however current level of expenditure is very less. Findings of this study reveal that conservation cost is very low compared to other social and environmental benefits. This paper argues that there has been opportunity to achieve significant welfare gains from increased conservation investment. This paper concludes with policy recommendation that Government should take initiatives to institutionalize sustainable financing mechanism and introduce "Trust fund mechanism" for not only ploughing back of revenue to same sector but also for initiation of performance based financing mechanism in protected area management .

Introduction

Protected area is viewed as an effective strategy to protect biological diversity, conserve species and ecosystems. Recognizing this, Government of Nepal too has declared different types of protected area to maintain diversity of landscape or habitat, associated species and ecosystems for wise use and equitable benefit sharing. Nepal has a network of 20 protected

areas covering nearly one fourth (23.3 percent) of the country's land area (DNPWC, 2011). Government has recognized protected areas as one of the major economic institutions which plays important role in poverty reduction along with maintenance of ecosystem services and adaptation of climate change impact. Recent years have seen rapid expansion of protected area in Nepal, which increased from 19.1 percent to 23.3 percent of country's area within the last one decade (2002 – 2012). Expansion of protected area is often criticized by many stakeholders in poor and development countries like Nepal because of food scarcity, foregoes opportunities of using the land for agriculture and other development purpose, and low return or revenue from managing protected area.

Protected areas provide a wide array of goods and services. However, its economic benefits are only seen in terms of values associated with extractive use of forest products, fishery and tourism earnings. Revenue contributes to nearly half (48.3 percent) of the protected area budget in Nepal (DNPWC, 2011), which reveals limited efficiency and effectiveness of protected area management. This has happened because little or no economic importance has been attached to non-extractive use and indirect benefits. Comprehensive benefits of protected area under-valued since there is no market value of different services offered by protected area and not traded in the commercial market. Hence, direct and indirect economic benefits should be measured in monetary terms to recognize true economic benefits of protected areas, maximize long term benefits and increased investment in conservation.

Protected areas management often gets a small share of national fiscal budget despite of its high contribution to economic development. In year 2011/12, share of protected area and MFSC on national budget is 0.06 percent and 1.4 percent respectively. Likewise, protected area management received 4.7 percent of national forestry sector budget despite of high geo-graphical coverage (MoF, 2011). Protected area management not only competes with development programmes but also within the forestry sector too. This situation arose because of a failure to recognize current and potential economic benefits of protected areas (MET, 2010). Hence, management heavily dependent on limited budgetary support which often hinder to meet conservation goal.

Recognizing this, total economic benefit derived of Bardia National Park (BNP) was estimated to sensitize stakeholders for making appropriate level of investment to sustain current level of benefits. The study will also provide useful information for management and financing decisions regarding protected areas and supports on raising public and political awareness for setting conservation priorities.

Bardia National Park

Bardia National Park (BNP) is one of the largest protected areas of the Terai Arc Landscape encompassing 986 sq km core area and 507 sq km buffer area. BNP has nearly a half decade history of conservation. The area was first declared as a Royal Hunting Reserve in 1969 which was later gazetted as Royal Karnali Wildlife Reserve in 1976. The reserve was renamed as Royal Bardia Wildlife Reserve in 1982. Later on the area was declared as national park on 1988 when the Babai Valley was included. Surrounding area of park (327 sq km) was declared as buffer zone in 1996 which was later expanded to 507 sq km in 2009.

The park is managed by the Department of National Parks and Wildlife Conservation, Ministry of Forests and Soil Conservation, Government of Nepal

BNP holds two major eco-regions namely Teai-Dun Savanna and grasslands, and the Sub-tropical Broad leaved Forest. The savanna and grasslands harbor a large number of ungulates and their predators. Forest is mainly dominated by Sal with Khair and Sissoo. Seven major vegetation types, four forest types, and three grassland habitats have been identified inside BNP (Pokharel, 1993). BNP provides home for more than 55 species of mammals of which 10 are protected species (e.g. One Horn Rhino, Royal Bengal Tiger, Wild Asian Elephant, etc). Likewise, more than 438 species of birds are recorded of which six are protected species (BNP, 2011).

Buffer zone covers 21 village development committees lying in the vicinity of park where 117,633 people live in 16,619 households (BNP, 2011). Tharu are the indigenous group and comprises more than half of the total population. Other ethnic groups in the BZ include Dalit, Brahmin/Chhetri, and people from Mongoloid origin (Magar, Gurung, Tamang etc). Majority of population are dependent on farming followed by seasonal migration to India and services. Migration to India is major source of cash income.

BNP and buffer zone offers wide range of goods and services to local communities (table 1). Services offered by BNP are grouped into four categories according to the definition of Millennium Ecosystem Assessment, 2005. Local people are collecting thatch from core area once a year while forests products such as timber, firewood, fodder and grasses are collected from buffer zone. Tourism remains one of the main sources of revenue of the park. It contributes to the wellbeing of Terai alluvium in terms of water regulation and protection from siltation and desertification and also effective protection to the fragile Churia ecosystem. Likewise, BNP also provide services such as carbon sequestration, ground water recharge, habitat provisioning etc.

Table 1: Services derived from Bardia National Park

English Name	Species
Provisioning (Products obtained from ecosystem)	<ul style="list-style-type: none"> ➔ Forest products such as Firewood, fuel wood, thatching grass/fodder; wild fruit, vegetables, medicine* ➔ Irrigation ➔ Drinking water** ➔ Fisheries* ➔ Hydro-electricity*
Regulating (Benefits obtained from regulation of ecosystem processes)	<ul style="list-style-type: none"> ➔ Regulating water run-off*** ➔ Pest and disease control*** ➔ Air quality control*** ➔ Waste detoxification and protection from Ultra Violet rays*** ➔ Moderating extremes of temperatures, wind, rainfall*** ➔ Control of soil erosion, flood and drought** ➔ Plant pollination, seed dispersal *** ➔ Forest fire prevention*** ➔ Carbon sink**

English Name	Species
Cultural (Non material benefits obtained from ecosystem)	<ul style="list-style-type: none"> ➤ Ecotourism and recreational* ➤ Research, development and educational* ➤ Culture maintenance**
Supporting (Services necessary for production of all ecosystem services)	<ul style="list-style-type: none"> ➤ Soil formation and nutrient cycling*** ➤ Maintenance of biodiversity ➤ Habitat provisioning

*Note: * = Market value exist; ** = Market value do not exist but can be included after valuation;*

**** = Market value possible in future*

Source: MEA, 2005 and PSPL, 2011

Study Methods

Conceptual framework

The study used preference based approaches and total economic valuation (TEV) framework to identify, assess and establish monetary value of economic benefits. TEV is a well-established and useful framework for identifying the various benefits/value associated with protected areas (IUCN, 1998). It also provides policy guideline for allocation of scarce public resources for the conservation and development in light of growing demand of both forest products and environmental services. TEV consists of both use values and non-use values. Use values comprises of direct use values, indirect use values, and option values. Non-use values include bequest values and existence values (IUCN, 1998).

- Direct use values are derived from the direct use of the protected area for activities such as recreation, tourism, natural resource harvesting, hunting, gene pool services, education and research. The direct use value can be directly obtained from the market price since they are traded in the market or some sort of market price exists.
- Indirect uses largely comprised of the protected area's ecological functions such as watershed protection, breeding habitat for migratory species, climatic stabilization and carbon sequestration etc. Indirect use values are often widely dispersed and thus go unmeasured by markets.
- Option values are derived from the option of using the protected area sometime in the future. Future information is often cited as particularly important for biodiversity as untested genes may provide future inputs into agricultural, pharmaceutical or cosmetic products from protected area sometime in the future.
- Non-use values comprises of bequest values and existence values. Bequest values are related to the values of leaving use and non-use values of PA for the benefits of off-spring. Existence values reflect the benefit of knowing that the protected area exists even though one is unlikely to visit it or use it in any other way.

Study methods

The study adopted following six sequential steps for quantification of economic benefits derived from managing protected area (Table 2).

Table 2: Sequential steps followed for TEV of BNP

Step	Activities	Methods
I	Identification of ecosystem services offered by BNP	Observations, discussions with Park Staffs and review of literature, local communities, rapid assessment
II	Prioritization of ecosystem services for valuation	Discussions with Park Staffs; Review of literature; Observations and pair wise ranking methods
III	Review and selection of valuation techniques	Review of previous studies and selection of the most promising methods
IV	Specifying the data needs	Development and preparation of survey instruments
V	Collection of data	Review and Survey
VI	Quantification of values & services	Analysis

Source: Adapted from IUCN, 1998

Rapid assessment of BNP was carried out to identify different ecosystem services offered within the framework of TEV. Altogether 20 ecosystem services were identified from BNP (see table 1). It would be extremely difficult to undertake a full TEV study since it would be costly, time-consuming and difficult. Realizing this, the study prioritized most promising services from BNP in consultation with park officials, conservation partners and local communities. Preference ranking methods was followed during consultations where the respondents are requested to identify most promising ecosystem services under each category. Of different ecosystem services offered by the BNP, the study prioritized following seven major benefits for valuation considering time and resource availability (table 3).

Valuation studies carried in Nepal and elsewhere were reviewed to identify and select appropriate valuation methods for monetary quantification of economic and environmental benefit. The study used combination of different valuation techniques such as contingent valuation, revealed price, tourism earnings and benefit transfer methods depending on benefits derived. However, study heavily relies on benefit transfer method. Benefit transfer methods is popularly used to assess different economic benefits which essentially use primary research data generated elsewhere for valuing impacts after adapting to local context. Based on this data collection needs had been assessed and instruments were designed. Survey was designed for collecting missing information only and supplementing the study findings.

Table 3: Prioritized services and valuation methods

Ecosystem services	Major benefits	Value	Method of valuation	Source of data
Provisioning	Forest products (Firewood, Timber, Fodder, thatching grass etc).	Direct use value	Benefit transfer method	NARMA, 2006
	Sand, boulders	Direct use value	Revealed price method	BNP, 2011
Cultural	Eco-tourism and recreational services	Direct use value	Tourism earnings	Hotels & managers survey
Regulatory	Carbon sink services	In-direct use value	Benefit transfer method	Carbon monitoring & Carbon market studies
	Soil conservation/ Nutrient loss	In-direct use value	Benefit transfer method	GOECE, 2006; NFA, 2008 & MoAC, 2011
Supporting	Maintenance of biological diversity	Option value	Revealed price method	BNP, 2011
	Habitat provisioning	Bequest value	Contingent valuation / Willingness to pay	Household survey, BNP

After estimation of total economic benefits, financial and economic return assessment was carried out to sensitize stakeholders on return from investment along with the need of better allocation of resources for conservation and development in light of growing demand of environmental goods and services from BNP.

Economic Benefits

Forest products

BNP and its buffer zone provides different types of forests products to local communities, which includes timber firewood, fodder, grass, thatches, reeds, cane and timber etc. Benefit transfer methods was used for estimation of benefits derived from forest products. The study estimated monetary value of forest products from Study on Level of Community Dependency on BNP, carried out in 2006 (NARMA, 2006), which was adjusted to current prices by taking inflation rate of the country. Value of forest products extracted from BNP and Buffer Zone is NRs. 3501 and NRs. 11271 per HHs respectively (Inflation adjusted in 2011 from NARMA, 2006). Resource use value of BNP is NRs. 187.3 millions when extrapolated for 16619 households (BNP, 2011) residing in the buffer zone.

