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Do Buffer Zone Programs Improve Local Livelihoods and Support Biodiversity Conservation? The Case of Sagarmatha National Park, Nepal

Thakur Silwal[1], Bishnu P. Devkota[1], Prabin Poudel[2], and Mark Morgan[3]

Abstract

Background and Research Aims: Buffer zone programs aim to reduce park-people conflicts by improving local livelihoods through integrated conservation and development activities. A case study was conducted at Sagarmatha National Park, Nepal from 2002–2016 to examine some buffer zone initiatives.

Methods: Focus group discussions (n = 7), key informant interviews (n = 14), and field observations were performed in accordance with the IUCN Framework for Assessing Management Effectiveness of Protected Areas 2006 and WWF´s Rapid Assessment and Prioritization of Protected Area Management 2006.

Results: A total of 99 buffer zone activities were identified, including a variety of construction activities such as hydroelectric projects, trails, schools, and monasteries. Park funds were allocated mainly for community development and social welfare (42%), and less on conservation and conflict management (22%). For example, traditional "*Nawa*" animal rearing practices, feral dog control, and mitigation of wildlife damages to crops and livestock were overlooked.

Conclusion: Support gained from the buffer zone program to address livelihoods of needy households who suffer from wildlife damages was lacking, despite legal provisions for compensation (e.g. crop damages caused by *jharal*). This should not occur at the expense of wildlife conservation and if it does, it will diminish the original intent of buffer zones.

Implications for Conservation: Although most of the local communities were positive about buffer zone programs and activities, there was a dire need to incorporate "*Nawa*" practices, wildlife damage compensation schemes, and feral dog controls. This study suggests to update policies that focus on conflict management.

Keywords

Buffer zone contribution, conservation, Mount Everest, national parks, human-wildlife conflicts, tourism

Introduction

People living near protected areas (PAs) can play vital roles for achieving conservation goals (Gatwaza & Wang, 2021). In 1992 The Fourth Congress on National Parks and Protected Areas suggested that management actions should include human-dominated landscapes beyond park boundaries, thereby recognizing the importance of local communities while addressing park-people conflicts (McNeely, 1993). Wildlife issues such as loss of crops, livestock, properties, human injury and death (Long et al., 2020) are noteworthy, especially ones which occur closer to park boundaries as compared to those farther away (Mojo et al., 2020). The majority of households seem to be positive toward PAs due to their conservation role and suite of tangible and intangible

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benefits. Yet building partnerships with local communities is easier said than done. Consistent with the Vth IUCN World Parks Congress's theme of "benefits beyond boundaries," several nations have designated communities around PAs as "buffer zones," where land use is partially restricted to give an added layer of protection and provide benefits to local people (MacKinnon et al., 1986). This strategy highlights linkages between local livelihoods and protected areas (Snyman & Bricker, 2019), thus gaining support for conservation. In other words, including cultural, social, and socio-economic factors into broader management schemes since they are interdependent with biophysical systems (Machlis, 1993). This idea is an extension of buffer zones, first established in 1968, designed to satisfy the twin objectives of conservation and development (Lynagh & Urich, 2002) since local people have a tendency to exploit PA resources for survival.

Although these two initiatives are similar, there are some important geographical, legal, and managerial differences between them (Straede & Treue, 2006). For example, buffer zones[1] in Nepal were established to provide adequate substitutes for forest resources that had not been plundered from national parks/wildlife reserves (Aryal et al., 2021; GON, 1996; Ruda et al., 2018; Ruda et al., 2020; Shahi et al., 2022; Sharma, 1991; Silwal, 2003). After political changes and reestablishment of multi-party democracy that occurred during the 1990s, the Nepalese government revised the National Parks and Wildlife Conservation Act 1973 (fourth amendment in 1993) to create buffer zones adjacent to parks and reserves for integrated conservation and development purposes (GON, 1973). Benefits include ecological buffering of PAs and socioeconomic buffering of neighboring communities (Heinen & Mehta, 2000) that recognizes the contributions of people living in the impact zone and understands their needs (Bhattarai et al., 2017; Sharma, 1990). Nepal's Buffer Zone Management Regulation 1996 included a 30–50% revenue sharing program, funded by park fees and charges (GON, 1996). This provision was consistent with the Convention on Biological Diversity which granted rights to local people for community development, forest management, and buffer zone utilization to stimulate public involvement for conserving resources and reducing park-people conflict. In addition to revenue sharing, local people obtain various social and economic benefits from PAs (Ferraro & Hanauer, 2015). Protected areas may improve income via tourism related employment or affiliated markets that can then be spent on household assets (Naidoo et al., 2019). The impacts of nature-based tourism can be positive for people and wildlife (den Braber et al., 2018). For example, it can alleviate extreme poverty in remote areas, challenging the notion that PA policies only benefit community elites (Agrawal & Gupta, 2005). There are 20 protected areas in Nepal covering 23.39% of the country's land mass. Of that amount, more than 16.5% are categorized as buffer zones. The Buffer Zone Management Committee (BZMC: legally elected public entities) disburses about $2.3 million of parks/reserves revenue annually for buffer zone programs and activities (DNPWC, 2017).

