



BUFFER ZONE MANAGEMENT ISSUES IN CHITWAN NATIONAL PARK, NEPAL: A CASE STUDY OF KOLHUWA VILLAGE DEVELOPMENT COMMITTEE

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ABSTRACT

Buffer zone management in Chitwan National Park is regarded as a successful programme in Nepal. However, buffer zones are typically treated as a homogeneous entity without much regard to the intra-zone dynamics. This research examined the impacts of rhinos along with households' resource use, dependency, involvement and associated impacts within one buffer zone – Kolhuwa Village Development Committee. Household surveys (N=68) were conducted and sampling was based on the type of settlement and land size. A structured and semi-structured questionnaire was used to interview household heads along with GPS points. The buffer zone was segmented into two zones – Close and Far Settlement based on the distance from the park boundary. Results illustrated that the impacts of rhinos were more pronounced among households that were closer to the boundary, and declined with increasing distance. Households had challenges to produce enough food for at least six months to a year, but noticeably more so in the close settlements. Residents that were closer to the boundary were most dependent on fuelwood and natural resources extraction. While both zones were reliant on income from outside their community, households in the close settlements were more dependent. Conversely, households in the far settlements had been involved for more years and in more activities in the buffer zone. Results are of utility to park management with respect to zoning designations.

Key words: People-Park conflict, resource use, rhinos, livelihoods, GIS, park management

INTRODUCTION

The buffer zone concept was developed by United Nations Organization for Education, Science and Culture (UNESCO) to provide an additional layer of protection around protected areas as well as to balance the development needs of the local people and conservation objectives of protected areas (Bajracharya, 2009). The creation of buffer areas encourages both sustainable extractive uses and public participation in protected areas management through decentralization of natural resource use along with financial and technical support to the user groups (Wells & Brandon, 1993). This opportunity to meet the dual goals of conservation and poverty reduction has generated major interest among governments, and has resulted in global implementation around protected areas (Parker & Thapa, 2012).

In Nepal, the buffer zone concept has been adopted as a national strategy to address the issues between parks and adjacent communities to ensure an optimal balance between the long-term conservation objectives and immediate needs of local residents (DNPWC, 1996). The major goal of the buffer zone programme is to involve and seek support from local communities for nature and wildlife conservation. The buffer zone management programmes have been widely implemented and have two major objectives: 1) to improve the management of the natural resources in the buffer zones; and 2) to improve ecological conditions in the buffer zones which offer an extended habitat for wildlife. In order to accomplish both objectives, the buffer zone areas serve to increase access to natural resources (e.g., non-timber forest products) in order to be sustainably harvested by



Local villagers returning from collecting fodder from the buffer zone of Chitwan National Park © Michel Gunther / WWF

the communities that reside within it, thereby reducing the pressure in the protected areas. Although buffer zone user groups are allowed to harvest the forest products from the assigned community forests, they are not permitted to sell them (New Era, 2004). Also, in comparison to the community forests outside the buffer zone, there are greater restrictions within the buffer zone area, as the primary objective of the community forest in the buffer zone is to improve biodiversity for wildlife habitat restoration (Bhusal, 2014).

Additionally, legislation has provided for a benefits-sharing mechanism for implementation of conservation and community development programmes related to institutional development, alternative natural resource development, capacity building, financial management, conservation education and awareness, and gender and special target group mainstreaming (DNPWC, 1996; DNPWC, 2015). Overall, the application of buffer zones has demonstrated utility and success but has also borne conflicting priorities between conservation and development goals. Furthermore, buffer zone policy has also been perceived to be coercive by some local community residents given the top-down managerial structure (Heinen & Mehta, 2000).

Among the various units within the protected areas system in Nepal, the first national park (Chitwan – established in 1973) has extensively utilized buffer zone programmes as a key conservation and management strategy. The case for a buffer zone approach was evident in Chitwan National Park (CNP) as threats to biodiversity conservation had continued to exist in numerous forms and at different scales (Budhathoki, 2005). People-park conflict had also been an ongoing issue due to the wildlife impacts in adjacent communities. Also, local community members had continued to ignore regulations and were engaged in extractive behaviours as well as grazing their cattle inside the park (Nepal & Weber, 1995; Sharma, 1991). In order to mitigate conflicts, a total of 34 Village Development Committees (VDCs¹) and two municipalities with households adjacent to the park were declared as buffer zones in 1996. The total area designated as buffer zones around the park was 750 km² (DNPWC, 2015). Along with its establishment, the buffer zone communities and user groups have been allocated a disbursement of 30–50 per cent² of the park revenues for community development and natural resources management programmes (DNPWC, 1996; DNPWC, 2015). The money is allocated for different categories: conservation (30 per cent), community development (30