Table 4: Total economic value of forest products

SN	Particulars	Unit	Amount
1	Total resource use value*	Rs/HHs	14,772
1.1	Value of forest products extraction from the BNP	Rs/HHs	3501
1.2	Value of forest products collection from Buffer zone	Rs/HHs	11,271

2	Number of households in the Buffer zone of BNP**	No	16,619
3	Total net value of provisioning services (3x4)	Rs 000	187,313

Source: *NARMA 2006 (inflation adjusted in 2011); **BNP, 2011

The study doesn't take into account of cost associated with the production and harvesting of forest products. First, management approach is largely protection oriented and no large investment has been made for production of forest products. Secondly, harvesting is very far below the sustained yield of forests, forest products are collected based on the demand of local community together with the amount of fallen and dead tree lying on the forests. No green harvesting is being carried out in the buffer zone. Thirdly, users directly borne collection and transportation costs of firewood. Apart from this, value of timber and forests products has been highly subsidized compared to prevailing market price. Hence values presented are highly underestimated, when compared to prevailing market price. Likewise, the study does not take into account of loss of crops, livestock and property of wildlife damages, since people are getting alternative livelihoods opportunity from cultivation of medicinal and aromatic plants. The study found that each household is generating additional income of NRs 7428 from cultivation of medicinal and aromatic plant (WTLCP, 2011) which is almost equal to value of loss of livestock, crops and property. Apart from this, local communities are getting forest products at subsidized prices because of residing on buffer zone of BNP.

Sand and boulders

Sale of sand, boulders is also one of the income sources of BNP, which contributes to 11.3 percent of total revenue (BNP, 2011). Monetary value of sand and boulders was obtained from annual report of BNP, which shows that BNP generated revenue of Rs 0.92 million (BNP, 2011). Since collection and transportation costs are born by the collectors/contractor company, the price paid to the park represents the net benefit generated by this service.

Ecotourism and recreational services

Ecotourism and recreational services remains one of the main economic benefits of BNP, which contribute to more than two third of total park income (BNP, 2011). The study used total earning from tourists visiting BNP to estimate value of recreational services, which is now used as alternative to travel cost method (Verma, 2008).

Tourist information was obtained from the records/publications of the BNP. More than 8000 visitors visited BNP in 2010/11, of which majority were from Nepalese tourists and foreign tourists (Table 4). All 17 hotels which were operating in Thakurdwara (adjoining Park headquarters) were surveyed to estimate expenditure made by tourist by place of origin, which includes (a) Nepalese (b) SAARC and (c) Foreign. Expenditure was estimated considering duration of stay, food and accommodation expenses, recreational expenses (elephant ride, jeep safari, jungle walk, fishing, rafting and entrance fee) and cost of travel. The cost of travel only includes expenditure made to reach BNP and vice versa to avoid inclusion of multiple site visits. Apart from this, results obtained from hotels survey were further validated with visitors.

Each tourist stays for 2.1 days in the BNP. Average expenditure of tourist by place of origin, namely aboard, SAARC countries and Nepal are NRs. 23,173, NRs.16,120 and NRs.7,667 per visit per person respectively. In addition to this, 2000 visitors visited annually in home stay of Dalla to enjoy Tharu culture and local cuisines, who spent NRs. 2932 per persons including travel expenses. Taking this expenditure into account, total economic benefits of ecotourism and recreational service is NRs 129.0 millions.

Table 5: Value of Ecotourism and recreation services

SN	Visitors	Number (a)*	Average expenses (Rs) per visitors (b) **	Total value (a*b) (Rs 000)
A. A. Protected area, BNP				
1	Foreign	3,919	23,173	90,815
2	SAARC	171	16,120	2,757
3	Nepalese	3935	7,667	30,170
	Total income	8025		123,742
B. B. Home stay,buffer zone***				
	Visitors	2000	2,932	5,864
	Total economic benefits			129,606

Source: * BNP, 2011; ** PSPL, 2011; **** interaction with Home stay operators

Carbon sequestration

Carbon sequestration is one of the most important services of forest resources. Forests comprises of 84,193 ha of the core and buffer zone area of the BNP (DNPWC, 2007). International studies conducted at different places have estimated various rates of carbon sequestration. For instance, Tewari and Karky (2007) has estimated a carbon sequestration rate of 3.7 tCha-1yr-1 and 1.9 tCha-1yr-1 for Nepal while Subedi and Singh (2008) estimated 3.1 tCha-1yr-1 for each hectare of forest in the Churia range which resembles the vegetation in BNP to a great extent. Likewise NARMA (2010) estimated a carbon sequestration rate of 1.91 tCha-1yr-1 in the buffer zones of protected area of Nepal. Recent carbon monitoring study carried out in Chitwan district shows the carbon sequestration rate of 1.38 tCha-1yr-1 (ANSAB, 2012).

This study used a conservative estimate of carbon sequestration, i.e. 1.38 tCha-1yr-1 due to lack of updated data on forest stock and density of BNP. The carbon prices prevailing at international markets range between some \$1- 13 per ton carbon dioxide (CO₂). The mean value of most of the transactions was US\$ 2.9 per ton of CO₂ in 2009 (Schneck et al., 2011). This is equivalent to US\$ 10.64 or NRs 871 per ton of carbon (1 ton of Carbon = 3.67 tons or CO₂). Hence, value of annual carbon sequestration is NRs. 101.2 million (Table 6).

Table 6: Value of annual carbon sequestration

SN	Sources	Unit	Quantity	Remark
1	Forest area	ha	84,193	DNPWC, 2007
2	Annual carbon sequestration rate	tCha-1yr-1	1.38	ANSAB, 2012
3	Annual total carbon sequestration (1x2)	tCyr-1	116,186	
4	Value of carbon	Rs -1tC	871	Schneck et al, 2011
5	Value of carbon sequestration (3x4)	Rs ;000	101,185	

Soil Conservation

The study adopted benefit transfer methods to estimate soil conservation value of BNP. Nutrient lost has been taken as indicator for measuring soil conservation value. Forest area encompasses 84,193 ha of land of BNP and buffer zone (DNPWC, 2007). Different studies carried out in Nepal reveal that a hectare of terai forests controls 7.8 tons/ha/year of soil loss (GOECE, 2005; NFA, 2008; NARMA, 2010). A loss of 1 ton of soil means loss of 15 kg of organic matter, 0.76 kg of Nitrogen, 1 kg of Phosphorus and 2 kg of Potassium per hectare (GOECE, 2005; NFA, 2008). The price of organic matter is estimated at NRs. 2/kg. Likewise, price of Nitrogen, Phosphorus and Potassium is estimated at NRs. 27.2/kg, 54.2/kg and NRs. 23.3/kg respectively (MoAC, 2011a). Table 7 presents value of nutrient loss prevented by BNP. Benefits of soil conservation are product of forests area, value of nutrient loss prevented and prevailing market prices of nutrients. BNP minimizes nutrient loss of NRs. 1181 per ha per year or provide economic benefits of NRs. 99.5 million per year.

Table 7: Annual soil conservation value of BNP

SN	Particulars	Quantity	Value (NRs/ha)	Total value (Rs 000)
1	Organic matter (kg/ha)**	15	234	19,701
2	Nitrogen (kg/ha) **	0.76	161	13,575
3	Phosphorus(kg/ha**)	1	423	35,593
4	Potassium (kg/ha) **	2	363	30,602
	Total		1,181	99,472

Source: * DNPWC, 2011; ** GOECE, 2005; NFA, 2008;*** MoAC, 2011a.

Maintenance of biological diversity

Revealed price is one of the best indicators for estimating value related to maintenance of biological diversity. Highly valued services will have higher investment and vice versa.

Hence, a fund allocated by national or international organizations for conservation/maintenance of bio-diversity/management of protected area is considered as a proxy value of biodiversity (Pearce and Moran, 1994; Pieter et al, 2003). Biodiversity service is estimated based on government expenditure together with direct and indirect financial support from conservation partners for conserving natural heritage and biodiversity of BNP.

Government spent NRs. 27.1 million in management of BNP in 2010/11 while expenditure of conservation partners through different projects and programme was 13.5 million. Some of the projects which are being implemented in BNP with support from conservation partners include Terai Arc Landscape programme, Western Terai Landscape Complex Project, Tiger Conservation Program, Conservation Supported conservation and livelihoods related programme etc. This makes a total of NRs. 40.6 million as a revealed value of the bio-diversity services of BNP.

Habitat provisioning

Value associated with habitat provisioning is estimated by using contingent valuation method (CVM). CVM is one of the popular methods which estimates value associated with maintenance of habitat for biodiversity/wildlife based on willingness to pay (WTP) for maintenance or enhancement of services. WTP is widely used in Nepal (NARMA, 2010) and elsewhere (Hadkar et al., 1997; Adams et al., 2008) for estimation of value associated with future use. CVM uses a survey instrument to measure individuals' maximum WTP in a hypothetical market. Sample households were asked the amount, which they are willing to contribute as cash and voluntary labor using a bidding game approach.

The study surveyed 110 households residing in buffer zone of BNP. Questionnaire was designed in a bid game approach. Attempts were made to create a situation in the bidding game in such a way that respondent feel that they would really have to contribute amount of cash or voluntary labor, which they committed at the time of survey very soon such that they decide with perfect economic rationality rather than being guided by altruistic motives. Table 8 presents habitat provisioning value of BNP. Average WTP per HHs is NRs. 34.3 and NRs. 221.5 in cash and kind respectively. Taking this value into account, habitat provisioning value of BNP is NRs. 4.2 millions with high amount coming from kind. This is mainly in form of voluntary labor work for conservation and management of habitat.

Table 8: Value of habitat provisioning

SN	Particulars	Willingness to pay (NRs./HHs)	Total HHs	Total value (NRs,000)
1	Cash	34.3	16,619	570
2	Kind (Labour)	221.5	16,619	3,681
3	Total			4,251

Source: PSPL, 2011

Majority of residents are willing to contribute either in cash or kind voluntary for maintenance of habitat. However, low investment or willingness to pay reveals that more efforts need to be carried for raising awareness on bio-diversity conservation along with minimizing human wildlife conflicts. Likewise, appropriate programmes need to be designed for linking conservation benefits with rural livelihoods so that people's motivation and investment towards conservation could be enhanced.

Results and Discussions

Table 9 presents economic benefits generated from BNP. BNP offered an annual economic benefits of NRs. 566 million per year or NRs 3796 per ha. Forests products (timber, firewood, grasses and thatches) remain main benefits (33.1 percent) offered by BNP followed by recreation (22.9 percent), soil conservation (17.6 percent) and carbon sequestration (16.8 percent each).

Table 9: Total annual economic benefits of BNP per year

Services	Value (NRs. 000)	NRs./ha	Proportion (%)
Recreation	129,606	868	22.9
Carbon	95,309	638	16.8
Forest products	187,313	1,255	33.1
Sand and boulder	918	6	0.2
Biodiversity	49,607	332	8.8
Soil conservation	99,472	666	17.6
Habitat provisioning	4,251	28	0.8
Total economic benefits	566,476	3,794	100.0

Source: Summarized from above table

Above economic benefits is underestimated since it only takes account of major economic benefits derived from BNP and exclude economic value of natural capital stocks and keystone species. Apart from this, value of forest products is highly undervalued when compared to market prices. Market price of forest products is more than ten times higher than local or user price. Value of standing forests in Terai ranges from NRs 1.42 million per ha to NRs 2.78 million (GOECE, 2005). Likewise, study conducted in Himanchal Pradesh of India shows that standing value of forests and endangered species/biodiversity is NRs 456,000 and Rs 78,400 per ha respectively (Verma, 2000). Using conservative estimate (Verma, 2000) together with ignoring annual rate of inflation, total economic value of BNP is estimated at 79.8 billion. The table further reveals that economic benefits are less than 1 percent of resource value of BNP. This reveals that total annual economic benefit of 566.5 million is an indication of minimum value of the benefits received from BNP. Hence total economic value of BNP is much higher when these values are taken into account.

Table 10: Total economic value of BNP per year

Services	Value (NRs. 000)	NRs./ha	Proportion (%)
Economic benefits*	566,476	3,794	0.7
Standing value of forest**	68,080,800	456,000	84.7
Endangered species/biodiversity**	11,705,120	78,400	14.6
Total economic value	80,352,396	538,188	100.0

Source: * Table 9; Verma, 2000

The study further compares economic value of the park to the value of alternative land uses. Land price around BNP has been escalating because of high demand of land for construction of hotel, lodges and restaurants. Likewise, different business opportunities exist within the BNP which provided alternative income and employment opportunities to local communities. However, estimation of these values is very difficult. Hence, the study compared net value generated by agriculture land with the BNP in order to provide indication of relative economic benefits of BNP with other alternative land use, especially agriculture land. Annual net income to the farmers from cultivation of two agriculture crops per year namely paddy and wheat is NRs 32,668 (MoAC, 2011b) which is less than 0.1 percent of economic value of BNP. The study does not take into account of both the ecosystem services provided by agriculture land as well as potential negative externalities of agricultural land.

