



Human-Wildlife Conflicts: The Case of Chitwan National Park and Buffer Zone People in Nepal

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Abstract: Human-wildlife conflicts are common phenomenon throughout the world which have become significant problems. Human-wildlife conflicts bring many socio-economic and ecological consequences in buffer zone area of the protected area. This study is based on mixed research design combination of both quantitative and qualitative research methods. Household survey, focus group discussions are used for primary data collection. After collecting data, the data are tabulated with coding and tables are constructed with percentage figures and qualitative data are analyzed inductively using descriptions through words and phrases. There are different major sources of conflicts in the people of buffer zone and the Chitwan National Park. The major conflicts are illegal extraction of park resources such as collection of firewood, fodder and timber, livestock grazing, crop raids by wild animals and loss of human life and property. The Mitigative measures used in the study areas for wildlife damage control are repellents, physical constructions and guarding. Different community development programs have influenced buffer zone people's attitude towards the park. Conservation education and with adequate compensation against damages and regular monitoring of wild animals help to reduce human-wildlife conflicts.

Keywords: National Park, Human Casualties, Depredation, Livelihood, Buffer Zone, Crop Raiding

1. Introduction

Since the establishment of Yellowstone National Park as the first protected area in 1872, the establishment of national parks and other forms of protected areas has been a key component of the conservation strategies of many countries [1]. National Parks in the developing countries, particularly in Asia, were established in the beginning of the second quarter of this century [2]. Protected areas has played significant role in the conservation of biodiversity but restrictions of protected areas in using park resources created resource conflict and wildlife induced damage in the form of human harassment or killings, crop damage and livestock depredations has brought negative sentiment towards it [3]. The human-wildlife conflict is a common phenomenon from the past and has become a significant problem throughout the world [4]. Crop raiding, property damage, livestock depredation and human casualties are the most common forms of conflicts with wildlife [5, 6]. Human-wildlife conflicts bring many social, economic and ecological consequences to the surrounding people of buffer zone area. Human-wildlife conflicts arise when they are compelled to share a common limited resource such as land,

game, livestock or fish [7].

Human-wildlife conflicts are closely associated with the wellbeing of the surrounding people. For the first time, the Third World Congress on National Parks held in Bali, Indonesia in October 1982 focused its attention on the relationship between protected areas and human needs and stressed the relevance in integrating protected areas with other development issues [2]. To address the issues of Human-wildlife conflicts including wildlife attacks on people, the changes in National Parks and Wildlife Conservation Act 1973 (fourth amendment in 1993) was made and adopted participatory approach for integrated conservation and development, and reduce wildlife damages [8, 9]. In Nepal it was implemented in 1996 and in the same year participatory approach for integrated conservation and development was provisioned in Chitwan National Park. The main objective of the amendment is to create buffer zones around existing protected areas and increase the level of tolerance of local communities against wildlife damages through sharing of 30 – 50 percent parks generated revenue [9, 10]. They receive regular support from the government (30–50% of the park revenue is shared with buffer zone) as well as grants and subsidies provided by other conservation organizations and government line

agencies. We documented that a relatively low proportion of the budget was spent on direct interventions to reduce wildlife impacts on communities (13.7%) [11]. Management of the buffer zones have been taken by local community based organizations such as user groups, user committees and buffer zone management committee with overall programme planning, resource distribution and implementation process carried out through parks' revenue [10].

The human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources or wild animals or their habitat [12]. Conflicts between human and wildlife are major threats affecting relationship between protected areas and the communities living adjacent the areas [13, 14]. Conflicts between humans and wildlife especially in areas bordering protected area are very common worldwide [15]. The 5th world park congress in Durban pointed out that human-wildlife conflicts occur when the needs and behavior of wildlife impacts negatively on the goals of humans or when the goal of humans negatively impacts the needs of wildlife [16]. As human population expands, the demand for resources will lead to conflicts between wildlife and humans competing for the same resources. Chitwan National Park has achieved success in conserving some of the most endangered species but often at the price of recurring conflicts between park and local people. Conflicts are now more intense and of greater magnitude in Chitwan National Park. These conflicts are often compounded by lack of education, unemployment, lack of community development and park related employment opportunities [17].