The Nepal Government declared a buffer zone at Sagarmatha National Park in 2002 so local communities could participate in integrated conservation and management activities for reducing park-people conflict (SNP, 2016). Establishing the buffer zone ensured that park-generated revenue would be returned to local communities for funding this initiative. In turn, local control of decision-making was designed to promote sustainability, instead of relying on a top-down approach that might promote some resistance. The long-term objective of the buffer zone program was to garner local support for conservation. However, gaining public support means sharing park revenue with adjacent communities. A portion of these funds were intended to be used for mitigating human-wildlife conflict, relief and compensation for crop loss, livestock killing, and human injury/deaths (Aryal et al., 2021; Silwal et al., 2016, 2017). Legislation channeled 30–50% of park revenue to buffer zone communities for implementing conservation and community development activities and reducing adverse impacts of local people on park resources. Buffer zone programs can serve a variety of purposes, such as institutional development, natural resource alternatives, capacity building, financial management, conservation education and awareness (Silwal, 2003; Silwal et al., 2016; SNP, 2016).

During the last 15 years, BZMC of Sagarmatha National Park has received significant funds (averaging $343,540 per year) for implementing activities that promote conservation and development. The program mostly supports rural infrastructure development in this region, improved local livelihoods, and active participation of villagers in biodiversity conservation. However, there is a lack of knowledge on the effectiveness of buffer zone initiatives. Numerous studies (e.g. Agrawal & Gupta, 2005; Bhattarai & Fischer, 2014; Lamichhane et al., 2019; Pant et al., 2015; Shahi et al., 2022; Sharma, 1991; Silwal, 2003; Silwal et al., 2016; Silwal et al., 2017) have been conducted on human-wildlife conflicts and buffer zone programs of lowland PAs in Nepal. Yet, research that measures the impact of buffer zone programs on local livelihoods, biodiversity conservation and human-wildlife conflict management in mountain parks is lacking. Are buffer zone activities consistent with national policies that are designed to meet forest product needs of local communities? Do buffer zone programs reduce park-people conflict? If so, how are communities managing buffer zones for sustainability? This case study examined the contribution of buffer zone programs and activities at Sagarmatha National Park during 2002–2016 in relation to biodiversity conservation and community development.

Study Area

Sagarmatha National Park (SNP), established in 1976, is located in the Solukhumbu district of eastern Nepal (Figure 1). This northern mountainous park is situated between $27^0$45′- $28^0$07′N latitude and $86^0$28′- $87^0$07′E longitudes

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(SNP, 2016). It covers an area of 1148 km^2 with elevations ranging from 2300 m to 8848.8 m (Mount Everest), but also includes other peaks nearby: Lhotse (8501 m), Cho Oyu (8153 m) and Nuptse (7896 m). The bioclimatic zone of SNP ranges from lower temperate to alpine and nival to Arctic conditions. Major flora of this area consists of blue pine (*Pinus wallichiana*), hemlock (*Tsuga dumosa*), himalayan silver fir (*Abies spectabilis*), and juniper (*Juniperus recurva*). Broadleaved species such as the birch, rhododendron, maple and oak are found on the cold slopes, intermixed with firs. Park and buffer zone forests are pristine habitats for endangered fauna such as the snow leopard (*Panthera uncia*), common leopard (*Panthera paradus*), musk deer (*Moschus chrysogaster*), red panda (*Ailurus fulgens*), wolf (*Canis lupus*), Jharal (*Hemitragus jemlahicus*), danphe (*Lophopharous impajenus*), blood pheasant (*Ithaginis cruentus*) and others