Table 11 compares amount of expenditure and revenue realized along with the economic benefits of BNP. The government revenue is less than 2 percent of total economic benefits of BNP. Hence, government revenue is very less when compared to total economic benefits. The economic benefit of BNP is nearly 21 times higher the total expenditure incurred in management of BNP and 53 times higher the revenue realized by BNP.

Table 11: Total economic benefits, expenditure and revenue realized from BNP

Particulars	Unit	Value
Total economic benefits	Rs '000	566,476
Revenue of BNP*	Rs '000	10,649
Total expenditure in BNP*	Rs '000	27,132
Ratio of revenue to total economic benefits	%	1.9
Ratio of total economic benefits to government expenditure	Times	20.9
Ratio of total economic benefits to government revenue	Times	53.2

Source: * DNPWC, 2012

After estimation of total economic benefits, financial and economic return was assessed to understand return on investment together with the need of better allocation of resources for conservation and development in light of both growing demand of environmental

goods and services from BNP. Input to output ratio analysis of BNP was carried out to assess financial and economic benefit (table 12).

Existing financial receipts from BNP are sufficient to cover only around 39 percent of the cost incurred by the Government. There is a net financial loss to the government from the management of BNP amounting to NRs.16.4 million.. This reveals that management of BNP is not worthwhile when financial return is considered. Hence, social benefit-cost criterion is more appropriate tool of analysis of public sector undertaking with significant externalities. The total benefit from BNP is NRs. 566.5 millions with the total cost of 49.6 millions. The net societal benefit from the management of BNP is NRs. 516.9 million. The national and global community receives benefits of NRs. 11 for every rupee spent by the government of Nepal.

Table 12: Financial and economic benefits of BNP (2010/11)

SN	Particulars	Financial		Economic	
		Total (NRs. 000)	NRs./ha	Total (NRs. 000)	NRs./ha
1	Expenditure (Cost)				
1.1	Government*	27,132	183.9	27,132	183.9
1.2	Conservation partners*			22,475	152.4
	Sub-total	27,132	183.9	49,607	336.3
2	Benefits (Return)				
2.1	Government revenue*	10,649	72.2	10,649	72.2
2.2	Economic benefits**			566,476	3,840.5
	Sub-total	10,649	72.2	566,476	3,840.5
3	Return (loss)	(16,483)	(112)	516,869	3,504.2
4	Benefits cost ratio		0.39		11.4
5	Return as % of expenditure		(60.8)		1,141.9

Source: * BNP, 2011; ** see Table 10

Financial analysis showed that management of BNP results a huge financial loss while it generates significant high net benefit when societal benefits are taken into consideration. This reveals that financial analysis or revenue alone should not be considered alone while taking management decisions of protected areas.

Present government budget (input) is around 5 percent of total economic benefits of BNP (output). Economic benefits are expected to grow at least at the rate of GDP growth rate for the next 10 years which is 3.5 percent per annum. The forestry budget has been increasing at a rate of 9 percent during the last ten years. But this has not been sufficient to meet conservation needs (BNP, 2011). It is very difficult for increasing public sector investment on protected areas considering political and economical situation of the country. Nevertheless, government should at least increase budget at the current rate (9 percent per annum) for the next ten years,

which will contribute significantly to improve input output ratio and consequently ensure sustainable management of BNP. Apart from this, Department of National Park and Wildlife Conservation should lobby for development of compensatory fund transfer mechanism for biodiversity conservations in recognition of its high economic benefit to the society.

Conclusions

BNP provides a wide range of provisioning, regulating, cultural and supporting services which are commonly known as ecosystem services. The economic benefit derived from BNP is NRs 566.5 million per annum while its resource value is more than 80 billion. Hence, total annual economic benefit of 566.5 million is an indication of minimum value of the benefits received from BNP. The study further shows high economic benefits and returns from protected area even when conservative estimates are made. Assessment of economic benefits of BNP reveals the following:

- Provisioning services such as firewood, sand and boulder remains the main economic benefits derived from BNP followed by recreational and soil conservation services. Hence, provisioning and cultural services remains main economic benefits.
- Economic benefits of BNP are highly underestimated when standing value of forests and endangered species are taken into consideration..
- Economic value of the BNP is very high when even compared with alternative land uses, especially with agricultural land.
- Management of BNP is not worthwhile when financial return is considered, however its societal benefits is quite high. Hence, financial analysis or revenue alone should not be taken into account while taking management decisions of protected areas.
- Conservation costs is very low while societal benefits are high, thus creating an opportunity for significant welfare gains from increased conservation investment. Likewise, current level of the government expenditure is inadequate to sustain and conserve biodiversity.

Park managers should proactively communicate the economic benefits of protected areas to the public and policy makers in order to maintain support for protected area management. Likewise, efforts should be made on introducing sustainable financing mechanism, especially on Payment for ecosystem services, conservation fees to correct the problem of lack of funding for management of protected area. It helps to address the two key problems often found in the management of the protected area, which includes (a) inability of the governments to cope with the necessary funds required to conserve natural resources and (b). involvement of all the stakeholders, who receive benefit or suffer from the ecological services derived from natural resource base and its conservation.

The government should introduce and institutionalize the "Trust fund concept" to provide long term financing for biodiversity conservation, sustainable management of natural resources and livelihoods improvement, which was also recommended by the National Biodiversity Strategy, 2002. Fund should be generated through (a) attracting and administering external funds (b) generating fund to encourage conservation and (c)

introducing market-based fees for goods and services. Fund should be deposited in the specific fund account such that all fund can be ploughed back to same sector or areas from where fund has been generated. Independent institutions should be established for operation and management of fund. These institutions provide long-term sustainable funding for conservation activities following the performance based system either in the form of grants, direct payments, budgetary support and designing and implementing programs/projects that support conservation.

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The population status, structure and distribution of greater one horned rhinoceros in Nepal, with special reference to the population of Chitwan National Park

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Abstract

The status of greater one horned rhinoceros (*Rhinoceros unicornis*) has been an indicator of Nepal's conservation success. In 2011, its abundance and distribution in the whole country was assessed with a total block count method using captive elephants. The accuracy of this method was assessed by comparing with capture-mark-recapture (CMR) analysis of individuals in a subpopulation where number and individuals were known from description and photographic images.

A total of 534 rhinos were found during the census consisting of 503 in Chitwan National Park, 24 in Bardia National Park and 7 in Suklaphanta Wildlife Reserve. Since the population was low in the late 1960s, after the establishment of Chitwan National Park in 1973 – rhino population increased at an annual rate of ca.5%, reaching its maximum of estimated 544 individuals in 2000. During the following 5 years, numbers were sharply reduced due to heavy poaching; thereafter the population has increased steadily at an annual rate of 5.1%, in spite of local decline in eastern part of the park. The ratio of male to female and the proportion of sub adults and calves appeared to have increased in recent years. Although the major rhino population in Nepal (in Chitwan) is again in an increasing trend, recent habitat degradation due to invasive species like *Mikania micrantha* and bush encroachment in grasslands combined with heavy poaching induced by the fragile political situation in the country, mean that the population is still under continuous threat.

Key Words: one horned rhinoceros, Conservation, Status, Nepal

Introduction

Mega-herbivores are globally vulnerable as a result of habitat conversion, fragmentation, poaching and illegal trade of their body parts. Their populations are mostly confined in small isolated protected areas (Owen-Smith 1988, Sukumar 1989). In Asia, the greater one horned rhinoceros *Rhinoceros unicornis* (henceforth rhino) has been seriously compromised by this fate. During the fifteenth century, rhinos were abundant throughout the floodplains of the Ganges, Brahmaputra and Sindh rivers and their large tributaries between Indo-Burmese border in the east and Pakistan in the west (Blanford 1891, Laurie 1978, Dinerstein 2003). At present, some 2,800 rhinos survive in isolated pockets of protected areas in India and Nepal (Talukdar 2009).

Rhinos in Nepal suffered a catastrophic decline during the 1960's to less than 100 animals due to loss of habitat and poaching that resulted from conversion of Terai grasslands and forests to agriculture subsequent to a malaria eradication and resettlement programme launched by the Government of Nepal (Laurie 1978, Dinerstein 2003). During the 1960s over 70% of the forests were cleared in Chitwan valley alone (Dinerstein 2003, Caughley 1969, Laurie 1978). After the establishment of Chitwan National Park in 1973 and strict law enforcement, the population gradually recovered to 612 in 2000 (DNPWC 2000, Dinerstein 2003). But during a decade-long armed conflict (1996 - 2005) rhino conservation in Nepal was compromised due to intense poaching, reducing the population to 400 across the country (DNPWC 2005).

Being a highly K-selected species, rhinos are extremely vulnerable to extinction due to deterministic factors such as poaching (Poudyal et al. 2009). At the same time, their biological traits such as large dietary requirements, slow rates of growth and maturation and a long inter-calving interval also render them vulnerable to stochastic factors related to demography. Therefore, to evaluate the effectiveness of conservation activities, regular monitoring of population status is essential for feeding into adaptive management programmes. Acknowledging this, Nepal has been conducting rhino counts at intervals of 3-5 years since 1994. Since 2009, an individual identity-based (ID-based) rhino monitoring programme has also been initiated in low-density and poaching-prone sites in Nepal. The aim of monitoring programme is to enhance rhino security as well as to providing regular information on recruitments and demography.

Herein, we report the status of rhinos in Nepal in 2011 using a total block count method. We further compare the count statistics with previous data to infer patterns. We also calibrate the rhino total counts with a population estimate obtained in an intensive study area in Chitwan wherein individually identified rhinos were used in a closed capture-mark-recapture (CMR) framework.

Study sites

The study covered the current distribution of rhinos within all potential rhino habitats in Chitwan National Park (27°30'N, 84°20'E), Bardia National Park (28°30'N, 81°15'E) including the narrow strip of forest corridor

(about 13 km) along the Geruwa River which connects Bardia with Katarniaghat Wildlife Sanctuary in India; and Suklaphanta Wildlife Reserve ((28°45'N, 80°06'E) (Figure 1).

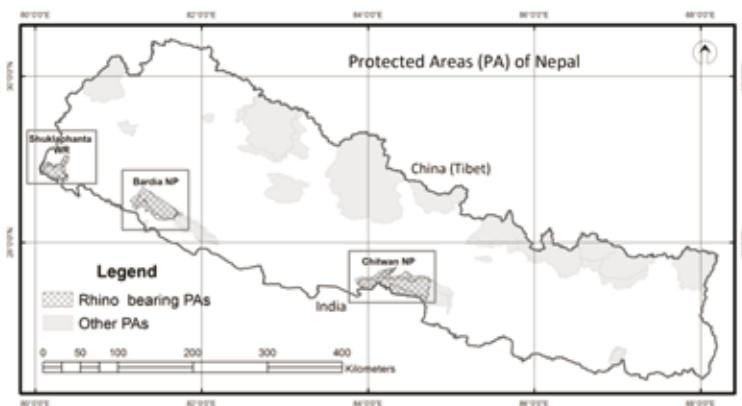


Figure 1. Map shows three rhino bearing areas in Nepal. Other protected areas are also shown.