Though the history of conservation in Nepal was begun in 1846 by the establishment of a hunting reserve covering tiger habitat in southern Nepal [18], the modern concept of scientific conservation started only after the formulation of The National Parks and Wildlife Conservation Act of 1973 [19]. The history of wildlife conservation in Chitwan valley dates back to the Rana regime (1846-1950). Prime Minister Jung Bahadur Rana declared rhino as a Royal hunting animal in 1846. During Rana regime, the Chitwan valley was a privileged class hunting ground where Royalties from Europe and Princely States of India were invited to take part in grand hunting. Chitwan valley harbored over 800 rhinos until 1950s [20]. In 1957, The Wildlife Protection Act 1957 provided legal basis for wildlife conservation with the establishment of rhino sanctuary to the south of Rapti River and declared as Mahendra Deer Park from the Rapti River to the foothills of Mahabharat range. The National Parks and Wildlife Conservation Act 1973 laid strong foundation for conservation, and Chitwan National Park was gazetted in 1973 as the first protected area in Nepal. The country comprises ten national parks, three wildlife reserves, one hunting reserve, six conservation areas and eleven buffer zones. More than 19.7% of the total area of the country is declared as protected areas [21].

Many studies have been conducted on human-wildlife conflicts issues in national parks in different places of the world. The nature and extent of conflicts are different from place to place. The type of conflict in one locality may not similar in

other areas because geographical, social, economic and cultural conditions are different for all places and times. Chitwan National Park is the first protected area of Nepal and first introduced buffer zone initiatives and envisioned to increase people's tolerance of negative impacts from wildlife. This study identify the causes and impacts of conflict to wildlife with suggesting ways of reducing the conflicts and to refine existing plans and practices to reduce human-wildlife conflicts.

2. Methods and Materials

2.1. Study Area

Chitwan National Park in Nepal is selected for this study because it typifies a national park in the tropics where wildlife density inside the park is increasing and communities around the park are experiencing frequent economic loss and safety threats from wildlife [22]. Chitwan National Park and its Buffer Zone is situated in Bagmati Province in southern part of Central Nepal. The geographical location of the National Park is between N 27° 20' 19" to 27° 43' 16" longitude and E 83° 44' 50" to 84° 45' 03" latitude whereas the geographical location of buffer zone is between N 27° 28' 23" and 27° 70' 38" latitude and E 83° 83' 98" and 84° 77' 38" longitude. The area of the park, when designated in 1973, was 544 km². It was later extended to 932 km² in 1977 and is designated it as a world heritage site in the year 1984. The park covers parts of Chitwan, Parsa, Makawanpur and East Nawalparasi districts. These districts respectively comprise of 74.04%, 15.45%, 6.97% and 3.54% of the total area of the park. An additional 750 km² was designated as a buffer zone surrounding the park in the year 1996. The park is divided into Amaltari, Kasara, Sauraha and Madi sectors for management. Each sector has its own area of responsibility. The National park area is drained by three major river systems, i.e., Narayani, Rapti and Reu rivers. The Narayani River marks the western boundary, the Rapti River marks the northern boundary and Reu River marks the southern boundary of the National Park. Chitwan National Park and buffer zone area of Nepal for this study was selected because it has been experiencing frequent and intensive human-wildlife conflicts since its establishment in 1973 [23].

2.2. Data Collection and Analysis

The mixed methods design is used in capturing best of both qualitative and quantitative approaches to fulfill the research objectives. A mixed methods design is useful when either the quantitative or qualitative approach by itself is inadequate to best understand a research problem or the strengths of both quantitative and qualitative research can provide the best understanding. Both methods are complementary and mixed-methods designs are appropriate. The park is divided into 4 sectors and 22 buffer zone users committees for management. At the first stage, the universe was divided into large sampling units and the sample was selected at random from them. Of the 22 buffer zone users committees, four buffer zone users committees were selected

from random sampling from each sector for management. From these four buffer zone user committees, 845 households among 8450 households were selected using

random sampling. Sampling unit for questionnaire survey is household.

