

Linking Livelihoods and Conservation: An Examination of Local Residents' Perceived Linkages Between Conservation and Livelihood Benefits Around Nepal's Chitwan National Park

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Abstract This paper investigates local recognition of the link between incentive-based program (IBP) benefits and conservation, and how perceptions of benefits and linkage influence attitudes in communities surrounding Chitwan National Park, Nepal. A survey of 189 households conducted between October and December 2004 examined local residents' perceived benefits, their attitudes toward park management, and perception of linkages between conservation and livelihoods. Linkage perceptions were measured by a scale compared with a respondent's recognition of benefits to determine whether IBPs establish a connection between benefits and livelihoods. An attitude scale was also created to compare attitudes toward park management with perceptions of benefits and linkage to determine if IBPs led to positive attitudes, and if the recognition of a direct tie between livelihoods and natural resources made attitudes more favorable. Research results indicate that as acknowledgement of benefit increases, so does the perception of linkage between the resource and livelihoods. Similarly, when perceived benefit increases, so too does attitude towards management. Positive attitude towards park management is influenced more by perception of livelihood dependence on resources than on benefits received

from the park. However, overwhelming positive support voiced for conservation did not coincide with conduct. In spite of the positive attitudes and high perception of linkage, people did not necessarily behave in a way compatible with conservation. This suggests that while benefits alone can lead to positive attitudes, without clear linkages to conservation, the IBP may lose persuasion when alternative options—conflicting with conservation objectives—arise promising to provide greater economic benefit.

Keywords Incentive-based programs · Protected areas · Conservation · Nepal · Chitwan National Park · Attitudes · Linkage perceptions

Introduction

With 70% of the world's protected areas inhabited by subsistence-based human populations, and many others being threatened by encroachment across their borders, issues surrounding social justice and local livelihoods in biodiversity conservation cannot be ignored (Terborgh and Peres 2002; Van Schaik and Rijksen 2002). In response to the criticisms of the social implications of exclusionary national parks or core zones, buffer zones have become increasingly common along their boundaries as a means to incorporate social concerns into environmental management (Brandon 2002). Incentive-based Programs (IBPs) have been initiated in buffer zones in an attempt to encourage local support for conservation.

Since the early 1980s, protected area planners have been attempting to achieve conservation objectives by

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improving support for conservation programs and management. The premise behind IBPs is to foster local support by addressing social needs and extending benefits to residents that act as incentives toward conservation. The approaches applied under the umbrella of IBPs are varied and can encompass building local capacity, empowering local people, providing micro-credit opportunities, developing tourism markets, offering training for skill development, and initiating community forestry programs or opportunities for sustainable resource extraction (Spiteri and Nepal 2006).

While research suggests that the receipt of benefits corresponds with improved attitudes toward conservation (de Boer and Baquete 1998; Gillingham and Lee 1999; Abbot and others 2001; Goodwin and Roe 2001; Mehta and Heinen 2001; Bauer 2003; Sekhar 2003), for benefits to truly act as incentives, a direct link must be established between the protection of natural resources and the development, social advancement or income-earning opportunities offered and supported by conservation institutions (Alpert 1996; Salafsky and Wollenberg 2000; Brown 2002). Establishing a theoretical link does not guarantee local residents will support conservation efforts; benefits can only function as incentives and alter local attitudes toward resource conservation if local residents actually perceive a link between livelihoods and conservation (Noss and others 1999; Salafsky and Wollenberg 2000). Essentially, the intention of incentive-based conservation is to create a dependency between conservation and livelihoods in order not only to encourage support for conservation of natural resources but to create a long term commitment to conservation. If this linkage cannot be established, then the program is simply a development project, and does not necessarily contribute to conservation objectives (Brandon and Wells 1992; Tello and others 1998; Noss and others 1999; Salafsky and Wollenberg 2000; Gadd 2005).

This paper examines attitudes of local residents surrounding Chitwan National Park (CNP), Nepal in relation to their perceived benefits and perceptions of the link between livelihoods and conservation. The research objectives are to (1) examine how perceptions of benefits affect attitudes toward park management, and (2) determine whether perceptions of a link between benefits, livelihoods and conservation lead to more favorable attitudes toward park management. Benefits, as defined in this paper, refer to benefit from resource extraction opportunities and park-based tourism, and from community development related benefits provided by the national park agency and various partners. The results presented are part of a larger research project that also explored the types of benefits identified from IBPs by boundary residents and how the benefits are distributed throughout the buffer zone. These results have been reported elsewhere (Spiteri and Nepal 2008).