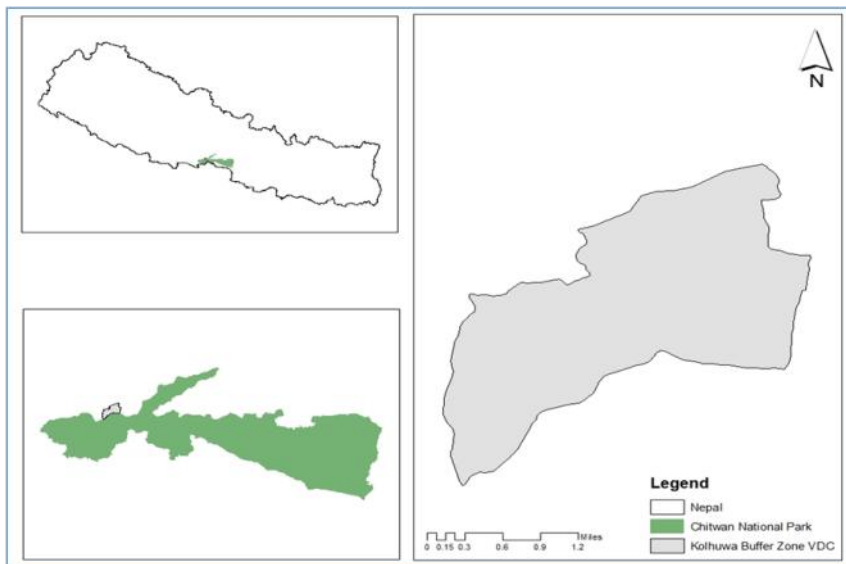


Figure 1: Study area

per cent), income generation and skills development (20 per cent), conservation education (10 per cent), and administration (10 per cent) (DNPWC, 2015).

CNP is a major site for conservation of wild habitats of several endangered wildlife species. The park was inscribed as a UNESCO World Heritage Site in 1984, and is located in the relatively flat and low lying Terai region (south-central Nepal) with a tropical and sub-tropical climate. The park encompasses 932 km² and is an important habitat for flagship faunas including tigers (*Panthera tigris*), elephants (*Elephas maximus*) and the one horned Rhinoceros (*Rhinoceros unicornis*), which is supported by the mixture of alluvial grasslands and riverine forests (Bhattarai & Kindlmann, 2011).

The establishment of the park has resulted in a substantial increase in the rhino population from 147 to 544 by 2000 (Adhikari, 2002), and 605 in 2015 (NTNC, 2015). While success has been evident, the rhinos are still endangered largely due to human-induced activities such as hunting and poaching. Given the monetary value of the rhino horn which is alleged to have medicinal properties, poaching is a major issue for CNP management. In fact, every community settlement within and outside the buffer zones is a potential shelter for rhino poachers (Adhikari, 2002). It has been reported that more than 60 per cent of the people involved in poaching activities live within or in the vicinity of the park/buffer zones (Lamsal, 2012). Also, all the rhino habitats lie adjacent to the buffer zone settlements, hence are vulnerable (Adhikari, 2002). Furthermore, rhino habitat has been under threat due to the demand for agricultural cultivation and cattle grazing (Lamsal, 2012).

Concomitantly, the buffer zones communities also experience varying levels of impacts due to rhinos and

other wildlife incursions. Most notably, the impacts are related to crop damage, livestock depredation, and loss of human life which have all perpetuated people-park conflict issues. Crop raiding along with human attacks by rhinos in the buffer zones have been a major issue which has led to defensive retaliation by the locals (Bajracharya, 2009; Budhathoki, 2005). While impacts have been borne by the local communities, not all buffer zones are equally affected by rhinos and/or other wildlife. Recent research has identified that residents that live within 2 km of the park's boundary reported more crop damage by rhinos than other wildlife (Lamsal, 2012). Such findings indicate that rhinos' mobility is concentrated in areas outside the park's boundary within buffer zone communities. However, further research is needed to examine mobility and impacts as noted by residents within the buffer zone communities.