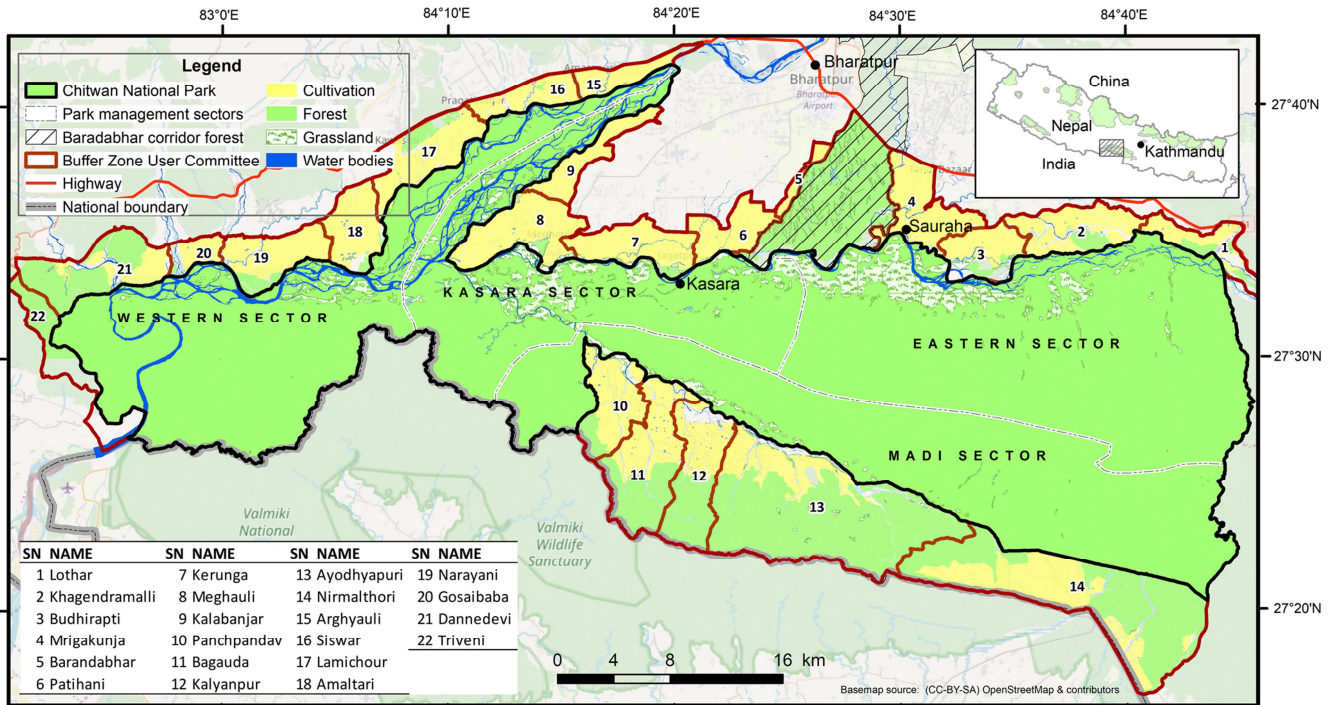


Figure 1. Chitwan National Park and Buffer zone Area.

The main source of primary data was questionnaire survey and focus group discussion. The questions include both open ended type questions and closed ended type questions so as to understand the ongoing issues and problems properly. The secondary data were acquired from the desk review of the published and unpublished hard copies and electronic materials and documents of various organizations, number of published and unpublished research documents, reports and theses and project reports on National Park and buffer zone. After collecting data, the quantitative data from closed ended questions were tabulated with coding and tables are constructed with percentage figures. Quantitative data were processed and analyzed with the help of computer EXCEL software and open ended answers and focus group discussion data were analyzed inductively using descriptions through words and phrases. Non-statistical tools such as maps and diagrams have been used to strengthen the data analysis.

3. Results and Discussions

3.1. Pressures on Park Resources

The relationship of people living around the protected areas has often led to conflicts with the wildlife [24]. The major conflicts is the illegal exploitation of park resources by people of buffer zone in the study area. The people of buffer zone depend their supplies of fuelwood, fodder, thatch grass, medicinal herbs and timber from the park. Most of the farmers keep their own livestock. Cattle are an essential part of the Nepali agriculture system whose manure is used in the farms

and he buffaloes and oxen are used for ploughing and transportation. Almost one fifth of the total sampled household heads who owned livestock reported that their livestock frequently entered and grazed inside the park. People of buffer zone area of Chitwan National Park have utilized various resources like grass, fodder, timber, firewood, thatch, medicinal herbs and many others from the park and have adopted livelihood options. The mean volume of firewood extracted from the park by one household is 18.21 load (Locally called Bhari). In the case of fodder, an average 20.45 loads are extracted by local people. The average volume of timber extracted from the park by one household is 2.5 load in a year. The average volume of vegetables extracted from the park by one household is 1.01 kg in a year (Table 1).