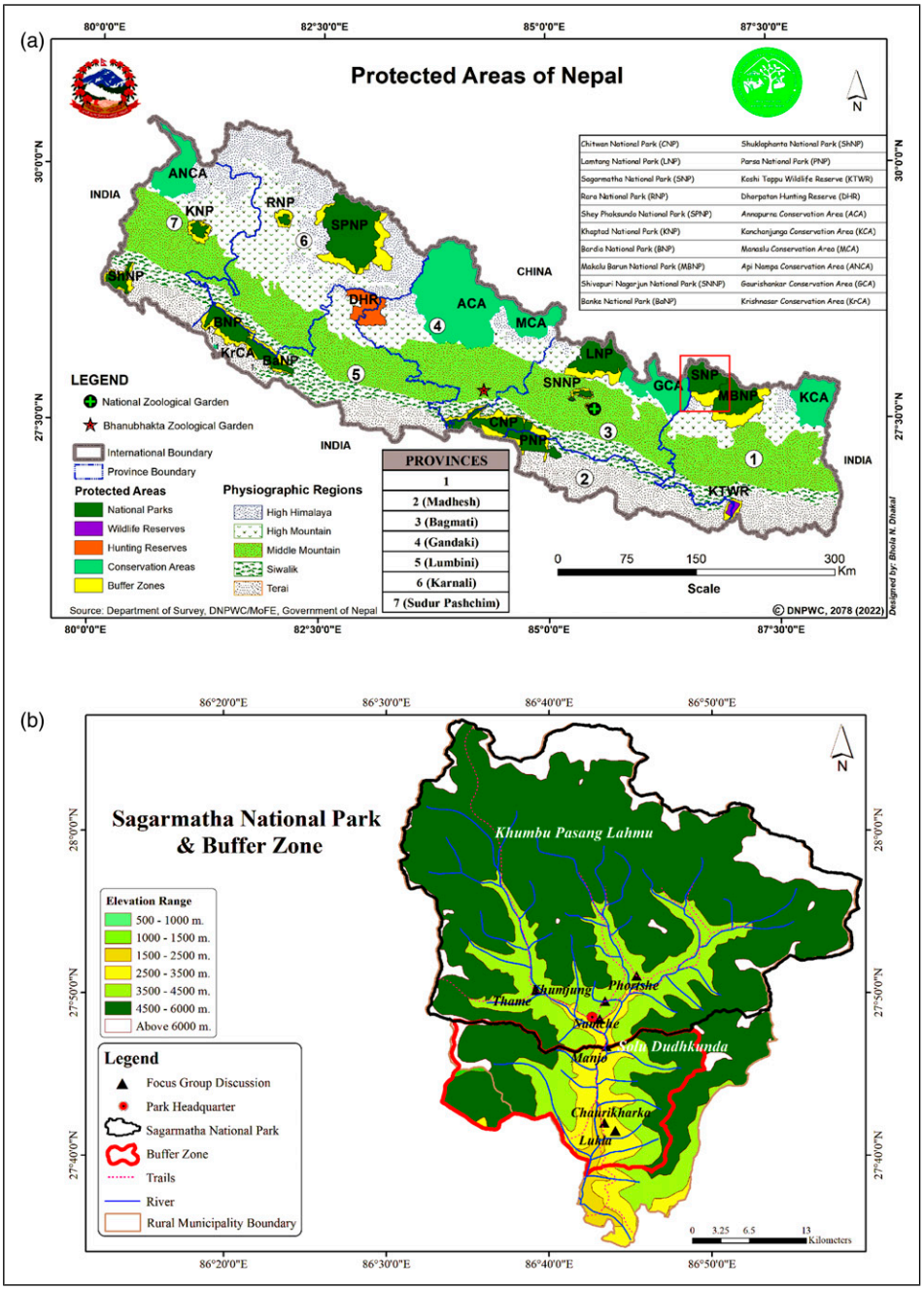


Figure 1. Location map of the study area (a) Protected areas of Nepal (adopted from DNPWC, 2022); (b) Sagarmatha National Park and Buffer Zone.

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(SNP, 2016). This study was conducted in the buffer zone adjacent to SNP.

In 1979, UNESCO recognized SNP as a World Heritage Site due to its exceptional natural beauty and cultural attributes, which consist of mountains, glaciers, and deep valleys surrounding the world's highest peak, Mt. Everest (SNP, 2016). The Gokyo and associated wetlands, a Ramsar Site, also lie within SNP. This setting is a world-famous destination for mountain tourism. The 5-year management plan (2016–2020) is a policy directive for safeguarding the Outstanding Universal Value of SNP and enhancing resilience of local communities in the buffer zone. In 2002, an area of 275 km^2 surrounding the park and some traditional human enclaves were designated as a buffer zone (Figure 1) for participatory conservation and development activities using three layers of Community-Based Organizations (CBOs): i) Buffer Zone User Groups (BZUGs) at the settlement level; ii) Buffer Zone User Committees (BZUCs) at the sector level; and iii) Buffer Zone Management Committee (BZMC) at the park level (DNPWC, 1999; GON, 1996; SNP, 2016). Presently, there are 28 BZUGs, three BZUCs and one BZMC that share administrative responsibilities for program planning, resource distribution and implementation for allocating park revenue. A total of 1619 households consisting of 7745 individuals live in the buffer zone. *Sherpa* is the major ethnic group of this region. Although the main source of income is from tourism (hotels, trekking guides, porters, etc.), many families depend upon subsistence agriculture (potato and buckwheat) and livestock (*yak, jhopa*) rearing practices. Some individuals from adjoining districts and villages operate hotels, offer porter services, and small businesses along the trekking routes.