In addition to the rhino impacts, the buffer zone communities are strongly tied to the park – environmentally (i.e., resources) and economically (i.e., tourism). While the park's management is engaged in revenue sharing and regulation compliance via the buffer zone management committees, the demand and dependency for fuelwood and other natural resources extraction has been an ongoing issue. Such issues have been consistently assessed as demonstrated by recent research in the buffer zone communities which has focused on residents' attitudes, perceptions, resource use and dependency issues (Lamsal, 2012; Nepal & Spiteri, 2011; Nyaupane & Poudel, 2011). Though there is a need for further research with respect to locals' use and impact assessment within and between the buffer zones and respective communities.

The buffer zone in CNP has been divided into three basic sectors: conservation, sustainable use, and intensive use

Table 1: Zonation of buffer zone areas

| Zone | Proximity | No. of sampled Households | Distance from the Park Boundary |
|--------|------------------|---------------------------|---------------------------------|
| Zone 1 | Close Settlement | 30 | <1100 m |
| Zone 2 | Far Settlement | 38 | >1100 m |

(DNPWC, 2015). Although these zones are operational, the park's management plan also has a reactive approach whereby future prioritization is based on the severity of contemporary issues. Since buffer zones are not a homogeneous entity given the varying degrees of community impacts as well as proximity of the settlements to the park's boundaries, additional research about the impacts of rhinos and related households' assessment will be of utility to management. Therefore, the objectives of this study were twofold and were based among households within a single buffer zone: 1) to examine the distribution of rhino impact; and 2) to assess resource use, dependency, involvement, and associated impacts.

METHODS

Study area

Among the 36 VDCs and municipalities assigned as buffer zones for CNP, the Kolhuwa Buffer Zone Village Development Committee (BZ-VDC) was chosen for this study since it has no forests. The lack of a forest has been a challenge given that households have to seek alternative sources for fuelwood. The Kolhuwa BZ-VDC is part of the Kolhuwa VDC which has a total area of 1,614.7 ha. The Kolhuwa BZ VDC is 1,052.4 ha and lies in the western sector of the park (PPP, 2000). The majority of the residents are Tharus who are indigenous and have predominantly lived in the Terai (lowlands plains) region. The community is culturally vibrant, and agriculture is the main occupation with wheat, maize, rice and sugarcane as the major crops cultivated.

Data collection

Household surveys were conducted in the study area. Sampling was based on the type of settlement (small, mid, large), and land size (landless, small farm, medium farm, big farm, large farm) (DNPWC, 2000). This process of categorization provided an opportunity to collect data from households with varying socio-economic status within the specific buffer zone communities. Based on the settlement type and land size, a total of 68 households were selected randomly within each specific cluster.

Table 2: Operationalization of variables

| Variables | Operationalization |
|-------------------------------|---|
| Rhino incursion | Households impacted by rhino in their field per year |
| Rhino frequency | Frequency of rhino visits by month – either in their field or their home per year |
| Food deficit | Households that cannot produce enough food for at least six months to a year |
| Fuelwood | Total tonnes of fuelwood needed by household per year |
| Natural resources extraction | Households that extract fuelwood and fodder from the park |
| Remittance dependency | Households with income sources outside the village |
| Buffer zone involvement | Household family member involvement in buffer zone activities |
| Years involved in buffer zone | Number of years in which a household family member has been either a member of a buffer zone user group or user committee |
| Land owned | Total land owned by household |
| Income | Total household income per year |

A structured and semi-structured questionnaire was used to interview the head of the households. The questionnaire comprised three sections: household information, buffer zone activities, and wildlife depredation issues. Pilot testing of the instrument was conducted and minor adjustments were made prior to data collection. Given the high rate of illiteracy, the interviewer read the questions to the participants at their respective home, and completed it accordingly. The age range for the household head was between 25 and 60 years. The interviews were conducted in Nepali and responses were translated into English. The translations were verified prior to statistical analysis. Also, GPS points for each sampled household were collected using Garmin eTrex GPS.