Methods

Study Area

CNP was established in 1973 as Nepal's first national park, and has since been managed by the Department of National Parks and Wildlife Conservation (DNPWC) primarily as a strictly protected core zone covering 932 km² (Fig. 1). The Nepali army holds the responsibility for the enforcement of park regulations. In 1996, a 767 km² buffer zone was established around the park to build partnerships with the 223,000 border residents facing implications from park management efforts (Smith and others 1998; Stræde and Helles 2000). Resource collection is prohibited in the park apart from a designated three day period for grass collection. Border residents face significant losses of life and property from park wildlife, and receive little support from IBPs in the buffer zone toward mitigating wildlife conflict (reference withheld). The charismatic wildlife protected in the park, such as one-horned rhinoceros (*Rhinoceros unicornis*), Bengal tiger (*Panthera tigris*), and Asian elephant (*Elephas maximus*), draw over 50,000 visitors to the area (DNPWC 2003). Up to 50% of revenues collected from tourist entry permits are used in the buffer zone for IBPs including revenue sharing, skill training seminars, park infrastructure improvements, and community forestry (DNPWC 2002, 2003). IBPs directed to improve the social and economic conditions in the buffer zone are also carried out by non-governmental organizations.

The study area is located on the northern boundary of the park in the villages surrounding the main tourist entry gate into the park. The main access to the park is from Ratnanagar, a market center on the highway, from where it is about a 20–30 min drive to Sauraha. Most tourist facilities and services are limited to Sauraha, where the national park visitor center is located. Brahmin, Chettri, and the indigenous Tharu are the main castes, and farming is the primary livelihood activity. Tourism promotion and development provides the main source of funds for IBPs. Residents view opportunities for resource extraction, whether legal or illegal, to be the main benefit received from CNP (Spiteri and Nepal 2008; Stræde and Helles 2000). Other benefits identified by residents include social development initiatives, opportunities to participate and contribute to conservation and development projects, resource conservation in general, and assistance, though limited, with efforts to mitigate wildlife damage to crops and livestock. While benefits have been found to be equally distributed based on demographic variables, residents in villages away from the tourist entry point to the park recognize fewer benefits than those in the gateway village (Spiteri and Nepal 2008). Political instability in 2004 resulting from conflicts between the government and the