Methods

Villager perceptions obtained through focus group interviews were coupled with quantitative data to assess the contribution of buffer zone activities on local livelihoods and conservation near Sagarmatha National Park (DNPWC, 1999; GON, 1973; GON, 1996; SNP, 2016). Primary and secondary sources of information were used. Prior to conducting any fieldwork, representatives from the Ministry of Forest and Environment, Department of National Parks and Wildlife Conservation, SNP and the Buffer Zone Management Committee (BZMC) were consulted to learn about the initiatives that were implemented between 2002 and 2016. During the field visits, focus group discussions were conducted with stakeholders, including interviews with key informants, to collect primary data during May-June, 2017. Secondary data was obtained from official records at SNP, the BZMC office, and respective BZUCs at the local level, including national level policies, acts, regulations and guidelines, management plans, government strategies and census statistics, and previous research. Relevant documents were reviewed and verified through a combination of methodologies, including triangulation, thus strengthening our findings (Patton, 2014).

Focus Group Discussion

Stakeholder opinions were an important component of this study. Altogether, seven focus group discussions were conducted within the respective BZUCs (*Namche, Phortshe, Khumjung, Thame, Manjo, Chaurikharka and Lukla*), providing details for each program. Most of the stakeholders (park authorities, BZMC office, bearers hoteliers, *Nawa*[2] participants, and local communities) freely discussed the pros and cons of buffer zone activities. The WWF´s Rapid Assessment and Prioritization of Protected Area Management (RAMPAM) methodology was used (WWF Nepal, 2006), as well as the IUCN framework for assessing management effectiveness of protected areas (Hockings et al., 2006). The RAMPAM method offers flexibility for broad level comparison among PAs is based on a framework developed by IUCN, one that has been tested in many countries, worldwide (WWF Nepal, 2006). On the other hand, the IUCN framework is based on the principle that effective PA management should follow a cyclic process (Hockings et al., 2006). These tools have been used to provide some flexibility at different scales and depths. Information obtained from focus group discussions was used as a framework which considered six elements of the management cycle (e.g., context, planning, inputs, processes, outputs and outcomes), offering breadth and depth. Facilitated group discussions included a semi-structured checklist using standard protocols. Each session lasted from 1–2:45 hours, depending upon the number of participants (group sizes ranged from 7 to 21 members). Discussions focused on conservation issues and activities, local development projects, and wildlife damage (crops and livestock) in the respective areas. This format allowed for simultaneous interaction among multiple stakeholders.

Group discussions focused on understanding stakeholder experiences, concerns, and participation, including their roles for identifying, planning, implementing, monitoring and evaluating site specific programs and activities. Recommendations from individuals for buffer zone improvements were verified by their peers during the discussion. Discussions were recorded by permission only, transcribed and translated for analysis afterwards. This process identified key informants, individuals having in-depth knowledge on the subject matter.

SWOT Analysis

Participants, ranging from 7 to 21 members, were asked to generate and prioritize a list of buffer zone activities within each settlement and adjacent areas through their respective BZUCs using the following criteria: size (smaller or larger areas); beneficiaries (number of people involved, i.e., larger the better); sustainability (once initiated, these activities could be performed later with little outsourcing or internal help); and ease of implementation (accomplished by local people). In addition, participants were asked to consider conservation

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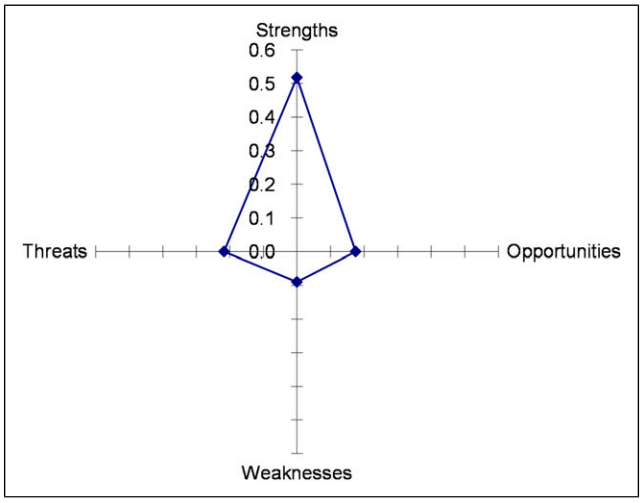


Figure 2. SWOT analysis of the buffer zone activities at *Khumjung*

aspects and outcomes with respect to forest and wildlife during the ranking process. The strengths, weaknesses, opportunities, and threats (SWOT) of such activities were analyzed for their impact on conservation (Figure 2).

Key Informant Interviews

Interviews were conducted with key informants (n = 14) to obtain in-depth information on activities that contributed to conservation and local livelihoods. Participants were village leaders, school teachers, BZUC officers, and park staff who were knowledgeable of buffer zone programs and activities in the respective areas. Semi-structured interviews were conducted with key informants to determine the relative effectiveness of such actions on conservation and local livelihoods (Silwal, 2003; Silwal et al., 2017). Key informants accompanied researchers during field observations at some sites.