Chitwan National Park (henceforth Chitwan) covers an area of 932 km² and is located in south central Nepal. The climate is subtropical monsoonal type with three distinct seasons: monsoon (June – October), cool-dry (October – February) and hot-dry (February – June). Average yearly temperature ranges from minimum 9°C in January to maximum of 36°C in May. Chitwan gets average 2,400 mm of rainfall per year, 90% of which falls in the monsoon season (Dinerstein 2003). Chitwan harbors 58 species of mammals, 539 species of birds, 56 species of reptiles and amphibians and 124 species of fish (cited in Thapa 2011). Tiger (*Panthera tigris*), gaur (*Bos gaurus*), greater one-horned rhinoceros (*Rhinoceros unicornis*) and Asian elephant (*Elephas maximus*) are major mammals. General vegetation types of Chitwan are described in Bolton (1975), Laurie (1978), Mishra (1982) and Thapa (2011). The vegetation is subtropical, ranging from early successional floodplain communities along the Rapti, Reu and Narayani rivers to mature climax Sal (*Shorea robusta*) forest on the upper and drier area. Sal forest covers 70% of the park, tall grasslands 15%, and remaining by riverine and other forest types (Dinerstein 2003).

Bardia National Park (henceforth Bardia) is the largest park in the south western lowland Nepal and covers an area of 968 km². The flora, fauna and climate is similar to Chitwan but receives less rainfall. Eighty three rhinos were reintroduced in Bardia from Chitwan between 1986 and 2003 to make a second viable population in Nepal (DNPWC 2009, Dinerstein 2003). Performance of the reintroduced rhinos is available in Jnawali and Wegge (1993), Jnawali (1995) and Dinerstein (2003).

Suklaphanta Wildlife Reserve (henceforth Suklaphanta) is located in far western lowland Terai and covers an area of 305 km². Suklaphanta is drier than Chitwan and Bardia with 1,300 to 2,300 mm of rainfall annually. It has 24 species of mammals, 350 species of birds and 14 species of fishes (DNPWC 2009). It supports the largest population of swamp deer *Cervus duvauceli duvauceli* in the world (SCP 2011). The rhino population in the park was started in 2003 with the translocation of 4 animals from Chitwan to add to one resident rhino which was first sighted and reported in 1995 (DNPWC 2009). More than 70 % of the reserve is covered by Sal (*Shorea robusta*) forest, the remaining is mainly the extensive grasslands and patches of riverine forests.

Methods

Total count method

Rhino census was conducted in April 2011 when visibility conditions were most suitable following the annual burning of the tall grasslands and leaf shedding of deciduous trees (Dinerstein and Price 1991). The survey covered the all potential rhino habitats in Chitwan (503 km²) including Barandabhar forest corridor and 86 km² in Bardia including Khata forest corridor along the Karnali floodplain. Census was not conducted in Suklaphanta as the small population was known through a regular monitoring program.

A survey design based on elephant-backed parallel strip transects was used (DNPWC 2009). All potential rhino habitats were divided into blocks (11 – 75 km²) based on physical features using a topographic map (scale 1:25,000) and reconnaissance surveys (Figure 2

and 3). A block was considered a sampling unit and was surveyed in a single day. Block surveys were conducted from east to west in Chitwan and south to north in Bardia. The probability of double counting rhinos due to their movement from surveyed to un-surveyed blocks overnight was assumed to be balanced by the probability that an equal number of rhinos were missed due to their movements in the opposite direction, in addition to their movement being minimized by topography such as streams, undulating features and Sal forests (Laurie 1978, Dinerstein and Price 1991).

Rhino Count Blocks in CNP, 2011

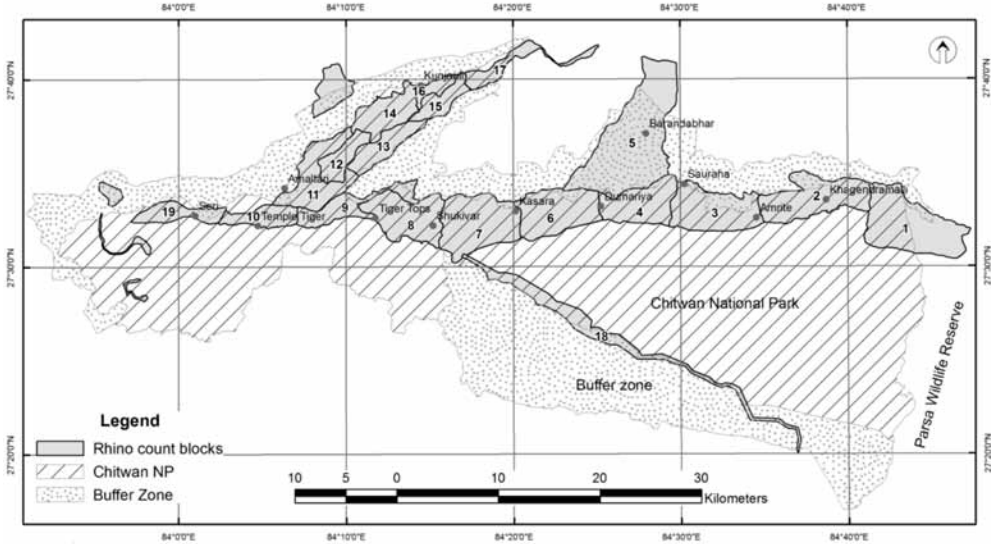


Fig 2. Map showing all potential rhino habitats with count blocks of Chitwan National Park.

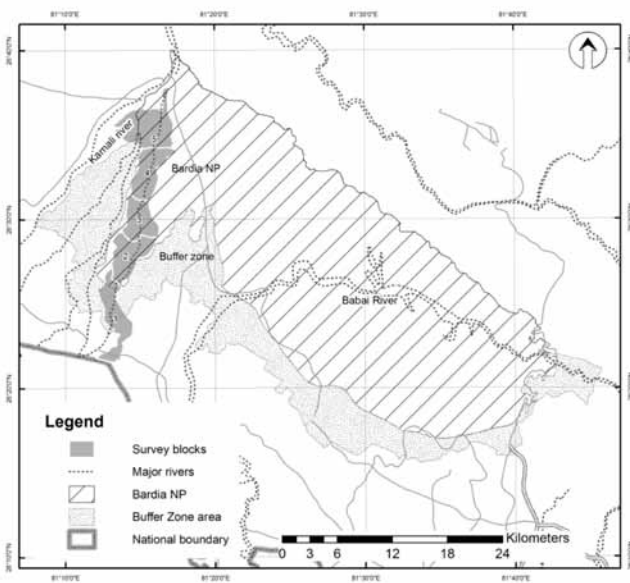


Fig 3. Map showing all potential rhino habitats with count blocks of Bardia National Park.

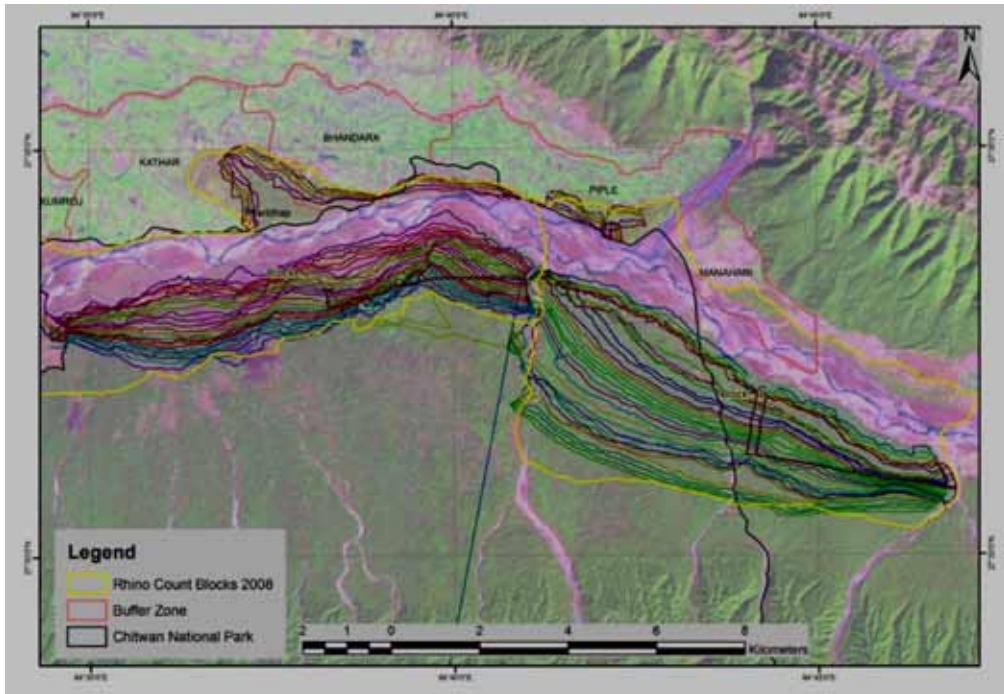


Fig 4. GPS track followed by elephants in block 1 and 2 in Chitwan national park.

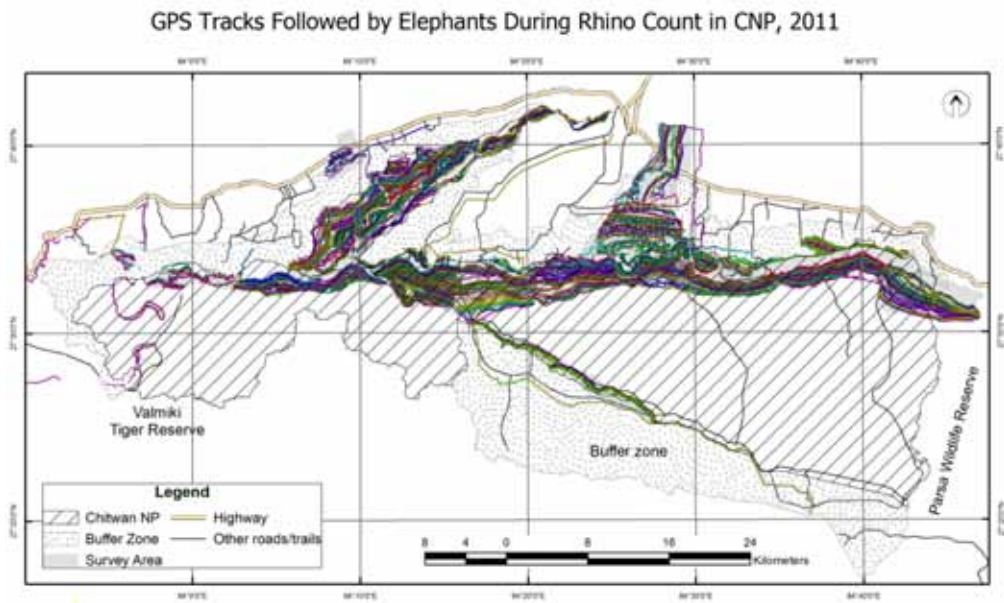


Figure 5. GPS tracks during rhino census showing the path of search by elephants in Chitwan

We used up to 40 elephants in Chitwan and 15 elephants in Bardia to survey each block systematically. Each elephant had an equipped trained observer and elephant driver on the back. Elephants were lined up and moved parallel along transects at a spacing of 50 m in dense forests and 100 – 200 m in open grasslands moving at an average speed of 1-2 km per hour. Each elephant team was equipped with a GPS unit loaded with each day's transect track and a radio unit for navigation and coordination.

To prevent animals from being double counted, rhinos sighted along the transects were recorded only after they had been pushed behind the line of elephants. All rhino sightings were communicated by wireless radio sets and observers from adjacent transects confirmed the observation. We minimized double counts by the above-mentioned coordination and by recording the GPS coordinates, time of sighting, habitat type, group size, movement direction of the rhino, and its age and sex along with any distinguishing features and photographs. The age of the rhinos were categorized as calf, subadult and adult (Laurie 1978). The trained observers and elephant drivers can differentiate the different age classes very easily. If sex was not 100% confirmed it was recorded as unsexed. These data were compiled every evening, debriefed and potential double counts were omitted from the entire block. Fifty five observers participated in the survey and all of them were previously trained in rhino survey techniques.

The total census comprised 19 days in Chitwan, and 5 days in Bardia with a search effort of 3,548 elephant hours. A total of 5,567 km of systematic survey effort was conducted, consisting of 4,817 km in Chitwan, 750 km in Bardia. Sighting condition was excellent throughout the survey with 2,148 km (45%) of effort conducted in grasslands.