3.2. Crop Raiding

Crop raiding was an issue in the study areas. In the realm of park-people conflict within the developing world, crop damages inflicted by wildlife are viewed as one of the most serious problems plaguing the relationship between humans and wildlife [23]. About 64.61 percent of the respondents suffered some type of crop damages from wildlife whereas the remaining respondents reported no damage during the past 12 months. Crop damages by the wild animals are a major source of conflict between farmers and wildlife in communities that surround Chitwan National Park. As identified by Nepal & Weber (1993) crop damage and threats to human and animal life by wildlife from park are two of the five major causes of park-people conflict in

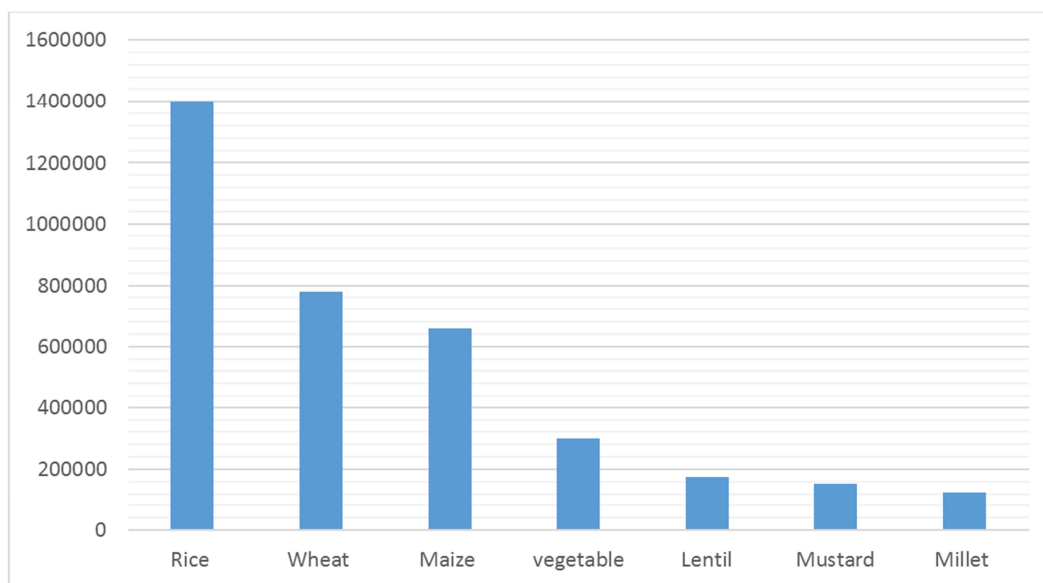
Chitwan National Park. These animals are regarded as the destructive raider and prefers crops such as maize, rice, wheat, mustard and vegetables resulting in substantial losses to the local farmers. Rhino, wild boar, elephant and deer are the main crop raiders in the study area. Crop damages by the rhinos are a major source of conflict between farmers and wildlife in communities that surround Chitwan National Park [25].

The Rhino is often regarded as the most destructive raider [26] and prefers crops such as maize, rice, vegetables and mustard resulting in substantial losses to the local farmers [1]. Rhino is responsible for nearly 16.33 percent of damages to crops during the past 12 months (Table 2). Respondents reported that the damages to crops from rhino are extensive throughout the year. Rhino damages the crops like rice, wheat, maize, vegetables, mustard, lentil etc. Chital and Wild Boar are the main crop raiders during both monsoon and winter seasons and elephant is another crop raider during monsoon season. Wild boar and spotted deer damages the crop like rice, wheat, maize, mustard, millets etc. Elephant damages the crop like rice, maize, vegetables etc. in the study area.