Field Observations

After consulting with stakeholders, field observations were performed at sites where buffer zone activities had been implemented. This was necessary to obtain detailed information about specific initiatives, mainly for verification purposes (Silwal et al., 2017). For this case study, field observations, stakeholder opinions, and impact analysis was conducted.

Results

Activities Under the Buffer Zone Programs

Consultation with Buffer Zone User Committees (BZUCs) yielded much information on specific activities in Sagarmatha National Park, categorized under five sub-headings (Table 1). Altogether, 44 types of 99 activities were initiated through BZUCs during 2002–2016 (Supplementary Table 1). Of that total, the highest amount (42%) was for community development, followed by 22% for conservation (Table 1). In *Khumjung* and *Namche*, the highest numbers of activities (24 in each) were completed through the buffer zone program. Likewise, focus group participants mentioned 17 activities in *Manjo,* 10 in *Phortshe* and *Lukla*, nine in *Thame* and five in *Chaurikharka* (Table 1). Most of these activities were financed through the buffer zone program, but some were done in conjunction with other organizations.

Group discussions revealed the most successful programs were hydro-power, rural trails, potable drinking water, *Nawa* practice, and training. Each of the BZUCs had installed micro-hydro projects using buffer zone funds and cost sharing with other organizations. From the list of activities (Supplementary Table 1), construction of hydro-power units, rural trails, and drinking water facilities were ranked based on their perceived ability to support local livelihoods, conservation, and mitigate conflict. A SWOT analysis of activities in the buffer zone around *Khumjung* yielded more strengths than weaknesses, and better opportunities than threats (Figure 2). The major strength of the buffer zone program was micro-hydro projects, bridge construction, and continuation of traditional *Nawa* practices since these activities have contributed to conservation and local livelihoods. However, *Nawa* could disappear if not promoted in a timely manner. Some activities such as knitting and sewing were useless, since people no longer relied on these crafts as a profession.

In Luka, micro-hydro projects, rural trails, drinking water facilities, and buildings were considered as major strengths of the buffer zone program, in addition to leadership and office management (book/record keeping) training. All of these activities were implemented by their BZUCs, but respondents felt that conservation, knitting, and sewing were not worthwhile. Effectiveness of the buffer zone program at SNP was analyzed using context, planning, inputs, process, outputs and outcomes.

The Context

The National Parks and Wildlife Conservation Act of 1973 provided the legal basis for establishing SNP in 1976. After promulgation, local herders removed their goats and sheep (traditional grazing practices) from this region with assistance from park authorities. The outstanding universal value for aesthetics and science was mostly responsible for listing SNP as a UNESCO-World Heritage Site in 1979 (SNP, 2016). Inclusion of Gokyo Lake and associated wetlands as a Ramsar Site in 2007 further signified its ecological significance. To reduce biotic pressure, the Nepalese government declared a buffer zone around SNP boundaries in 2002. Local livelihoods depend largely on tourism and subsistence agriculture. The Himalayan National Park Regulation 1979 permitted households to collect forest resources (firewood, leaf litter, small pieces of timber, and fodder) for personal

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Table 1. Activities Completed by Respective BZUCs in the Settlements of Buffer Zone of Sagarmatha National Park During 2002–2016.

SN	Categories of Completed Activities	Number of Completed Activities by Respective BZUCs in the Settlements							
		Khumjung	Namche	Manjo	Phortshe	Lukla	Thame	Chaurikharka	Total
1	Community development	8	11	5	4	5	5	4	42
5	Conservation development	4	5	6	1	3	3	-	22
4	Conservation awareness	3	5	3	3	1	-	-	15
3	Institutional development	6	1	2	-	-	1	1	11
2	Capacity enhancement and income generation	3	2	1	2	1	-	-	9
	Total	**24**	**24**	**17**	**10**	**10**	**9**	**5**	**99**

consumption and authorized local communities to practice rotational grazing and livestock shading inside SNP (GON, 1979). The Buffer Zone Management Regulation 1996 and Guideline 1999 focused conservation and community development activities in the buffer zone.

The buffer zone program at SNP was designed to improve local livelihoods through natural and cultural resources while balancing the interests of conservation and tourism (SNP, 2016). Construction is a major threat to biodiversity in this region due to rapid urbanization. There is increasing pressure on local communities for non-timber forest products. The supply of timber and fuel-wood are insufficient for local people, causing them to purchase these forest products outside the buffer zone. After implementing the buffer zone program, public participation in conservation has increased and also built positive relationships between park authorities and local communities. Yet, other villagers doubt the future of buffer zone programs because they lack trust in politicians for returning 50% payment back to the BZMC. They fear that the money may go to local governments, instead of local communities.