Double sampling

Previous rhino censuses (DNPWC 2000, 2005, 2008) assumed a detection probability equal to one. We checked this assumption by conducting ID based rhino monitoring in intensive study area.

Rhinos are identified individually from well recognized features such as horn shapes, folds and body marks (Laurie 1978, Dinerstein and Price 1991). We used blocks 1 – 5 in the eastern section (Sauraha area) in Chitwan to compare rhino numbers obtained by the total count method with a total inventory of all identified rhinos and with an estimate obtained by CMR. In this area, rhinos have been intensively monitored based on individual identification during the past three years. The profile protocol includes full body photographs highlighting distinguishing characteristics, sexer, age and information about locations and associated rhinos. Some rhinos –mainly sub-adults- do not have any recognizable features. However, these constitute only 2-5% of all sightings and such individuals were distinguished from their location and range use, as well as from associated identified rhinos, when applicable.

Two weeks prior to the total count exercise, we conducted a mark-recapture based population estimation using information on individually identified individuals in Sauraha subpopulation (block 1-5). We divided the area into 1 X 1 km grids which were intensively searched by 13 elephants, each with two observers. The entire area was covered within a

period of 4 days, which constituted an occasion. We invested equal search effort within each grid. Three complete coverage searches (occasions) were completed within 12 days (726 elephant hours) so as to ensure population closure. On sighting of a rhino, the observers either identified it based on a photo catalogue that they carried and/or they took a photograph, which was then later used to identify the animal. The data over the three occasions were then organized in a 'X' capture matrix and analyzed in program MARK to arrive at a population estimate. The population estimate obtained by total block counts and from total inventory of individually identified rhinos from Sauraha subpopulation (block 1 - 5) was then compared with the population estimate obtained by CMR analysis.

Results

Abundance and Distribution

The 2011 survey recorded a total of 503 rhinos in Chitwan, 24 in Bardia, and 7 in Suklaphanta, giving a total rhino abundance of 534 animals for the whole country (Table 1).

Table 1. Population status and structure of rhinos in Nepal in April 2011.

Protected area	Age-group	Female	Male	Unidentified	Total
Chitwan National Park	Adult	157	126	49	332
	Sub-adult	14	9	37	60
	Calf	12	10	89	111
	Total	183	145	175	503
Bardia National Park	Adult	7	4	4	15
	Sub-adult	1	0	3	4
	Calf	1	1	3	5
	Total	9	5	10	24
Suklaphanta Wildlife Reserve	Adult	2	2	0	4
	Sub-adult	0	0	2	2
	Calf	0	0	1	1
	Total	2	2	3	7
Grand total for Nepal		194	152	188	534

In Chitwan, 48 animals (9.54%) were recorded outside the park in community forests and Barandabhar forest corridor. Altogether in Chitwan, 44% of the rhinos were found in tall grasslands, 37% in riverine forest, 7% in wetland, 7% in short grasslands and 5% in Sal forest. The highest number was in block 8 and 9 (Sukhibar to Temple tiger) (Table 2). This area of 48 km² holds 46.5 % of Chitwan rhinos. The density and encounter rate in Sukhibar area was 5.6 individuals/km² and 0.32/km respectively. While in the far eastern corner i.e. block 1 and 2, the density and encounter rate was lowest at 0.02/km and 0.003/km respectively.

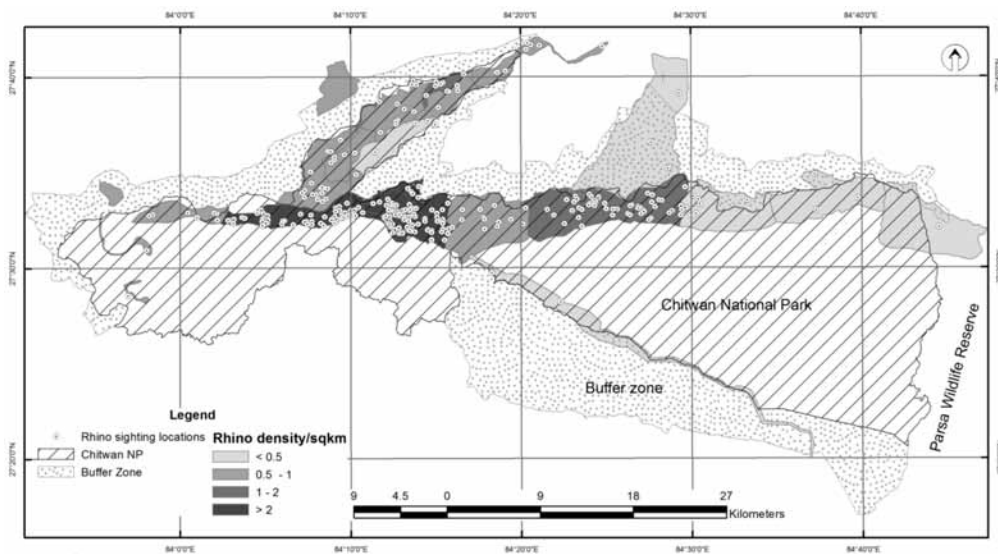


Fig 6. Rhino distribution and density gradient in Chitwan in 2011.

Table 2. Block size, recorded rhino number, density and encounter rate in Chitwan

Count block	Name of the major sites	Number of rhino	Block size km ²	Searched transect (km)	Density/ km ²	Encounter rate/km
1	Sunachuri, Harda	1	46.3	318	0.02	<0.01
2	Harda, Amrite & Kuchkuche	4	34.9	310.8	0.11	0.01
3	Amrite, Marchauli, Icharny	19	33.5	392.4	0.57	0.05
4	Barandabhar corridor	7	24.9	517.5	0.28	0.01
5	Marchauli, Dumaria	46	74.7	235.2	0.62	0.2
6	Dumaria, Kasara	34	31.6	265.6	1.07	0.13
7	Kasara, Kamaltal	17	38.7	273	0.44	0.06
8	Sukibhar, Rapti-Reu junction	164	29.3	510.7	5.6	0.32
9	Reu-Khoraimuhan, Reu-Bankatta	70	17.9	197.7	3.9	0.35
10	Khoria, Temple tiger, Bagai	43	12	195	3.58	0.22
11	Gharial island, Lamichur, Kawasoti	26	38.5	238.1	0.67	0.11
12	Gharial island, Bhorsaghat	10	11.7	183.5	0.86	0.05
13	Bhagedi, Seri, Tamsapur	3	15.1	246.2	0.2	0.01
14	Main island of Bandarjhula	13	20	222.2	0.65	0.06
15	Bhorsaghat, Kujauli	12	10.5	132.7	1.12	0.09
16	Mardighol, Gajapur	8	4.9	126.1	1.63	0.06

17	Kujauli, Sikrauli	11	11.6	258	0.95	0.04
18	Madi, Thori	4	27.7	119.5	0.14	0.03
19	Seri, Tribeni	11	19.2	75	0.57	0.15
Grand total		503	503	4,817		

Temporal and spatial distribution of rhinos was found to be changing in Chitwan. There were 252 rhinos in Sauraha subpopulation (east of Kasara) in 1988 (Dinerstein and Price 1991), 208 in 1994 (Yonjon 1994), 217 in 2000 (DNPWC 2000), 138 rhinos in 2008 (DNPWC 2009) and 128 in 2011 (present census). The data clearly revealed the continuous decline of Sauraha subpopulation after 1988. However, the rhino population west of Kasara in Chitwan is gradually increasing.

Twenty four rhinos were found in Bardia and all of them were confined to Karnali floodplain (Fig 7). Out of twenty four, two were outside the Park at Khata corridor forest and rest were recorded inside the park. Sixty five percent rhinos were recorded in mixed riverine forest and 35% in the floodplain tall grasslands in Bardia. No rhinos and their signs were found in Babai valley like previous count of 2008. All the rhinos were poached in Babai valley during armed conflict, where 70 rhinos were released between 1991 and 2003 (DNPWC 2009). Some of the Bardia rhinos are dispersed in India towards Katarniaghat Wildlife Sanctuary (DNPWC 2009, Jnawali 1995). Some 4 to 6 individuals were reported in Katarniaghat Wildlife Sanctuary at the time of count (Ramesh Thapa, pers. comm.).

In Suklaphanta, 7 rhinos were found distributed along the Chaudhar and Mahakali river floodplains. Our annual monitoring data showed a frequent movement of rhinos towards India at Lagga Bagga Tiger Reserve (Fig 8), which is contiguous to Suklaphanta.

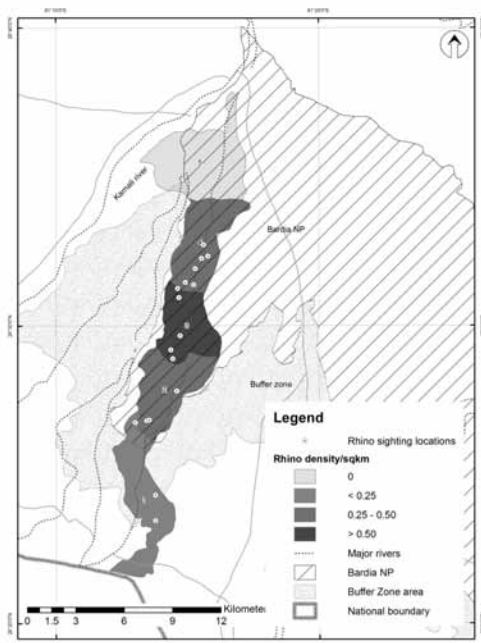


Fig 7. Rhino distribution and density in Bardia National Park



Fig 8. Rhino distribution in Suklaphanta Wildlife Reserve

Performance of three different abundance estimate methods

In 2011, in the intensive study area of Sauraha (block 1 - 5) we had 67 individually identified rhinos with photographs and 5 sub-adults with photos but not having clear features for identification. Also, there were 3 individuals rhinos that occasionally used the study area. CMR analysis revealed 72 to 75 animals occupied this area at any one time. During the total count we found 77 rhinos in the same area (see Table 2).

From a total of 161 rhino sightings, 66 unique individuals were identified. The best model selected by CAPTURE was model Mh that incorporated individual heterogeneity in capture probabilities ($p = 0.81$). The population in Sauraha was estimated at 66 ± 2.3 . Since the population of non-identifiable rhinos in the study area was 5, the total population estimate was between 67 to 76 rhinos with 95% confidence interval. Thus, three methods produced quite consistent and comparable results.

Population structure

Out of the 503 rhinos recorded, 66% were adults, 12% sub-adults and 22% calves in Chitwan (Table 2). Thirty five per cent of the adult animals could not be sexed (Fig 9). Among the sexed animals, the adult female to male sex ratio was 1.24 ($N=283$) for the Chitwan and 1.75 ($N=17$) for Bardia. In Chitwan 60% of the adult females had calves and 55% had calves in Bardia. Bardia population had 62% adults, 21% sub-adults and 17% calves.

The female to male sex ratio was 1.43 in 1994 and 1.58 in 1988 in Chitwan (Yonjon 1994, Dinerstein and Price 1991). It indicates a slight increment of male proportions in the population. In 1975, there were 52.2% adults, 21.2% sub-adults and 26.6% calves (Laurie 1978), and the population structure was similar in 1988 and 1994 (Dinerstein & Price 1991, Yonjon 1994). The proportion of adults started to increase after 1994, and which reached maximum in 2005, thereafter it is again decreased gradually (Fig 10). Similarly, the proportion of calves and sub-adults was lowest in 2005 and is steadily increasing in recent counts.

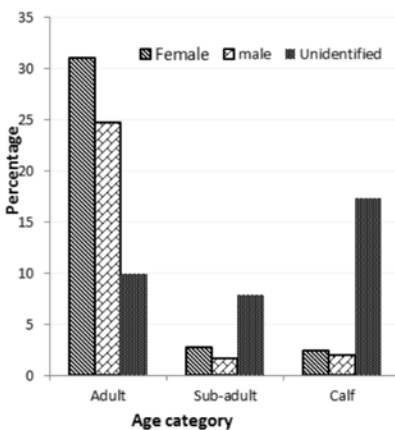


Fig 9. Age and sex composition of rhinos in Chitwan in 2011.