Other animals mostly feed on Maize, Rice, Wheat, Mustard, Lentil and the crop loss depended on the situation of the field, near to park and varied from year to year. The surveyed data shows that the most destroyed crops in the order of severity include rice, wheat, maize, vegetable, lentil, mustard, and millet in the study area. The study showed that the highest percentage of damage of crops is in Rice (32%), followed by wheat (20%), Maize (17%), vegetable (12%), Lentil (11%), Mustard (8%) and Millet (8%). Almost half of the crop losses incurred in Wheat, Maize and Lentil whereas, Rice accounted to near one third of total crop loss.

3.3. Loss of Crop, Livestock and Human life

Loss of livestock is also a severe problem around Chitwan National Park [2]. Loss of human life from wildlife is another source of conflict in CNP. Every year people have been killed or seriously wounded by rhino, tiger, sloth bear, elephant, and wild boar and other wildlife [12, 27]. Wild animals responsible for attacking humans include elephant, rhino, tiger, sloth bear and wild pig/wild boar.



Source: Field survey, 2018

Figure 2. Costs related to crop damage.

In monetary term the greater crop loss is incurred in Rice which amounted to NRs. 13,99,800. The second most damaged crop is Wheat (NRs. 7,78,500) followed by Maize (NRs. 6,57,900), Vegetable (NRs. 2,99,600), Lentil (NRs. 1,75,000), Mustard (NRs. 1,53,800) and Millet (NRs. 1,25,500). Loss of livestock is also a severe problem around Chitwan National Park. It is revealed from the field study that 206 individuals of livestock are killed by tiger, leopard and jackal during the past 12 months. Among them 62 goat/sheep, 35 cattle, 12 calf and 57 Chickens are killed (Table 4). Goat/Sheep are the animals most preyed upon followed by cattle, chicken and calf. 13 houses are destroyed

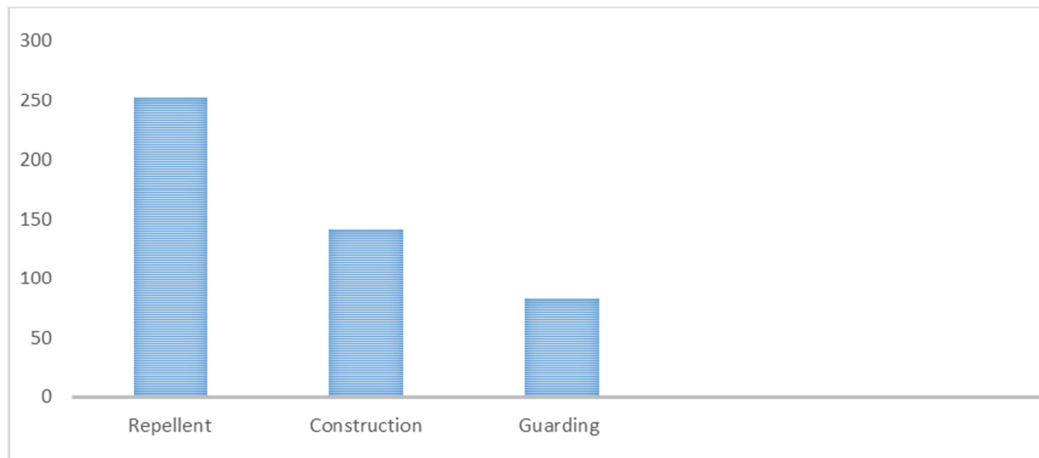
by elephant in the last one year and total loss by house destruction by elephant is NRs. 2,30,000. Elephant destroyed and eat the stored Rice and Maize in 6 houses and total loss by house destruction and ate stored rice and maize is NRs. 55,000 in study area. The total loss by wild animals is NRs 62,77,858 and average loss per household is NRs 11,497.90. One person from the village is killed by elephant and tiger has attacked an adult man in the village during the past 12 months in study area.

3.4. Mitigative Measures

Farmers residing adjacent to protected areas around the

world employ a number of measures to ward off potential damages to their crops and properties [25]. Spatial separation of human and wildlife through physical barriers (fences), guards, and repellents are common preventive measures [28-

30]. The Mitigative measures used in the study areas for wildlife damage control has been classified in terms of repellents, physical constructions and guarding.



Source: Field survey, 2018

Figure 3. Mitigative measures.