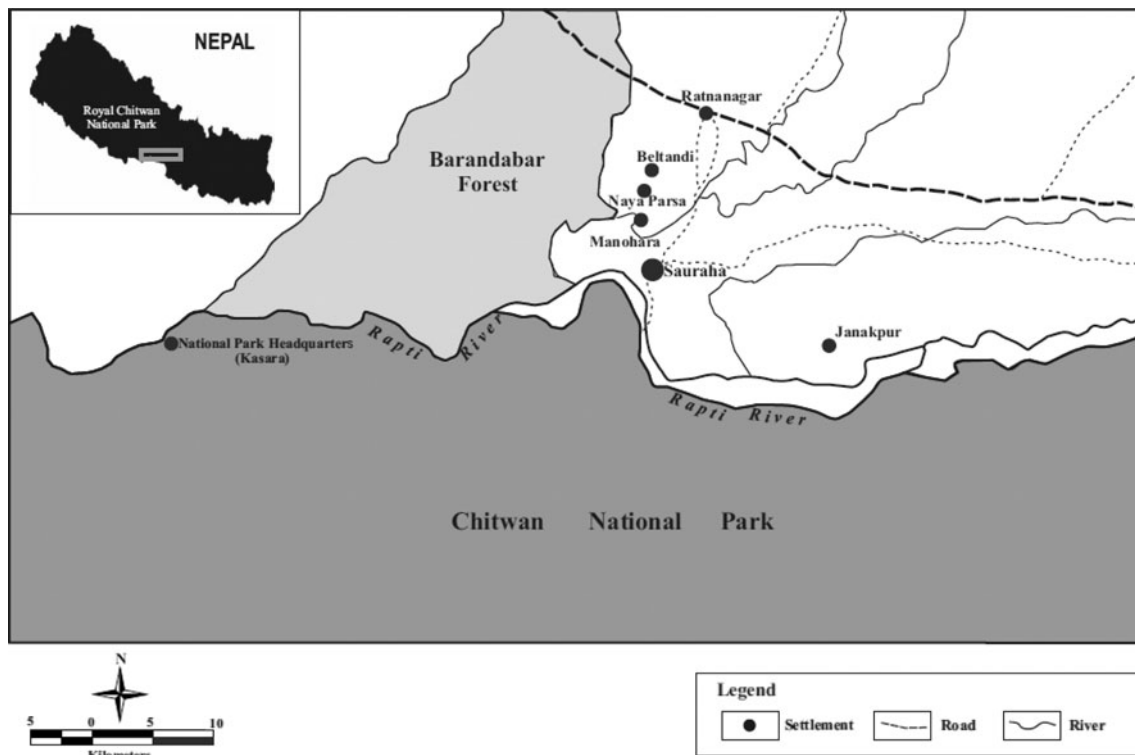


Fig. 1 Location of study area near Chitwan National Park

insurgent Maoist party restricted the study area selection due to concerns over the safety of our research team in other regions. Villages were purposively selected to ensure the sample included communities both located in and away from tourist areas.

Data Collection

A questionnaire survey, administered between October and December 2004, was used as the primary data collection instrument, combined with open-ended interviews with some key informants. A total of 189 randomly selected household heads were surveyed, with a sampling coverage of 20–30% of all households residing in the sampled villages. Five villages were included in the survey; Sauraha and its adjacent neighbor Odhara, Beltandi, Manohara, Naya Parsa and Janakpur. Table 1 provides a summary of the characteristics of respondents. Questionnaires were administered in Nepali, or translated into the local Tharu language, in person by a team of two research assistants, including one female to ensure equal gender representation in the sample. Questions, specific to this paper, asked respondents for information on perception of program benefits, recognition of linkages between conservation and livelihood benefits, and attitudes toward park management. Likert scale and agree/disagree questions were coded so positive responses corresponded with higher numerical

codes to facilitate data analysis. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 13.0.

Three key variables were examined in this research: a respondent's (1) perception of benefits, (2) perception of linkage between conservation and livelihoods, and (3) attitudes toward park management. The first two variables were measured to determine their affect on the third variable, attitudes toward park management. Table 2 provides a list of the main variables and their components and assigned codes used in the analysis. A mean overall score for each question is shown as well. Scales were created to measure all three variables, as using a single variable to measure an underlying concept overlooks other potential confounding variables, allowing no room for error in interpretation of a question on the part of the respondent (De Vaus 2002). Scales have many advantages over using single variables in data analysis, especially if the underlying concept being identified is complex. The use of scales increases the validity, reliability and precision of measurements of the latent variable (De Vaus 2002).

Benefits were measured by a respondents' *perceptions* of benefit receipt overall, and benefit receipt from tourism. Responses from two questions regarding perceptions of benefit receipt were summed to create a composite scale reflecting a household's receipt of benefits from the protection of natural resources and conservation-related

Table 1 Profile of respondents

	%		%		%
Village		Education		Ability to meet livelihood needs	
Gateway	42.9	None	36.5	No	11.1
Distant	57.1	Primary	15.9	Sometimes	71.4
Gender		Lower secondary	14.4	Yes	17.5
Male	49.7	Secondary	19.7	Origin	
Female	50.3	University	13.8	Native	61.9
Occupation		Age in years		Migrant	38.1
Housework	20.6	18–24	16.4	Caste	
Agriculture	47.1	25–45	57.1	Low caste/untouchable	12.2
Tourism	24.9	46–64	22.8	Middle caste—Traders	53.4
Other	7.4	65+	3.7	High caste—Brahman/Chhetri	34.4

development activities (refer to Table 2, Benefits: *Perception of Benefits*). Each question listed four categories of benefit levels including none (0), little (1), some (2), or a lot (3). The scores from both questions were combined and then transformed to fit a zero to 10 scale, with 10 indicating the highest level of benefit (De Vaus 2002). Similarly, a respondent's perceived benefit from tourism was determined by responses to two questions (adapted from Walpole and Goodwin 2001): (1) my family has more money due to tourism, and (2) tourism benefits my family (refer to Table 2, Benefits: *Tourism Benefit*). Respondents who gave positive responses to either question were considered to perceive some benefits from tourism. Tourism benefit was further broken down into direct tourism benefit for households with at least one member employed in tourism, and indirect tourism benefit for respondents who acknowledge benefits from tourism but have no household members employed in tourism.