Activities in the buffer zone have resulted in preservation of sacred sites (e.g., monasteries), local traditional customs, indigenous heritage (*Sherpa culture*), and historic areas. Although *Nawa* is still practiced, villagers are less dependent on livestock rearing than before. There has been a gradual shift in livelihoods from subsistence agriculture to tourism (hotels, trekking guides, porters). In fact, tourism was the main reason that many local people abandoned traditional occupations, such as livestock herding (*yak* and *jhopa*). Tourism and conservation can be incompatible if left unchecked. Yet, tourism can have some positive impacts in the buffer zone. For example, local people can use alternative sources of energy instead of fuel-wood due to higher incomes. Trails funded by the buffer zone program enable tourists to see, and pay for, the benefit of magnificent scenery. Pictures posted on social media might influence others to visit this site. SNP is one of the most popular tourism destinations in Nepal. For this reason, visitor facilities were satisfactory. Although, tourism is not a consistent source of income as evidenced by the global, COVID-19 pandemic. The number of tourists decreased by 56% (i.e., 58,030 to 32,636) at SNP in 2020, as compared to 2019 (DNPWC, 2020).

Buffer zone declaration has improved some animal populations, especially for rare and threatened species. For example, the snow leopard and wolf reappeared after making some habitat improvements. However, this might be an outcome of climate change since the Tibetan snow-cock *(Tetraogallus tibetanus)* has not been seen in the lower portion of SNP and Asiatic wild dog *(Cuon alpinus)* has been absent for several decades. Livestock killing from wolves, common and snow leopards is a management challenge. Poaching is also a concern for wildlife conservation since poachers tend to be outsiders who enter SNP as guides, porters, or visitors. Feral dogs often accompany people and are responsible for causing much harm to small mammal and bird populations at SNP.

Planning

Buffer zone management objectives were met through appropriate activities to improve local livelihoods and conservation. This process included an analysis of threats, pressures, strengths, and weaknesses. Buffer Zone User Group (BZUG: household representatives) prioritized conservation and development activities for their settlements and forwarded these results to the BZUC (DNPWC, 1999). Members of the BZUC practiced bottom-up planning at sector level. The BZMC allocated its budget to the BZUC, based on their ranking. The BZUC then provided funding for approved programs to respective BZUGs for implementation.

Although the BZUCs attempted to include everyone in the planning process for ensuring transparency, some residents felt excluded during BZUCs meeting. Equal representation was difficult to achieve due to intangible factors such as community status, education level, public speaking skills, or personality. Other participants, such as those in *Chaurikharka*, expressed a low level of interest in the process. Some individuals were involved with tourism and had less time to participate in social programs and activities.

The BZUCs were unaware of some legal provisions for budget allocation and authorized spending. For example, the entire budget was spent on a single activity 1 year, endorsed

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Table 2. Budget Disbursement by the Categorized Activities of the Buffer Zone Program in Sagarmatha National Park During 2011/012–2016/017.

S.N.	Details of Activities	Fiscal year Budget in NRs (`000)							
		2011/012	2012/013	2013/014	2014/015	2015/016	2016/017	Total	%
1	Community development	13,115	26,380	27,630	21,657	19,860	17,270	125,912	70
2	Conservation development	*2410*	*4785*	*6860*	*4800*	*4540*	*9150*	*32,545*	*18*
3	Capacity enhancement and income generation	475	3156	1150	1700	1415	2400	10,746	6
4	Conservation awareness	1360	760	3600	1150	900	1890	9760	5
5	Institutional development	985	2485	1600	3990	1400	900	1614	1
	Total	**18,345**	**37,566**	**40,840**	**33,297**	**28,115**	**31,610**	**180,577**	100

by community members. There seemed to be less planning on core conservation and conflict resolution such as plantations, illegal harvest of forest products, poaching, *Nawa* practices, and wildlife damages associated with crops and livestock. Instead, villagers were more interested in local development projects such as drinking water, hydro-power, monasteries, trails, and bridge construction. This process resulted in a gap between prioritization and allocation for conservation and conflict resolution. In other words, provisions for monitoring and evaluating systems existed in theory, but not in practice. Feedback on activity performance was not monitored closely.

Inputs

The allocated financial, technical, and human resources adversely impacted on the effectiveness of buffer zone programs and activities at SNP. For example, a few staff were able to provide technical and legal support for implementation. Other limitations included management capacity, weak infrastructure, inadequate logistical support, and incentives for park staffs. SNP covers an extensive area in the Himalayan range, resulting in poor communication. Although program administrators received some training in wildlife conservation, skills and knowledge were lacking for buffer zone management. These shortcomings affected law enforcement, patrols to combat poaching, in addition to monitoring and evaluation.

Many focus group participants reported that budget allocations as outlined by Buffer Zone Management Guideline 1999 were not followed carefully. In fact, this guideline had not been practiced since inception of the program. More funds (70%) were allocated for local development than any other program (Table 2), despite guidelines which specified that only 30% of the budget should be earmarked for this purpose (DNPWC, 1999). As a result, activities such as conservation education and awareness, plantation and income generating activities received less funding (Table 2). Although livestock depredation and crop damages were mentioned during the meetings, no funding was used for reducing wildlife impacts or compensation schemes to reduce park-people conflict (Supplementary Table 1).