Data analysis

First, the buffer zone was segmented into two different zones based on the distance from the boundary of the park. The zoning was conducted via buffer analysis in ArcGIS 10.1. The width of the layer was fixed at 1100 m so as to divide the buffer zone into two equal parts. Zone 1 comprised 30 sampled households and was labelled as

Table 3: Comparison between two zones

| Variables | Close Settlement Zone 1 | Far Settlement Zone 2 | Test Statistic | P value |
|---|----------------------------|--------------------------|-------------------|----------|
| Rhino incursion (%) | 58.3 | 34.4 | 5.689 | 0.028** |
| Rhino frequency (months/yr/household) | 7.08 | 1.97 | 246 | 0.000*** |
| Food deficit (%) | 73.33 | 47.37 | 5.442 | 0.022** |
| Fuelwood (tonnes/yr/hh) | 1.80 | 1.48 | 416 | 0.039** |
| Natural resources extraction (%) | 70.0 | 21.05 | 16.421 | 0.000*** |
| Remittance dependency (%) | 76.67 | 39.47 | 9.407 | 0.002*** |
| Involvement in buffer zone (%) | 40.00 | 65.79 | 4.495 | 0.034*** |
| Number of years involved in buffer zone | 2.30 | 4.20 | 738 | 0.037** |
| Land owned (ha/hh) | 0.56 | 0.74 | 651 | 0.356 |
| Income (USD/yr/hh) | 825.3 | 930.2 | 638.5 | 0.442 |

Legend: ***: significant at 0.01 level; **: significant at 0.05 level

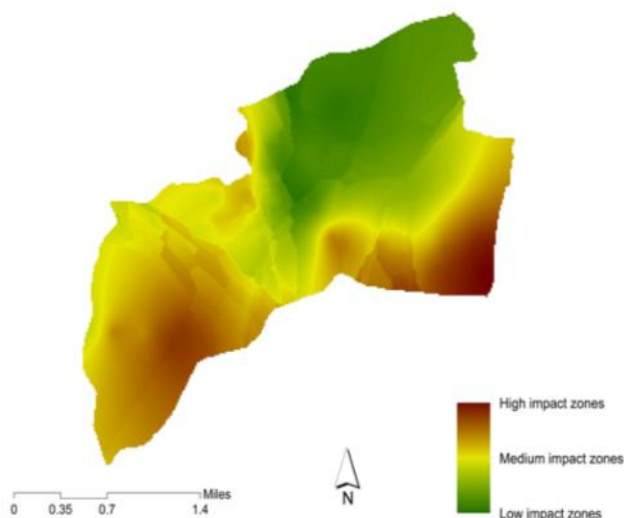


Figure 2: Impact of Rhinos in the Kolhuwa Buffer Zone

Close Settlement, while Zone 2 consisted of 38 households and was recorded as *Far Settlement* (see Table 1).

For research question #1, the impacts of rhinos among the households were assessed by the amount of crop loss and the monthly frequency of rhino incursions into the area. Spatial analysis using ArcGIS 10.1 was conducted to assess household impacts, and subsequently the results were interpolated through Kriging analysis to identify impacts in the whole study area. For research question #2, comparative analyses of sampled households between the two zones were conducted based on the following variables: rhino impacts, frequency of rhino incursions, food deficit, fuelwood demand, natural resources extraction, remittance dependency, involvement and years served in buffer zone user groups and committees, land owned, and income (see Table 2). For statistical analyses, normality tests were administered for the tested variables. Since the data were

identified to be skewed, non-parametric analysis was conducted. Mann-Whitney U test was used for the scale data while Chi-square analysis was used for the categorical data.

RESULTS

Research question#1

The analysis identified that the impact of rhinos was correlated to the distance of the sampled households from the park's boundary. The impacts were more pronounced among households that were closer to the boundary, and declined with increasing distance from the park. The mobility of rhinos outside the boundary was evident with a higher traffic concentration due to the proximity of the Narayani River's flood plain. Hence, households that were located in the flood plain were more susceptible to impacts due to rhino mobility. The degree of household impacts based on both settlement types is illustrated based on a spatial analysis in Figure 2.

Research question#2

Based on a comparative analysis between the sampled households in the two zones, the impacts were more prominent for Zone 1. The frequency of rhino incursions and impacts were substantially higher and was likely the result of settlements' location in the flood plain. Food deficit was higher for Zone 1 households, but was also an issue for households in Zone 2. Basically, the sampled households in both zones had challenges to produce enough food for at least six months to a year. In addition, the households in Zone 1 which were closer to the park boundary were most dependent on fuelwood and natural resources extraction from the park. While both zones were reliant on sources of income from outside their community (i.e., remittance), Zone 1 households were more dependent. Conversely, households in Zone 2 had been involved for more years as well as in specific



Rhino in Chitwan National Park © Equilibrium Research

activities in the buffer zone. Of all the measured variables, only two failed to reach statistical significance – land owned, and income (see Table 3).