Linkage refers to the *perceived* connection on the part of the respondent between their livelihood and conservation. Salafsky and Wollenberg (2000) suggest the presence of a perceived linkage can be determined by asking the question: "If the biodiversity of the site were to be damaged, what would happen to your livelihood activity?" This question was included in the questionnaire as a measure of linkage, but given the ambiguity in translating *biodiversity*, respondents were asked "If the resources of the park were to be damaged, what would happen to your livelihood activity?" Although this measure alone can provide a good indication of the linkage perceived by local residents, linkage is a complicated perception to measure; as a result, this question was combined with five other questions to form an overall linkage scale (refer to Table 2, Linkage Perception).

Much of the literature on conservation attitudes in developing countries indicates local residents hold favorable attitudes toward conservation in general (Gillingham

and Lee 1999; Mehta and Heinen 2001; Walpole and Goodwin 2001; Bauer 2003); however, they may not support active conservation efforts encompassing their community or impacting their livelihood. Even if conservation efforts are supported, local residents may have poor relationships with the management authority, and disagree with their management approach (Ite 1996; Van Den Born and others 2001; Bauer 2003). Given the prevalent positive response to attitude questions regarding conservation in general and the conservation role of CNP by respondents, residents were asked questions about their *attitudes toward park management*. These questions were used to determine if a respondent's perceptions of benefit or linkage were reflected in their attitudes toward park management. Responses to seven questions on attitudes toward park management were combined to form each respondent's attitude scale score (refer to Table 2, Attitude Toward Park Management).

Scales were created from the six questions regarding perceived linkage between livelihoods and the conservation of natural resources and the seven questions about attitudes toward PA authorities. A number of steps were taken to produce the scales for linkage and attitude (Table 3). Scale components included redundancy, which is considered beneficial in highlighting the latent variable (DeVellis 1991). Variables with positive skew (>90%) and item-total correlations less than 0.3 were excluded from the scales as low correlations indicate the set of variables are not unidimensional (De Vaus 2002). Cronbach's Alpha coefficient provides a measure of the overall reliability of a scale, ranging between 0 and 1 (De Vaus 2002). A value of 0.65 or higher indicates a reliable scale (DeVellis 1991). The Alpha values for the final linkage and attitude scales were 0.67 and 0.81, respectively, with no item-total correlation falling below 0.3. Individual variable scores were summed and then converted to reflect final linkage and attitude scale scores between the values of zero to ten for

Table 2 Key variables, variable components and coding

Variables and variable components	Mean score	Coding scheme
<i>Benefits</i>		
Perception of benefits		From a low of 0 to a high of 10 1 = high, 0 = low
How much does your household benefit from... ...the protection of forests and wild animals?	1.77	3 = a lot, 2 = some, 1 = little, 0 = none
...development programs run by the park?	1.42	3 = a lot, 2 = some, 1 = little, 0 = none
Tourism benefit		1 = yes, 0 = no 2 = direct, 1 = indirect, 0 = none
My family has more money due to tourism	0.57	1 = agree, 0 = disagree
Tourism benefits my family	0.57	1 = agree, 0 = disagree
<i>Linkage perception</i>		
		From a low of 0 to a high of 10 1 = strong link, 0 = weak link
The park provides employment to many local people	0.39	1 = agree, 0 = disagree
My livelihood depends on the existence of the forest and wild animals	0.59	1 = agree, 0 = disagree
The protection of the forest and wild animals does not improve the social services in my community	0.74	1 = disagree, 0 = agree
The protection of the forest and wild animals does not improve my standard of living	0.66	1 = disagree, 0 = agree
Improvements to the social services available in my community are due to the presence of the park	0.85	1 = agree, 0 = disagree
If the resources of the park were to be damaged, what would happen to your livelihood activity?	1.86	3 = end, 2 = worsen, 1 = no change, 0 = improve
<i>Attitude toward park management</i>		
		From a low of 0 to a high of 10 1 = positive, 0 = negative
The park authorities...		
...are generally helpful and understand our problems, needs and expectations	0.71	1 = agree, 0 = disagree
...are not interested in our needs or concerns	0.54	1 = disagree, 0 = agree
...are open to our suggestions and concerns regarding development and conservation programs	0.75	1 = agree, 0 = disagree
...treat us as equal partners in development and conservation	0.73	1 = agree, 0 = disagree
...don't understand our problems and needs	0.51	1 = disagree, 0 = agree
...encourage us to participate in conservation and development programs	0.84	1 = agree, 0 = disagree
...don't respect our input or appreciate our efforts	0.65	1 = disagree, 0 = agree