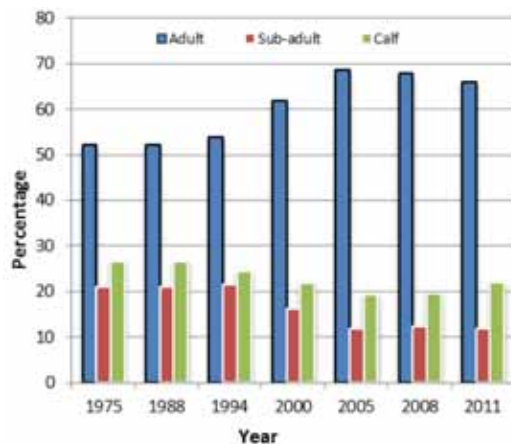


Fig 10. Composition of age group in different count years in Chitwan.

Population trend

Rhino numbers in Nepal have been seriously compromised by poaching (Roothley et al. 2004, Poudel et al 2009). Because of poaching, the population has fluctuated markedly (Figure 11). Between 1966 and 2000 – especially after the park was established in 1973 – the population in Chitwan steadily increased due to improved security. Then, during the political upheaval between 2000 and 2005 heavy poaching decreased the population at annual rate of 7.6% (Fig 10).

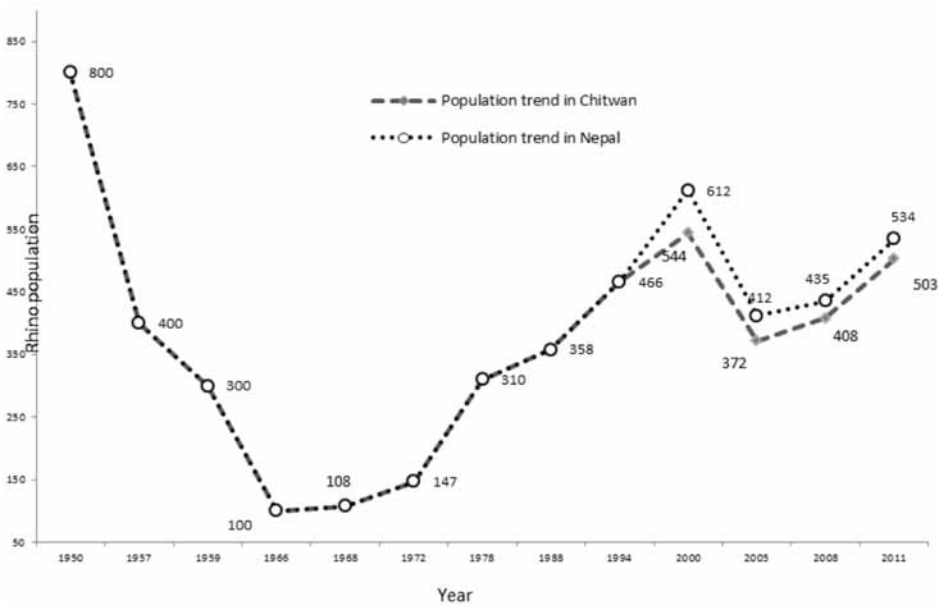


Fig 11. Rhino population trend in Chitwan and Nepal.

Mortality

Between 1998 and 2010, 341 rhino mortalities were registered in Chitwan. Of these, 47.5% were male, 34.9% female and 17.6% unsexed. Similarly, 85% were adult, 2% sub-adult and

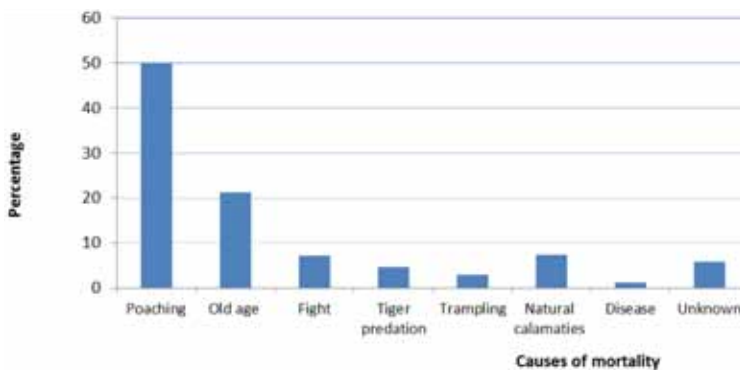


Figure 12 Rhino mortality due to different causes in Chitwan (1998-2010).

13% calf. Fifty percent of the rhino mortality was caused by poaching, 21% by old age, 7% by natural calamities (flood, drowning etc), 7% by fighting, 5% by tiger predation, 3% by adult's trampling, 1% by disease and 6% by unidentified causes (Figure 12). Poaching in Chitwan peaked during 2002 and 2003 (Figure 16).

Discussion

Population trend, structure and distribution

The overall population trend of Nepal supports the statement of Dinerstein and Price (1991) that if poaching can be brought under control and sufficient habitats are protected the rhino populations in the alluvial floodplains of the Indian sub-continent can rebound quickly. By observing the previous population performance of rhinos in Chitwan it can be expected that the population will grow at least by 5% annually if the security system is improved or maintained at the present level. This is quite possible as the population has not yet reached carrying capacity level (Rothley et al. 2004).

On the other hand, the maximum proportion of adults recorded (68.75%) during 2005 was possibly due to heavy poaching of breeding females in 2002 and 2003, which reduced recruitments of calves. In spite of higher mortality of male compared to female in the past 13 years, the gradual increment of the male proportion in Chitwan may be attributed to male biased births in rhinos (Lang et al. 1977) and removal of more females for reintroductions or captive breeding. A total of 103 individuals were removed from Chitwan after 1984 of which over two third were females (NTNC unpublished data).

Our mortality data clearly indicated that the poaching was by far the principal cause of rhino mortality in Chitwan. There has been no rhino poaching in Nepal in 2011. Current integrated antipoaching strategy seems to be very effective, where the Department of National Parks and Wildlife Conservation (DNPWC), the Nepal Army, Nepal Police, local communities, WWF Nepal, the National Trust for Nature Conservation (NTNC), the Zoological Society of London (ZSL), buffer zone community based organizations (CBOs) and other international conservation partners are working together to halt poaching. There were remarkable achievements in halting poaching and trade during last two years. More than 150 poachers were arrested and sent to the jail between 2010 and 2011 (CNP 2012). However, poaching can escalate at any time and is mostly geared up during the periods of political instability like between 2001 and 2005. Currently, Nepal is in a period of political transition and therefore the poaching threat is still prominent. On the other hand, habitat degradation due to recent infestation by *Mikania micrantha*, which has seriously invaded more than 15% of the prime rhino habitat (DNPWC 2009), and ongoing succession of tall grasslands to woodlands have the potential to reduce carry capacity and retard population growth (DNPWC 2009, Murphey et al. 2012 in press).

Out of 503 rhinos recorded in Chitwan, 9.54% were recorded outside the park in Barandabhar forest corridor and community forests in the buffer zone. Dispersal of rhinos outside the park is a challenge for security but is also an opportunity for partnership with local communities in rhino conservation. Because of strong community engagement in rhino conservation

in the buffer zone and the corridor, poaching has been sharply reduced in these areas. However, the security of these rhinos and the human-rhino conflict is a constant challenge for park management.

The Sauraha subpopulation in the eastern part of Chitwan (east of Kasara) has declined continuously since 1988, whereas the subpopulation in the west is gradually increasing. The reasons for the decline could be: (i) removal of 65 rhinos from the Sauraha subpopulation between 1984 and 2003 for reintroductions and captive breeding (DNPWC 2009 and NTNC unpublished data). (ii) Out of total poaching (N=171, 1998 - 2010), 48% of the animals killed were from this small area in Chitwan. About 60% of the poachers arrested from Chitwan valley were from villages close to Sauraha (NTNC, unpublished data). Therefore, we suspect even higher pressure from poaching in this area than actually recorded especially during armed conflict. (iii) Annual monsoon floods are responsible for maintaining prime grazing habitat and high population densities in Chitwan (Laurie 1978, Dinerstein and Price 1991). This phenomenon has been obscured after the establishment of about a 9 km long dyke/embankment along the northern bank of Rapti river between Kumrose and Lothar during 1990s which may have resulted on the reduced productivity and distribution of oxbow waterholes in the Sauraha block (east of Amrite) and hereby contributing to loss of prime habitats and lowering the carrying capacity for rhinos.

The declining trend of Sauraha subpopulation can be turned around by applying the principles of biological management. The best option to accelerate the growth rate will be reintroducing some individuals from the western subpopulation and provide best chance for breeding concurrently with habitat improvements recommended by applied research. On the other hand, the population at Suklaphanta is too small and therefore demands immediate actions for further reintroductions of some individuals. For Bardia, further studies on habitat availability, population performance and security threats will provide scientific inputs for decision making regarding further reintroductions of rhinos.

Comparison of different methods of population estimation

In Chitwan, the tall grasslands, dense riverine forests and small number of rhino population makes aerial count and transect count inefficient (Laurie 1978). Identification and registration of each individual is the most reliable method for carrying out rhino census (Laurie 1978). Dinerstein and Price (1991) used this method as recommended by Laurie (1978) in an extensive way. Later on, Nepali biologists modified this method in 2000 and started total block count method by using a large number of captive elephants. We compared the results of total block count, total inventory through photo registration and mark-recapture methods. These three methods gave very consistent results with marginal difference (2.5% to 7.8% above count by total count method). Combining photo registration of individual animals with total block counts produces reliable population estimates of rhinos and hence is recommended.

Management implications

Nepal rhino populations will always be under serious threats of poaching, even though the rhino security and antipoaching activities have improved recently. Continuous surveillance

and monitoring of illegal trade of horn and effective law enforcement are of grave importance for the persistence of rhino populations in the country.

Habitat degradation through alien invasive plants like *Mikania micrantha* has become a new threat to rhinos. This threat has been aggravated by conversion of grasslands into woodlands and by drying up of waterholes through siltation and reduced flood actions. Immediate actions to control the invasive species and habitat management will help to improve the carrying capacity of the parks. Internal reintroduction of some rhinos from the western subpopulation to the Sauraha subpopulation would help metapopulation management and stimulate population growth. Similarly, Suklaphanta population is too small and should be supplemented by further reintroduction of some individuals.

Photo registration and identification of individuals to estimate the abundance is the best available method for small and low density populations. Both total block count method and photo registration method produced reliable abundance estimates of rhinos. Intensive ID-based rhino monitoring that are in practice will further help in close monitoring of demographic features and hence assists in better scientific management of rhinos

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Abstract

Nepal is one of the tiger range countries, working in tiger conservation with the aim to double the tiger number by 2022 from its base of 2010. Nepal extended tiger habitat by declaring new protected area such as Banke National Park and adding buffer zones such as in Bardia National Park. Increase in stringent protection coupled with intelligence gathering and robust anti-poaching program and collaborative actions of wildlife crime control bureaus and civil society, tiger numbers have been increasing in protected areas such as Chitwan National Park and Bardia National Park. There is hope that the tiger will occupy the newly declared areas of Banke National Park and corridors such as Khata, Basanta, Laljhadi.

We are able to garner support from conservation partners and government domestic financing mechanism for the overall biodiversity conservation in general and tiger conservation in specific. Institutions such as Terai Arc Landscape, National Trust for Nature Conservation, WWF Nepal are continuously supporting to Nepal government in this movement. The buffer zone communities, media and Nepalese societies and global communities are playing vital role in the conservation movement.

While facing the challenge of poaching, growing demands of tiger parts coupled with human-tiger conflict, Nepal is committed to work jointly with all the concerned agencies and stakeholders to fulfill the ambitious target of doubling the tiger by 2022.