DISCUSSION

Buffer zone management in CNP is regarded as a successful programme in Nepal. This research examined the impacts of rhinos along with households' resource use, dependency, involvement and associated impacts within one buffer zone. This specific buffer zone was chosen due to its rural characteristics, lack of a community forest, and does not have any commercial tourism activities. Results identified differences in impacts and benefits accrued in the two segmented settlements (close and far) within the buffer zone. Rhino movements were noted to occur in the buffer zone and were concentrated closer to the park boundaries. Such movements were also reported especially at night by almost two-thirds of residents sampled in 16 buffer zones and two municipalities (Lamsal, 2012). In this study, households in Zone 1 were most affected especially with respect to crop loss that resulted in food insecurity. However, given the proximity of the flood plain from the park boundary, the mobility of rhinos is unlikely to decrease. Since impacts to agriculture and livelihoods have been noted to be a regular occurrence, it might be worth exploring the idea of voluntary community resettlement. Such resettlement programmes have been implemented, and recent research has identified that residents are recorded to have improved their economic and social ties in their new location (Dhakal et al., 2011). However, a participatory planning approach along with fair compensation and access to basic needs such as

water, health, and education facilities would be essential to determine success in voluntary relocation initiatives (Dhakal et al., 2011).

Residents within the buffer zone were largely dependent on the park for natural resources basically due to the lack of access to a community forest which is common in other zones. The proximity to the park boundary and ease of access likely resulted in resources utilization, especially among those from closer settlements (Zone 1). Resource dependency and exploitation among residents in two other buffer zones has been previously identified (Stræde & Treue, 2006). In fact, such use and dependency was also recently noted among those that lived closer to the park boundaries in multiple buffer zones (Lamsal, 2012). Overall, illegal resources extraction from the national park has been a constant managerial issue for park authorities. Moreover, intensive removal of trees for timber is a growing concern as anecdotal reports have reported multiple illegal saw mills in operation in various communities. In addition, timber harvesting has also created opportunities for poachers to survey areas for potential animals, including the rhino. To combat illegal extractive use and dependency, there has to be alternative sources of fuelwood offered to community residents. A viable alternative by the government has been to offer free and/or highly subsidized biogas, but the programme lacks major dissemination especially among those close to the park boundaries.

While the impacts were more prominent for residents located in Zone 1, they were also significantly less

involved in buffer zone activities such as user group and/or committee members. Additionally, those who were involved had slightly more than two years of experience in comparison to an average of over four for those from Zone 2. The lack in the level of engagement and involvement in buffer zone management activities can act as a real impediment to development activities. The park management is required to operate a revenue-sharing programme with respect to community development initiatives, however, the mechanism does not provide for the equitable use of revenues within and between the buffer zones (Gurung et al., 2010). Hence, the importance of representation in buffer zone management activities is central for resource allocation to assist with initiatives in the respective settlements. Nevertheless, the park management needs to have more authority with respect to monetary disbursement to ensure equitable representation in distribution. This process will be essential to build social capital and community trust between the park management and the respective buffer zone community members. Similar to other studies (Abbasi & Khan, 2009; Steinmetz et al., 2014), open dialogue and community engagement will foster stronger ties, and assist in alleviating various illegal practices including poaching and resources extraction.

The average land ownership for residents in the whole buffer zone was 0.64 hectares which was substantially lower than the minimum of 2 hectares required to cultivate food for a single family (Joshi, 1999). Thus, food deficit was an issue for both zones as residents were unable to produce enough food for at least six months to a year, but noticeably more so for residents in Zone 1. Similarly, residents in both zones were dependent and were recipients of remittance, but more so for Zone 1. Remittance is a major driver of the economy and has resulted in more out-migration (within and outside the country) of youth for employment. This issue of youth mobility suggests that employment prospects were generally dismal, but more impactful for Zone 1 residents. Nepal is highly dependent on remittances. In 2009, their value comprised USD 3 billion which is equivalent to 22 per cent of national GDP (World Bank, 2011), but the true value could be even higher (Parker & Thapa, 2012). Remittance is a valued source of household income and can help to increase food security, but at the same time the dependency suggests the failure of the buffer zone programmes to offer development activities. Buffer zone management committees need to conceptualize other innovative development activities such as home-stay tourism, small-scale entrepreneurship, etc. to increase economic activities within the communities.