each respondent. Although the components of the final scale were initially in an ordinal form, when summed the convention is to treat the new scale as interval because such treatment allows for more sophisticated and powerful statistical tests (De Vaus 2002). Following this convention, scale scores were treated as interval variables when entered as predictors in logistic regression, and were visually presented in bar graphs measuring scale means to highlight differences between groups. The scale scores were also transformed into dichotomous variables reflecting high and low values by group means to allow for logistic regression analysis with the scale as the dependent variable.

The relationship between perceptions of benefit, tourism benefit and linkage were examined by logistic regression, with the dichotomous values for linkage as the dependent

variable. While the relationship between benefits and linkage could be examined by looking at whether linkage determines a respondent's perception of benefits, this study determines of those respondents who perceive benefits, did they perceive these benefits to be linked to their livelihoods. In other words, we examine if those households who perceived benefits from the park recognized the benefits to be linked to park conservation. Without such a perception of a link, the benefits they perceive are not reliant on the conservation value of CNP. To determine the affect of benefit perceptions and linkage on attitudes toward park management, the dichotomous value for attitude was entered in a hierarchical logistic regression analysis. Given tourism is the primary source of IBP funding in CNP, relationships between type of tourism benefit and scale

Table 3 Steps applied in the development of scales

Steps	Technique	Example: linkage scale
Choose variables to include based on latent variable to be measured	Based on literature review, include questions in survey to measure latent variable	Questions relating to linkage
Exclude variables with >90% positive response	Examine frequencies	Due to 100% positive response, one question was excluded from the scale
Score variables in same direction	Reverse coding of negatively worded statements; high score corresponds with presence of latent variable	“My livelihood depends on the existence of the forest and wild animals.” A = 1, DA = 0 ^a “The protection of the forest and wild animals does not improve my standard of living.” A = 0, DA = 1 ^a
Standardize variables to adjust for unequal categories ^b	Divide old variable by standard deviation Calculation: new variable score = old variable score/ standard deviation	Linkage scale included six questions. Five questions had two categories of responses, while one had four response categories. To ensure each variable had equal representation in the scale, response codes for each variable were divided by the standard deviation for that variable
Reliability statistics		
Unidimensionality	Remove variables with item-total correlation >0.3	Removed one question from scale due to low item-total correlation.
Reliability	Maximize Cronbach’s Alpha—ideally >0.65	Cronbach’s Alpha = 0.67
Create scale ^c	Sum scores for each variable included in the scale	Six variable scores were summed for each respondent
Transform scale to fit 1–10 ^c	Calculation: new scale score = ((old score – minimum score)/score range) × 10	Minimum score = 0 Maximum score = 17.2 Range = 17.2 New scale score = ((old score – 0)/17.2) × 10
Create dichotomous variable ^c	Collapse scale into new variable divided by group mean to represent high and low scores relative to group	Linkage Scale mean = 6.51 Low linkage = less than 6.51 High linkage = greater than 6.51

^aA agree, DA disagree

^b This step was only needed for the linkage scale. Variables included in other scales consisted of the same number of response categories

^c Only these steps were necessary to create the composite scale for perceptions of benefit receipt

scores (linkage, attitude) were also examined using Kruskal–Wallis tests. Bar graphs comparing means by tourism benefit for each of these scales were used to visually illustrate these relationships.

Results

The results indicated that the majority of respondents acknowledge some benefit from conservation and development activities (Table 4). The majority of respondents state they benefit most or somewhat from the protection of forests and wild animals (79%) and from development programs run by the park (60%). Interestingly, 23% indicated they receive no household benefits from the development programs run by CNP. This may suggest that the extension activities run by the park have not reached some intended beneficiaries. Likewise, 10% indicated receiving no benefits from the protection of forests and wildlife. The

mean score for perceptions of benefits was 5.3 on a 10-point scale and with a standard deviation of 2.13. Benefits from tourism are perceived by 62% of respondents; however, of those recognizing tourism benefits only 53% had a household member directly employed in tourism services. The remaining 47%, therefore, recognized indirect benefits from tourism.