Management Process

If planning and inputs are stable, suitable management processes can be conducted efficiently to achieve predetermined objectives of the buffer zone program. In this section, we discuss the ongoing management process, while implementing the buffer zone programs (SNP, 2016). A comprehensive management plan was conducted at SNP during 2016–2020. In addition, the BZUCs had their own constitution approved by SNP. However, local people were unaware of these two documents. The management process was based on current need and demand, rather than the previous plan. The BZUCs made decisions regarding implementation of buffer zone programs as per group discussion. With respect to local culture, these decisions were made in traditional systems. A public audit was conducted to ensure transparency. Coordination occurred between park authorities, user groups, NGOs and local leaders. Although local people participated in the buffer zone program, most of the activities focused on community development, rather than conservation and conflict management issues.

Outputs

To analyze outputs, it was important to determine if the management process addressed threats and pressures. Expected outputs were mentioned in the management plan (SNP, 2016), but not put into practice. The number of meetings and general assembly of a BZMC and BZUCs were held at irregular intervals. This protocol showed that there was less need to discuss implementation. Community members were unaware of patrols needed in the buffer zone. Few trainings were conducted to empower local people and BZUCs office bearers. After comparing implemented versus planned outcomes, some focus group participants were not satisfied with previous benefits that had been implemented through the buffer zone program.

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Outcomes

Outcomes measured the real effect of management actions (Hockings et al., 2006) on conservation and local development. In this study, quantitative and qualitative observations derived from local communities provided an important basis for assessing the efficiency of buffer zone programs. Participants agreed that natural resources awareness had increased among villagers, as well as livelihoods of local communities. People thought they were able to express their opinions stronger than before.

Discussion

Most buffer zone activities at SNP were similar to those at Bardia and Chitwan National Parks (Pant et al., 2015; Silwal, 2003; Silwal et al., 2013) but they did not produce a significant impact on social welfare, like those at Kenya's Maasai Mara National Reserve (Mojo et al., 2020) since the programs were focused on community development, instead of reducing human-wildlife conflicts. In fact, more than 42% buffer zone activities at SNP from 2010–2016 were development-oriented (e.g., construction of hydropower, village trails and drinking water facilities) (Table 1, Supplementary Table 1), consuming 70% of the budget (Table 2). Some individuals believed that buffer zone programs were designed to restrict access to forest resources at SNP for needy people, under the guise of community welfare, overlooking subsistence livelihood options (e.g. agriculture crops, livestock husbandry, collection of wildlife fruits and medicinal plants etc.) at the household level. Results were consistent (no significant household benefits) with a national reserve in Maasai Mara (Mojo et al., 2020). SWOT analysis of prioritized activities revealed that development projects (micro-hydro projects, trails, bridges, and continuation of *Nawa* practice) had more strengths than weakness, and also better opportunities than threats in the buffer zone (Figure 2). These activities reduced pressure on conservation and improved local livelihoods. However, few funds were available to address human-wildlife conflict mitigation (e.g. crop loss and livestock depredation). Unfortunately the traditional *Nawa* grazing practice could disappear entirely if proper legal provisions and immediate actions are not addressed soon.

Limited conflict prevention and mitigation activities might be one reason for a low funding by the Buffer Zone Management Guideline 1999 (DNPWC, 1999; Silwal et al., 2013, 2017). However, to resolve this inequity, park officials can develop guidelines in consultation with BZMC for guaranteeing a portion of the budget to reduce human-wildlife conflict (Silwal et al., 2013, 2017). A similar approach has been done at Shivapuri Nagarjun National Park since 2016; re-directing 25% of the budget to reduce human-wildlife conflicts (DNPWC/SNNP, 2016).

Although communities emphasized the need for projects (e.g. hydro-power, bridges, trails, etc.) to address social needs, park records showed that livestock killing had increased recently and most of it was attributed to wolves (common leopard and snow leopards to a lesser extent) (former Conservation Officer of SNP Mr Pramod Bhattarai, personal communication, February 10, 2021). For example, about 82, 204, and 286 livestock were killed in 2018, 2019, and 2020, respectively. It has been reported that livestock killings were mostly caused by wolves that year. Crop damage (wheat, barley, buckwheat etc.) was caused by *jharal*, but no compensation was available for such crop losses (MOFE, 2013). People perceived the wildlife damage compensation guideline is mainly focused on lowland's conflicting species (e.g. mega-herbivores and top-carnivores) and neglected mountain species. Livestock predation and crop damage created a larger burden for poor households, yet these individuals often lack voices in public discussions. A similar study at Chitwan National Park reported that only 13.7% of buffer zone funds were spent to address conflict prevention and mitigation activities (Lamichhane et al., 2019). Furthermore, restricting access to forest resources can have several negative social and economic impacts on local people who have traditionally relied upon those resources for their livelihoods (McElwee, 2010) in additional to the loss of livestock, crops, property and human lives caused by wildlife.