Introduction

Tiger is an apex animal in its habitat and terrestrial ecosystem. The tiger is also known as flagship species. There are eight tiger species in the world. However, three species are believed to be extinct (GTRP, 2010). The Royal Bengal Tiger *Panthera tigris tigris*, one of the five surviving sub-species of tiger, has now been endangered, the wild population is around 3200, sharply declined in the recent years. This synthesis provides status of tiger conservation in Nepal.

The estimated number of wild tiger is around 3500 individuals globally. Tiger normally lives in the tropical climate. The species has wide range in terms of distribution. There are thirteen Tiger Range Countries (TRCs)—Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Russia, Thailand, and Vietnam. However, the population distribution is uneven. India has the largest population while Nepal stands 6th position by number. Laos

and Vietnam has very small population (Table 1). Habitat loss, poaching and illegal trade, human-tiger conflicts are largely realized to be causes of tiger population decline. Road and other infrastructure construction have negative consequences to tiger habitats. Basically, infrastructure supports to fragmentation and shrinkage of habitat. Tiger is an apex species and important component in terrestrial ecosystem; the species has superior roles to existence of other species. The species is also regarded as the indicator of healthiness and hygienic ecosystem. Following that importance of tiger, all TRCs including Nepal are aiming to double the tiger number by 2022. In order to achieve these global objectives, seven different activities were identified as the major intervention in the national tiger recovery plan of respective TRCs.

Table 1. Distribution of Tiger

TRC	Estimated tiger population 2010	Expected tiger population in 2022	Estimated % of increment
Bangladesh	440	Demographically stable at or near carrying capacity	25%; 550
Bhutan	75 (67-81)	Demographically stable population	<20%; 90
Cambodia	10-30	50; may require translocation program	50
China	45 (40-50)	Significant population growth	100%; 90
India	1,411 (1165-1657)	50% increase	50%; 2,100
Indonesia	325 (250-400)	Increase tiger populations at 6 priority landscapes by 100% and occupancy levels by 80%	100%; 650
Lao PDR	17 (9-23)	100% increase	100%; 35
Malaysia	500	100% increase	100%; 1,000
Myanmar	85	50% increase	<50%; 120
Nepal	155 (124-229)	100% increase, 2010 survey estimated 155	100%; 310
Russia	360 (330-390)	50% increase	50%; 500
Thailand	200	300, 50% increase	50%; 300
Vietnam	Unknown, low numbers, estimated 10s	50 tigers; may require translocation program	50
TOTAL	Mean=3,643	Overall 60% increase	5,870

Source: GTRP, 2010

Tigers status in Nepal

Nepal deserves the 6th position in tiger number in the world (Table 1). Terai Arc Landscape (TAL) is the main tiger habitat of Nepal, which extends from Bagmati River in the east to Mahakali River in the west. In Nepal, latest population estimates 176 adult and sub-adult individuals (DNPWC, 2009 and 2012). Chitwan National Park boasts 125 individuals, which

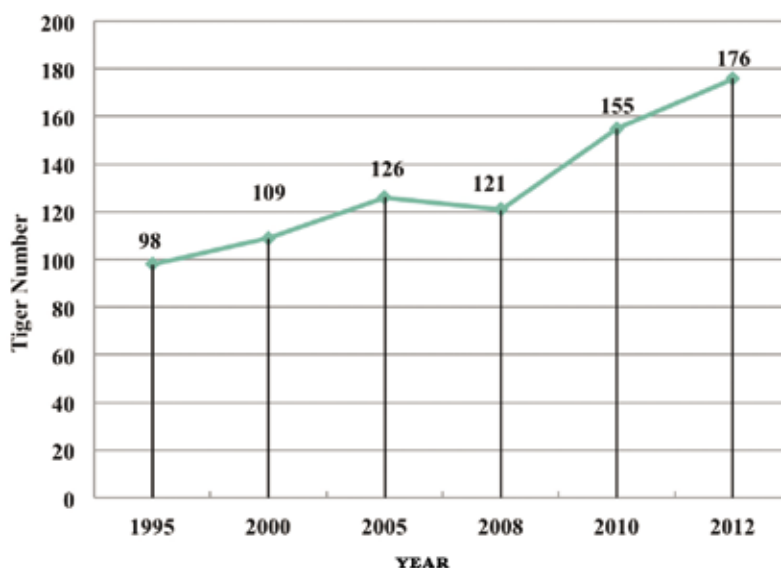
is highest number in a specific area for the country and one of the protected areas in the world having more than 100 tigers, and lowest number is in Parsa Wildlife Reserve that has 4 individuals on record (Table 2). Population of the species in Nepal is more of stable nature over the last decade and the trend is increasing in areas like Chitwan and Bardia.

Table 2: Status of tiger estimated in different studies in Nepal

	19981/(areakm2) in complex	1999/2000 (no)	2005 (no)	2009 (no)	2010 (no)	2012
CNP	50(1921)2/69	50-60	50-60	91	125	125
BNP	25/50	32-40	32-40	19	18	37
SWR	16(320)	16-23	16-23	7	8	10
PWR	Included in CNP			4	4	4
Total	91/135	98-123	103-130	121 (100-191)	155 (95-185)	176

Source: 1Smith et al 1998.2. Also includes PWR, 3 Smith et al 1987b, 4 Wegge et al 2009, 5. Regmi 2000

Even though Nepal does not have a long history of tiger census, the trend shows increasing order of tiger number (Figure 1). A systematic tiger study was started in Nepal in the 1970s. However, initial studies were limited tiger ecology rather than fining the tiger number and develop tiger strategy. The first tiger count was carried out in 1990 and it has been continued at every 3-5 years intervals. The initial tiger count was initiated based on the counting pugmark (foot prints) method. Later, this method is replaced by camera trapping though it is expensive, represents cut-edging technology in the wildlife research elsewhere in the world. Obviously, wildlife census in the jungle is not easy task. It requires huge budget amount, technique and technicians and equally risky job.



Source: DNPWC 2012a

Figure 1. Tiger population trend in Nepal

In order to count the tiger number and monitor the tiger number with consistence and reliable methods DNPWC has developed a tiger monitoring protocol (DNPWC 2008). This protocol has provided a ground to the protected area managers and conservationists. However, it is essential to revise and update following the ecological change and tiger population and distribution as well.

TAL is the tiger habitat to Nepal. In many instances, tiger habitat of Nepal are interrelated to India as same tiger habits extended and expanded at both counties jurisdictions. Tiger conservation is a common goal to everyone; it is a concurrent matter to both countries. In many instances, the government of Nepal and the government of India applied common efforts together under trans-boundary cooperation.

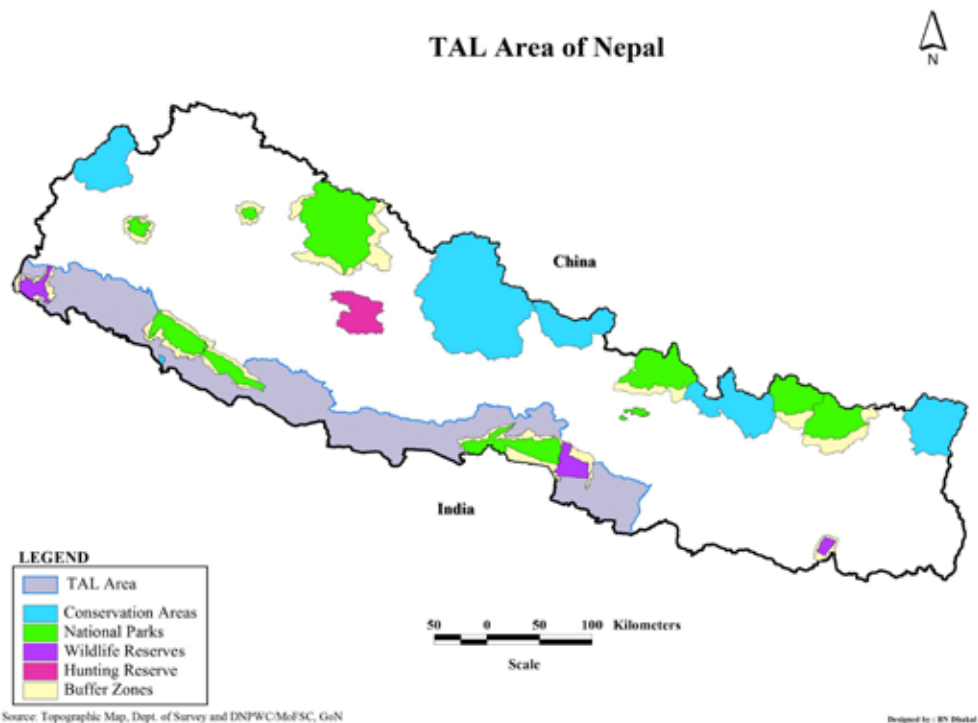


Fig. 1. Terai Arc Landscape, Nepal.

Tiger conservation efforts

Tiger Conservation special Program

The Government of Nepal has been allocating 60 Million Nepali Rupees for tiger conservation annually. Based on the two years experience of this program, we observed immense effects of all weather road construction, and consequently all seasons patrolling and reduce both poaching and illegal trade of wildlife. This program is observed equally fruitful to grassland management, wetland maintenance and improves the wildlife habitat. This program is

implementing by the Department of National Parks and Wildlife Reserve, Department of Forests and three Regional Forest Directorate.

The Government of Nepal equally emphasized on advance research with cutting edge technology on tiger conservation. Regular tiger monitoring is incorporated in the annual program. This year we carried out tiger count in Shuklaphanta Wildlife Reserve and Bardia national Parks. The results are very encouraging that the tiger number in Nepal is increasing. This good sign for us to double the tiger number as stipulated in the Sent Petersburg Declaration in 2010.

Habitat and wetland management

Nepal has put enormous efforts to create favorable Tiger survival environment through habitat management, poaching and illegal trade control, extension of habitat, establishing of corridors and connectivity, regular monitoring of tiger, new approach of scientific assessment, maintenances of prey base, mitigating human tiger conflicts, engagement of local people, special budgeted program for tiger conservation.

Grassland in all tiger bearing protected areas of Nepal are maintained in order to provide grassland facilities to prey base of tiger. Once a year, local people are allowed to collect grasses. Some of the grasslands are cut to provide the fresh flush of nutritious grass to herbivores. Cutting is followed by burning in some patches to further reduce the biomass from the grassland floor.

Wetlands are invaded by species such as water hyacinth, lettuce. Wetlands are cleaned in short interval to control by weeds. Most of the wetland gets dry during the hot dry season. Thus, in some of the wetlands, small dams are erected to raise the height thereby holding required water level.

Involvement of local communities in tiger conservation

Local communities of the settlements are organized into groups, formally known as user groups under the umbrella of Buffer Zone management. Representative of the groups are organized in committee, known as user committee. A management committee is formed from the chairs of the user committee in the protected area.

Different sub-committees and functional groups are formed for the specific conservation and development activities. Youths are organized in each sector and committees are formed in user committee level. These youths are actively engaged in to different conservation awareness activities including the protection of wildlife in and around their areas. These volunteers have high level of commitment and are able to trace if any suspected persons are observed in there areas. In some protected area, they also volunteer in the patrolling with park personnel. Selected leaders and members are given different kinds of training, exposures and skill enhancement opportunities.

Fourteen representatives of Sukla, Bardia, Parsa and Chitwan are receiving intensive formal and on the job training in tiger, rhino and other biodiversity monitoring conducted by the National Trust for Nature Conservation-Biodiversity conservation center, Chitwan. Some of them have already been successful for the post of game-scout-the grass root staff in protected area.

Control poaching and illegal trade

In order to implement the Sent Petersburg Declaration, its objectives and our own responsibilities, the Government of Nepal has initiated various tiger conservation efforts. The initiation was started from political will at national level through the formation of National Tiger Conservation Committee (NTCC) under the chair of Prime Minister. The recent meeting of NTCC was held in the July 29, 2012 on International Tiger Conservation Day and the Prime Minister was instructed to conduct the nationwide tiger monitoring using uniform method in the meeting.