Answers to statements questioning the link between livelihood opportunities and conservation activities indicate respondents do recognize a connection (Table 5). Many people feel the park is responsible for the social services available in the community (83%) and that protecting the forest and wild animals improves their standard of living (68%). Only 38% of respondents believe the park provides employment to locals, yet, 86% believe if the resources of the park were to be damaged their livelihood activity would worsen or end. This implies that the link between CNP and local livelihoods is recognized even by the respondents who are not employed in tourism. The

Table 4 Perceptions of benefit receipt (*n* = 180)

Benefit	How much do you think you and your household actually benefit from...	
	...the protection of forests and wild animals? ^a (%)	...the development programs run by the park? ^a (%)
...a lot	6.9	3.7
...some	72.5	56.1
...little	9.5	12.2
No benefit	10.1	23.3
Don't know ^b	1.1	4.8
Mean ^c	5.26	
Standard deviation ^c	2.13	

^a Values assigned to responses (a lot (3), some (2), little (1), none (0)) to these two questions were combined and transformed to a 0–10 scale, with 10 reflecting a high perception of benefit

^b Cases including ‘don't know’ responses were excluded from the analysis due to the limited number of variables comprising the composite scale

^c Summary of composite scale details

average score on the linkage scale was 6.5 on a 10-point scale, with a standard deviation of 2.15. A higher mean score indicates a higher perceived linkage. A logistic regression analysis was employed to examine the relationship between perceptions of benefits and linkage. Because of the perceived ability of tourism development to establish strong linkages between livelihoods and resource conservation (Groom and others 1999; Hamilton and others 2000), linkage scores were also evaluated based on the type of benefit received from tourism (direct or indirect).

Perceptions of benefits and type of tourism benefit were found to have significant effects on an individual's perception of linkage (Table 6). For each one-point increase on the ten-point benefit receipt scale the odds that the

Table 6 Results of logistic regression between respondent's perception of benefit receipt and perception of linkage between livelihood and park (*n* = 178)

Benefits	B	SE	Wald	<i>P</i>	Odds ratio
Perception of benefit receipt	0.29	0.09	9.72	0.002	1.34
Direct tourism benefit	2.34	0.46	26.01	0.000	10.34
Indirect tourism benefit	1.77	0.43	16.87	0.000	5.88
Nagelkerke <i>r</i> square	0.38				

B regression coefficient, *SE* standard error, *Wald* Wald statistic, *P* significance. Overall fit of predicted to observed results = 73%

respondent will perceive high linkage increases by 1.3. The odds ratios for type of tourism benefit indicate those directly benefiting from tourism and those indirectly benefiting from tourism are 10.3 and 5.9, respectively, more likely to perceive higher linkages than those not benefiting from tourism, when all other variables are equal. The bar graph displayed in Fig. 2 helps in understanding this relationship between linkage and tourism benefit more clearly. Residents indicating no benefits from tourism have the lowest mean score on the linkage scale. Linkage scores increase for those indirectly benefiting from tourism, and are highest among respondents directly benefiting through employment in tourism.

Support for CNP and conservation in general was very high. When respondents were asked the open-ended question: ‘Do you see a need for the park to exist?’ (after Ite 1996), 93% of respondent's replied positively. All respondents agree the protection of plant species is important, while support for wild animal conservation was indicated by 98%. The majority of respondents felt it was good that the land was protected (99%). Although support for CNP and resource conservation was almost unanimous, respondents did not hold similar attitudes toward park management (Table 7).