A local villager in the buffer zone of Chitwan National Park
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CONCLUSION

The creation of buffer zones has been beneficial for conservation and for development initiatives in the respective communities. However, buffer zones are typically treated as a homogeneous entity without much regard to the intra-zone dynamics and associated challenges. This study explored the impacts and issues within one buffer zone based on proximity to the park boundary. As results demonstrated, the impacts via rhinos and other issues such as resource use, dependency, and involvement varied based on location of dwelling within the buffer zone. Also, revenue sharing mechanisms along with buffer zone community engagement needs to be further prioritized accordingly. The results should be of utility to park management with respect to zoning designations. However, it is acknowledged that this study only focused on one buffer zone with specific characteristics that may not be applicable to other areas. Additional future research is needed based on comparative analysis of buffer zones with respect to issues such as natural resource dependency, tourism development, local natural habitats (i.e. access to forest and non-forest) etc. Finally, similar to this research, the use of technology such as GIS with social sciences research needs to be further adopted to understand the varying context of the park-people relationship.



Boundary guard post in Chitwan National Park © Equilibrium Research

ENDNOTES

¹VDCs and municipalities are administrative units that are representative of the rural and urban areas respectively.

² Revenue sharing for all national parks was mandated by the government via legislation in 1996.

ABOUT THE AUTHORS

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RESUMEN

La gestión en la zona de amortiguamiento del Parque Nacional de Chitwan se considera como un programa exitoso en Nepal. Sin embargo, las zonas de amortiguamiento suelen ser tratadas como una entidad homogénea sin mayor consideración a la dinámica intrazona. Esta investigación examinó los impactos de los rinocerontes, junto con el uso de los recursos, la dependencia, la participación de los hogares y los impactos asociados dentro de una zona de amortiguamiento –Comités de Desarrollo de Aldea de Kolhuwa. Se realizaron encuestas a hogares (n = 68) y el muestreo se basó en el tipo de asentamiento y el tamaño del terreno. Se utilizó un cuestionario estructurado y semi estructurado para entrevistar a los jefes de familia junto con los puntos GPS. La zona de amortiguamiento se dividió en dos zonas –Asentamiento Cercano y Lejano según la distancia que los separa del límite del parque. Los resultados mostraron que los impactos de los rinocerontes fueron más pronunciados entre los hogares que estaban más cerca de los límites, y disminuyeron al aumentar la distancia. Los hogares tenían problemas para producir suficientes alimentos durante al menos seis meses a un año, pero de manera más notable en los asentamientos cercanos. Los residentes que estaban más cerca del límite eran más dependientes de la leña y la extracción de recursos naturales. Si bien ambas zonas eran dependientes de ingresos de fuera de su propia comunidad, los hogares

en los asentamientos cercanos lo eran aún más. Por el contrario, los hogares en los asentamientos lejanos habían participado durante más años y en más actividades en la zona de amortiguamiento. Los resultados son de utilidad para la administración del parque con respecto a las designaciones de zonificación.

RÉSUMÉ

La gestion de la zone tampon du Parc National Chitwan est considérée comme un programme couronné de succès au Népal. Cependant, les zones tampon sont généralement considérées comme des entités homogènes sans prendre en compte les dynamiques intra-zonale. Cette étude a examiné l'impact des rhinocéros ainsi que l'utilisation des ressources par les foyers au sein d'une zone tampon – les Comités de Développement Villageois de Kolhuwa. Des enquêtes auprès des ménages (N=68) ont été menées avec un échantillonnage basé sur le type de village et l'étendue du terrain. Un questionnaire structuré et semi-structuré a servi à interroger les chefs de famille et à recenser les points GPS. La zone tampon a été divisée en deux entités – les implantations locales et éloignées, en se basant sur la distance du périmètre du parc. Les résultats ont démontré que les impacts des rhinocéros sont plus prononcés chez les ménages près du périmètre et vont en diminuant avec leur éloignement. Les ménages ont du mal à produire suffisamment de nourriture pendant au moins six mois de l'année, et ceci est plus apparent dans les villages proches. Les habitants proches du périmètre dépendent dans une plus large mesure de l'exploitation du bois de chauffe et des ressources naturelles locales. Alors que les deux zones sont tributaires de revenus générés à l'extérieur de leur communauté, les ménages dans les villages proches en dépendent le plus. Inversement, les ménages dans les villages éloignés ont été impliqués dans davantage d'activités et depuis plus longtemps dans la zone tampon. Ces résultats s'avèrent utiles pour la désignation du zonage par les gestionnaires du parc.