About 52.84 percent, 29.68 percent and 17.47 percent of the respondents used different types of repellents, physical constructions and guarding respectively as a method for wild animal damage control. Out of adopting some type of measures to protect against wildlife damages. Noise making and fire making are the methods of repellents used for protection against wildlife damages in study area. Noise making are the most frequently used method to scare away the wild animals from the human settlements and cultivated area. Physical construction is another category of measures employed against wildlife damages. Barriers as fencing, natural barriers, trenches and construction of watch towers locally known as Machan are used to prevent the wildlife from entering the settlements and cultivated area. The implementation of the electric fence at Chitwan National Park has been viewed as an overwhelming success. The fence itself is a joint product of the buffer zone committee, the Nepalese government (who received some funding from international donors) and the inhabitants of villages that surround Chitwan National Park [25]. The electric fences are only effective at preventing crop raiding from large mega fauna species such as rhinos and occasionally, elephants [31]. Banikoi *et al.* (2017) reported only 26% of the electric fences are operational around CNP, the rest are non-functional due to lack of maintenance [32]. The third category of measures employed against wildlife damages is guarding. Guarding is most frequently practiced during nighttime.

3.5. Attitude Towards Parks

There are positive attitude towards the park, loan facilities from buffer zone groups and other benefits from participation in buffer zone and related social programs are considered the main factors form them to have such an attitude. Villager

resides in buffer zone of Chitwan National Parks attitudes toward the Park are becoming more positive as they begin to realize that the Park is a valuable, needed source of managed resources that are not so easily, or not at all, available elsewhere [33]. Different community development programs is also considered by the respondents to have influenced their attitude towards the national park. Because these benefits are closely associated with the attitude towards the park, it is important to investigate the coverage of benefits i.e. if a recipient of one particular benefit is more likely to be a recipient of other benefits.

4. Conclusions

People settle in buffer zone are depend upon Parks resources. There are five major sources of conflicts in the people of buffer zone and the Park. These conflicts are illegal extraction of park resources such as collection of firewood, fodder and timber, livestock grazing, crop raids by wild animals and loss of human life and property. The crop loss was reportedly more in the buffer zone area of Park. Rice and wheat are mainly damaged by rhinoceros and maize was damaged by wild pig and mustard by chital. Human casualties were mainly caused by elephant, rhinoceros, wild pig and bear. These conflicts are the result of the divergence between the priority and objectives of the park and the surrounding people. Out of adopting some type of measures to protect against wildlife damages, noise making and fire making are the methods of repellents used for protection against wildlife damages. Despite their different type of conflicts people have positive attitude towards the park. The park has set and implemented several attempts to minimize the conflict. Relief scheme and buffer zone programme is being launched and systematized. Buffer zone management rule and guideline need to be revised with the main themes of

development and conflict management. This may be helpful in formulating guidelines for human-wildlife conflict of the people of buffer zone.

Appendix

Table 1. Volume of major resources extracted from the park.

S. N.	Items	Average load
1.	Firewood	18.21
2.	Fodder	20.45
3.	Timber	2.5
4.	Vegetables	1.01 kg

Source: Field survey, 2018.

Table 2. Crop damage by wildlife.

S. N.	Animals Responsible for crop damage	No. of respondents	Percentage
1	Rhino	138	16.33
2	Elephants	47	5.56
3	Wild boars	49	5.79
4	Spotted deer	34	4.02
5	Others (Peacock, Monkey etc.)	54	6.39
6	More than two wild animals	224	26.5

Source: Field survey, 2018.

Table 3. Wild animal liable to damage.

S. N.	Wild animal	Crop damage
1	Rhino	Rice, Wheat, Maize, Vegetables, Mustard, Lentil
2	Elephants	Rice, Maize, Vegetables
3	Wild boars	Rice, Wheat, Maize, Mustard, Millet
4	Spotted deer	Rice, Wheat, Maize, Mustard, Lentil

Source: Field survey, 2018.

Table 4. Loss of livestock.

Livestock	Quantity lost	Total amount lost (NRs.)
Goat/Sheep	62	7,44,303.00
Cattle	35	17,50,500.00
Calf	12	1,42,000.00
Chickens	57	47,955.00
Total	166	26,84,758.00

Source: Field survey, 2018.

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