Table 5 Perceptions of linkage

Statements	%
The park provides employment to many local people	37.6
My livelihood depends on the existence of the forest and wild animals	57.1
The protection of the forest and wild animals does not improve the social services in my community	23.8
The protection of the forest and wild animals does not improve my standard of living	31.7
Improvements to the social services available in my community are due to the presence of the park	82.5
If the resources of the park were to be damaged, what would happen to your livelihood activity? ^a	85.7
Scale mean ^b	6.51
Standard deviation ^b	2.15

Statements were used to create a scale to measure linkage perceptions (*n* = 187)

Percentages are based on total number of respondents agreeing with statement

^a Adapted from Salafsky and Wollenberg (2000). Responses were coded (0) improve, (1) no change, (2) worsen, (3) end. Percentages based on total number of respondents answering worsen or end

^b Summary of scale details. Based on a 0–10 scale, a high mean score indicates a high perceived linkage

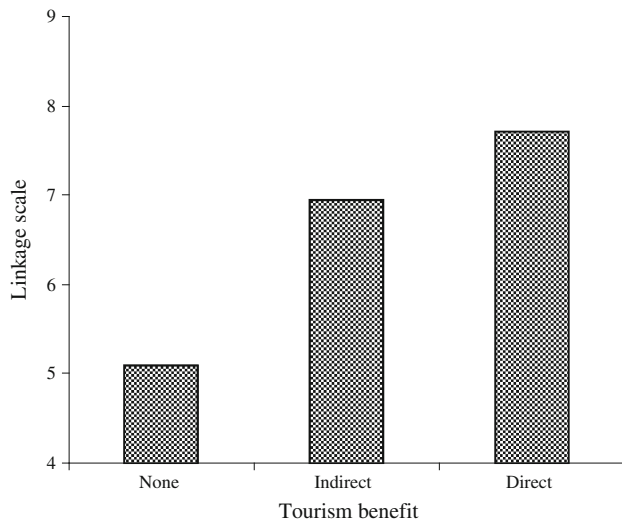


Fig. 2 Mean perception of linkage by tourism benefit. Results of Kruskal–Wallis show differences are significant ($\chi^2 = 47.519$, $df = 2$, $P < 0.0001$)

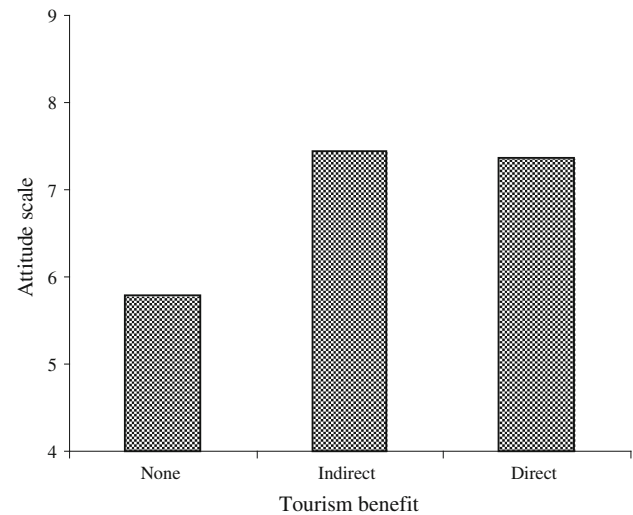


Fig. 3 Mean attitude by tourism benefit. Results of Kruskal–Wallis show differences are significant ($\chi^2 = 10.340$, $df = 2$, $P < 0.006$)

Table 7 Attitudes toward park management

The park authorities...	%
...are generally helpful and understand our problems, needs and expectations	67.2
...are not interested in our needs or concerns	44.4
...are open to our suggestions and concerns regarding development and conservation programs	69.8
...treat us as equal partners in development and conservation	67.7
...don't understand our problems and needs	47.6
...encourage us to participate in conservation and development programs	81.5
...don't respect our input or appreciate our efforts	30.7
Scale mean ^a	6.81
Standard deviation ^a	3.06

Percentages are based on total number of respondents agreeing with statement. Statements were used to create a scale to measure attitudes ($n = 182$)

^a Summary of scale details. Based on a 0–10 scale, a high mean score indicates a positive attitude

Many respondents feel encouraged by park management to participate in conservation and development programs (82%) and believe management is open to their suggestions and concerns (70%); however, almost half (44%) feel management is truly not interested in their needs and do not understand their problems (48%). The mean score on the attitude scale was 6.8 (standard deviation 3.06) on a 10-point scale. A higher mean score indicates a more positive attitude. Attitudes toward park management are significantly more positive among respondents involved directly or indirectly in the tourism industry, with almost no difference between the two types of benefits (Fig. 3).