Nepal is said to be transit country for the illegal trade of wildlife body parts between India and China, and a country of origin of tiger parts. The Environment Investigation Agency described Kathmandu as a “staging point” for illegal skins brought in from India to trade to Tibet Autonomous Region of China. However, Nepal no longer remains as the hub for skin trade like in the early 1990s. Frequent seizures of wildlife parts also indicate that Nepalese territory is increasingly being used to transport these goods to the end users in TAR China, East Asia and even to the west. There is a well-connected nexus for smuggling wildlife commodities linking Nepal with China and India. Further, Nepal’s porous border and its extensive international airline connections have made it an easy flow area.

Twenty nine criminals have been prosecuted on tiger poaching related crime in Nepal in three years (2009 to 2012) with 10 tiger skins and about 41 kg of bones (Table 3).

Table 1. Distribution of Tiger

S.N	Year	Persons arrested	Skin	Bone (Kg)	Location of incident
1	2012	2	1		Bardaghat, Nawalparasi
2	2011	16	6	29.1	Bara, Kanchanpur, Parsa, Kathmandu
3	2010	9	3		Dhanusha, Kathmandu
4	2009	2		12	Bharatpur
	Total	29	10	41.2	

(Source: DNPWC, 2012)

Locations of seizure of skins and bones suggest significant seizure were made near to the tiger bearing PAs in Nepal. Some portion of the parts was being carried to Kathmandu (might go to international market) that indicates inclining threat to tigers in Nepal and India

(Karki et al 2008) (Table 3).

During four years (2006-2010), 16 persons were accused in five different cases of illegal trade of tiger parts in Chitwan National Park with penalty ranging from Rs 50000 to Rs100000 and up to 15 years of imprisonment. Ten persons were arrested in four different cases between from 2008 attempting to trade the tiger parts and are under CNP court in the process. As per the National Parks and Wildlife Conservation Act 1973, person convicted for killing or illegal trade of tiger parts can be penalized with Rs 50,000 to Rs100, 000 of fine and 5 to 15 years of imprisonment or both.

Terai Arc Landscape (TAL)

Terai Arc Landscape (TAL) covers from Bagmati River in the east and Mahakali River in the west is a small, but important landscape that harbors a remarkable number of wildlife including tiger. TAL provides habitat to elephants, leopards, rhinos, bears and crocodiles that still live in the jungles, grasslands, and wetlands of Terai, the southern plains of Nepal. The TAL area is also habitat of local communities and has helped thousands of rural poor to improve their lives basically who are living in and around the protected areas, protected forests and other national forests. The programs also supports to local communities in forests and wildlife conservation and management, and secure their usufruct right over the natural resources through access and to and control over the benefits.

Even though TAL program envisaged involvement of several donors and conservation partners, mainly supported by WWF Nepal. It supported to habitat management, control poaching and illegal trade, awareness and capacity building of government staff, wetland management, income generating activities and community development activities. Involvement of local communities in community development has a number of implications. Major implications are creation of employment opportunities, income sources, and improvement of livelihoods of local communities as a whole. TAL program has also positive implications on ecological and social safeguards to wildlife and people concurrently.

In addition, National Trust for Nature Conservation supports to carry out the research and support to the Department of National Parks and Wildlife Conservation. In the TAL area, NTNC has three field offices respectively Biodiversity Conservation Center (BCC) in Chitwan National Park, Bardia Conservation Program (BCP) in Bardia National Park and Shukla Conservation Program at Shuklaphanta Wildlife Reserve. A small office is also established at Parsa Wildlife Reserve. These offices used to train frontline field staff and wildlife technicians. Besides, these offices also support to community development and livelihood activities like TAL.

Strengthening Regional Cooperation for Wildlife Protection in Asia (Regional IDA Project)

The Regional IDA Project funded by the World Bank for five years. The worth of this project is 3 million US\$ and aims to assist the participating governments to build or enhance shared

capacity, institutions, knowledge and incentives to jointly tackle illegal wildlife trade and other select regional conservation threats (DNPWC, 2012). The project has three components namely (i) Capacity building for addressing the illegal trans-boundary wildlife trade, (ii) Promoting wildlife conservation in Asia and (iii) Project coordination and communication. The component (i) includes Institutional strengthening in wildlife conservation and illegal wildlife trade control and staff capacity building and training toward regional collaboration. Similarly, component (ii) incorporates Virtual Regional Center of Excellence (VRCE) for wildlife conservation, competitive funding to support the management of protected areas (PAs), forest reserves (FRs) or reserve forests (RFs) and national forests (NFs) with regional conservation benefits and innovative pilot projects with a regional dimension popularly known as the Window approach. The window opportunity always may have two synergy effects. First, field managers can developed an innovative proposal that is needy in the field following the ground reality. Second, the field manager can capitalize their innovative ideas, which always emerged in the mind based on the ground reality.

Landscape conservation-Trans-boundary cooperation

Corridors and bottlenecks managed in Nepal's Terai Arc Landscape offer additional land base for tigers outside the PAs. Restoration of degraded habitats and reduction in grazing pressure are some major interventions undertaken in corridors and bottleneck areas. There is increased sign of habitat use by tigers. Occupancy of corridors by prey base indicates improvements in habitat quality in areas outside protected areas (WWF, 2006). Other land bases that provide prey base include community managed forests and part of national forests.

Trans-boundary cooperation has been increasingly realized as one of the essential mechanism for better conservation and effective management of PAs, especially in resolving trans-boundary problems such as wildlife movement and trade of wildlife body parts and sharing of experiences between neighboring countries. During the process various types of trans-boundary meetings, trainings and study visits has been organized.

Challenges and way forward

Human-tiger conflict

Wildlife - human conflicts are normally regarded as the negative outcomes of conservation. It has negative consequences in conservation too. Tiger-human conflict is one of the serious threats for the continued survival of tiger and, if conflicts are not adequately minimized, local support for conservation may decline rapidly (Bhatta et al 2008). Human and livestock casualties are major forms of conflicts with tiger. Beside, poaching, tigers are often killed in retaliation or to 'prevent' future conflicts.

In last 8 years, tiger killed minimum 2,923 livestock (Sheep, Goat, Pig, Buffalo etc), which is one livestock per day in the country (Thapa, 2011). Of those 97, people killed in past 27

years, 90% were killed in Chitwan and the trend of human loss has increased significantly from an average of 1.5 persons per year (1979 – 1998) to 8.25 persons per year since 1999 (Gurung et al 2006). The trend of increase is significant in buffer zone areas compared to inside the boundary of park but in last few years casualties are decreasing. As an example, only one person was killed in Chitwan in 2011 from tiger attack.

This conflict has not only affected human beings but also tigers. A total of 28 tigers were removed from their natural habitat due to this conflict from these areas (BNP 2004, Gurung et al 2006). Out of 36 tigers that were killed or died naturally between 2000 to 2007, 2 (6%) were killed as retaliatory killing by poisoning and 3 (8%) were killed due to their man eating behavior.

As the buffer zone area were more managed, this became good habitat of tiger that attracted the species to move out of park boundary, as well as, when restrictions were made in buffer zone community forests, people started moving to the core park areas for various proposes which has increased the conflict. With that, there is low level of awareness and high ignorance in communities about the risk of wild animals and way to handle them. Likewise, decrease in prey base in the area has forced tigers to enter settlements for prey that has increased the chances of encounter with human beings as well as it irks the local communities when they loss their livestock (Bhatta et al 2008).

The conflict is increasing as human and tiger share common resources and likely to increase in future as both are coming closer to meet their needs. The Landscape approach of conservation is essential for long-term survival of tiger but this may further enhance tiger-human conflict. Thus, Tiger-human conflict mitigation measures have to be adequately considered in PAs and corridors if the target of doubling the tiger population by 2022 is to be fulfilled.

Relief mechanisms to communities

Appropriate relief mechanisms and timely compensation could only retain the trust of local communities in conservation particularly wildlife victims. Maximum relief paid so far in Chitwan NP is Rs. 25,000 for human casualty, up to Rs. 10,000 for human injury (treatment) and 25% of the cost of livestock as judged by local users for livestock casualty. The relief payment is done is only after the decision of Buffer Zone Management Committee as per the criteria set up by themselves. Relief guideline 2066 Bs has provisioned to pay Rs 150,000 for human casualty but has no provision of payment for crop and property loss which has increased the rift between park authorities and management committees.

Controlling poaching and illegal trade

Identification of parts or products derived from tiger is one of the major problems faced by enforcement officials. Pieces of tiger skin, tiger bone or its powder and other derivatives are difficult to identify in the trade points such as custom entry points, police check points and so on. People in such places are not fully aware of the CITES and traders take benefit of this. DNPWC with is conducting CITES implementation related training to enforcement officials in Kathmandu valley and in the districts around PAs. The government has sent some officials

to Wildlife Institute of India to learn the laboratory skills on identification of such specimens and products.

The government has established WCCCC (Wildlife Crime Control Coordination Committee) under the chair of Minister of forests and soil conservation aiming to combat the poaching and illegal trade of wildlife parts particularly tiger. WCCCC mainly aims to gain political commitment in the center. In order to execute policy for effective law enforcement, The government of Nepal further established WCCB (Wildlife Crime Control Bureau) under the chairmanship of Director General of DNPWC in the center. Following the aim of WCCCC and WCCB, 10 WCCB units have already been established covering 12 different districts.

Shrinkage of habitat

Ever expansion of cultivated land is largely considered as one of the major underlying cause of tiger habitat shrinkage. Migration of people from various parts of the country to the TAL area and their intended and unintended activities always put pressure on forests. Forest patches of Bara, Banke and Dang districts are among the shrunked tiger habitat. The habitat shrinkage increases the tiger-human conflicts.

Habitat Degradation

Habitat degradation includes loss in quality and quantity of prey-base. The potential tiger habitats outside the PAs do not support adequate tiger population to ensure long-term viability (Smith et. al 1998). In many parts of tiger's range area, ungulate assemblages with no large or medium sized prey (cervides or bovids) support low tiger density and poor reproduction rate (Karanth & Stith 1999, Karki et al 2009). Decline in prey base as a result of habitat degradation and widespread poaching has limited land base that can support tigers. Shrinkage of tiger habitat due to conversion of forest land and degradation due to increased human and livestock pressure has resulted low prey availability causing overall loss of tiger habitat (Poudel et al, 2008).

Fragmentation

Construction of national and international highways has further enhanced fragmentation of tiger habitat in all five PAs in Nepal where tiger is available. Similarly, rampant construction of rural roads without conducting IEE and EIA has enhanced fragmentation of tiger habitat. Land fragmentation forms patches of habitat that fragments the population of tiger too r. Fragmented habitat means limited dispersion of new individuals, which results to high competition for habitat and increase inbreeding. Fragmentation of the tiger habitats is one of the major concerns identified in Tiger Action Plan (1999, 2005). More corridors and connectivity are required to maintain gene pool of tiger population.

A total of 1610km² sq. km. area has been added in the protected area system since 1990 as buffer zone in all four tiger range PAs (Chitwan 750km², Bardia 507 km², Parsa 298 km² and

Suklaphanta 244 km²), Banke 898 km² as new National Park, to support tiger habitat. Some parts of national forests have been included in the buffer zones declared. However, has not been expected improvement in habitat due to invasion of alien species such as Mikania macrantha, Lantana camera and habitat alteration.

Inadequate incentives and infrastructures

Tiger bearing protected areas, corridor and tiger habitats outside-protected area are in need of infrastructure and human resources. Appropriate incentives and means to control poaching and illegal wildlife trade needs to further strengthen. Infrastructures damaged earlier require

to be built. The ten wildlife crime control bureaus formed in 12 districts need to be strengthened further to control the illegal wildlife trade and rescue of the wildlife. These units have to be formed in the rest of seven districts as decided by the central level wildlife crime control bureau. The decision to prepare and/or upgrade the database of the poachers and illegal activities by all the agencies and sharing amongst need to be implemented with priority. The forensic science is becoming very important to prove the court cases with proof. The existing facility needs to be upgraded to the international standard. Capacity of the institutions has to be build to tackle such cases time. The transboundary initiatives with India and China in central level and field levels need to be further regularized as per the need.

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