Common development activities in the buffer zone affect more households than claims for wildlife damages (Silwal et al., 2016, 2017). For that reason, prorated compensation schemes should favor the majority. However, many individuals are disenfranchised by this process. Villagers are forced to seek reimbursement for wildlife damage through the park office, since there is no existing provision for leveraging funds from the Buffer Zone Management Committee (Aryal et al., 2021; DNPWC, 1999; GON, 1996). Ironically, the main reason for creating buffer zones was to mitigate conflicts due to park establishment or restricting forest resources at the household level, such as livestock grazing, non-timber forest products, livestock depredation, and wildlife-crop damages. Arguments are made on the basis of legality: National Parks and Wildlife Conservation Act 1973 and Buffer Zone Management Regulation 1996 emphasize local development and conservation, but do not mention conflict management specifically (GON, 1993; GON, 1996; Silwal et al., 2017). Similar studies in lowland protected areas have shown that buffer zone programs have been exploited by knowledgeable or elite people, rather than benefitting local households who suffer needlessly from park restrictions which address hand-to-mouth issues or wildlife damages (Agrawal & Gupta, 2005; Lamichhane et al., 2019; Silwal et al., 2013, 2016, 2017). In contrast, PAs can provide solutions for extreme poverty in remote areas (den Braber et al., 2018), challenging previous evidence that PA policies only benefit community elites (Agrawal & Gupta, 2005). A similar study conducted

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by Oduor (2020) reported that the local people perceived negative impacts due to capture of resources by the local elites, inequitable distribution of conservation benefits, and costs of human-wildlife conflicts in Kenya's Maasai Mara. Local people who live within or close to protected areas tend to be affected disproportionately. Such individuals often feel compelled to exploit park resources for survival (Lynagh & Urich, 2002). Reversal of this trend requires integrated planning and promotion of an ecological lifestyle (Gatwaza & Wang, 2021), one that addresses local issues such as traditional livestock rearing practices and human-wildlife conflict. Our fieldwork did not include household surveys, therefore it may not represent perceptions of those individuals.

Implication for Conservation

Has the SNP buffer zone program achieved harmony between conservation and development through proper planning and management? The initial context included well-defined objectives that consisted of community-based, conservation-friendly developments. Villagers accepted the notion to remove their goats and sheep for promoting conservation. In the planning process, attempts were made to include local stakeholders from the different settlements. Improvements were needed to achieve the targeted objectives of conservation and park-people conflict management. Although most of the local communities were positive about buffer zone programs and activities, active support and participation for these initiatives at the household level was negligible. Virtually every decision of the Buffer Zone Management Committee was made by elite individuals without hearing those from those who suffer needlessly from wildlife damages. This result is consistent with Maasai Mara National Reserve in Kenya, as reported by Mojo et al. (2020). Although significantly higher economic costs due to crop damages and livestock depredation were reported close to the boundary, however, the majority of households (86%) felt good about the PA due to its conservation role and direct and indirect benefits that had been obtained or expected in the near future. There is a dire need to incorporate wildlife damage relief and compensation schemes into planning processes and management actions for needy households. Although crop damages and livestock depredation by wildlife was severe in some cases, there was no activity, planned or implemented, to address this dilemma. Other overlooked issues included feral dogs, accompanied by tourists/porters, since they frequently kill small animals and transmit disease through their feces. There is a need to monitor dogs at various checkpoints.

Inadequate human resources, funding, and communication resulted in poor deliberations among the stakeholders. Although buffer zone activities play a secondary role for conserving biodiversity and enhancing livelihoods for villagers, they can mobilize people to improve environmental awareness. This should not occur at the expense of wildlife conservation and if it does, it will diminish the original spirit of the buffer zone initiative (reducing public pressure on park resources and vice-versa). Unfortunately, the real victims are needy individuals who suffer from wildlife damages, yet receive inadequate compensation, despite having a legal provision for making such claims. So, the buffer zone program and its contribution may not eliminate human-wildlife conflict, however, it should increase public tolerance of respective protected areas and wildlife therein.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. The buffer zone concept has been introduced in Nepal as a key component of the national biodiversity conservation strategy to minimize the negative impacts of protected areas on local livelihoods, and thereby reduce adverse impacts of local communities on protected areas. Manage alternative forest resources to the local communities. Gaining community support, then, involved sharing revenues from the respective protected areas with local communities, mitigating human-wildlife conflict with relief for crop loss, livestock lifting, property damages and human injury or deaths.
2. "*Nawa"* is a traditional livestock rearing practice used near Sagarmatha National Park. Local communities in this area have developed their own values and norms for selecting *Nawa,* in addition to assigning duties and responsibilities. *Nawa* people are responsible for taking care of the livestock during certain times of the year.

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