The attitude scale created facilitates logistic regression analysis to measure associations between attitudes toward park management, receipt of benefits, and perceptions of a link between conservation and livelihoods. First, bivariate simple logistic regression was used to determine the effect of perceptions of household benefit receipt on attitudes. The analysis revealed a significant positive association between perceived benefits and attitudes, with attitudes toward management improving as benefits increased at an odds ratio of 1.3 (Block One, Table 8). Using hierarchical logistic regression, linkage score was entered into the second block to explore the relationships among attitudes, benefits and linkage (Block Two, Table 8). By adding linkage scale scores to the equation, the association between benefits and attitude became insignificant, indicating a respondent's perception of the link between their livelihood and conservation had a greater effect on attitudes toward park management than benefits. Results show that as a respondent's linkage perception increases, attitudes toward park management improve at an odds ratio of 1.4.

Discussion

Research results indicate that individuals who perceive they benefit from CNP are likely to recognize that these benefits, and, in turn, their livelihood, are directly tied to the integrity of the park and its resources. In principle, boundary residents of CNP unanimously support the park and conservation in general; however, satisfaction with park management is less universal. This study shows that individuals who perceive more benefits from the park are likely to hold more favorable attitudes toward park

Table 8 Results of hierarchical logistic regression between attitudes and perception of benefit receipt and perception of linkage ($n = 172$)

Blocks	B	SE	Wald	<i>P</i>	Odds ratio	Nagelkerke <i>r</i> square
Block One						
Perception of benefit receipt	0.27	0.08	12.22	0.000	1.31	0.101
Block Two						
Perception of benefit receipt	0.15	0.09	3.01	0.083	1.16	
Perception of linkage	0.32	0.09	12.45	0.000	1.38	0.197

B regression coefficient, *SE* standard error, *Wald* Wald statistic, *P* significance. Overall fit of predicted to observed results = 65.7%

management than those perceiving less benefit. However, as the results on Table 8 show, positive attitudes toward park management are influenced more by their perception of a direct dependence of their livelihood on the park and its resources, than on their perceived receipt of benefits from the park.

Residents are aware of the importance of the park to their community, with most people recognizing benefits from the park also perceiving a direct link between conservation and livelihoods. Local perceptions of linkage are captured in this statement expressed during an informal conversation with a resident:

It is a good thing to protect forest and wild animals. These are our wealth and we are responsible for protecting them. We get grass, fodder, firewood, and other forest resources by protecting the forests. In addition, we also enjoy the privilege of viewing rare wild animals. It is because of the tourists that Sauraha [*the main tourist village accessing the park*] is what it is today.

Tourism has been cited as ideally suited to offer clearly defined and well-established linkages to local livelihoods; however, some research suggests that unless residents receive direct benefits from tourism, the linkage is overlooked and not understood (Walpole and Goodwin 2001). Even with direct tourism benefits, people need to first of all recognize they receive that benefit, and then that the benefit is linked to conservation, if IBPs are to contribute to conservation objectives (Gadd 2005). Given that tourism provides the primary source of funds for many of the benefits extended in the buffer zone of CNP, local people who are not working directly in the tourism field must recognize that some of the benefits they receive stem from tourism, which, in turn, depends on conserving the natural attractants in the park. Around CNP, tourism is an important activity which many residents are able to relate to conservation. This implies that local residents are aware that without the park there may not be any tourism and with it any livelihood opportunities. While direct tourism benefit from CNP through employment leads to a stronger likelihood a respondent will recognize a link than indirect benefits, contrary to previous findings (Walpole and Goodwin 2001; Gadd 2005), the association between

linkage and benefits remains high among indirect tourism beneficiaries surrounding CNP, as indicated by the logistic regression results. Tourism to CNP is inherently linked to conservation because the primary tourist attraction is the opportunity to view endangered wild animals in their natural habitat (Damanian and Hatch 2005). While the perception of a link between conservation and livelihoods is not expected to be more likely among respondents receiving indirect tourism benefits, the results suggest CNP has established IBPs with clear linkages to conservation. Provided local residents recognize some form of benefit from the park, respondents will perceive such benefits are a result of conservation efforts in the park.

Higher levels of benefit receipt in communities surrounding CNP correspond with positive attitudes toward park management, and, respondents who perceive tourism benefits have more favorable attitudes than those that perceive no tourism benefits. Although benefits have been found to lead to more positive attitudes in many cases (Fiallo and Jacobson 1995; de Boer and Baquete 1998; Hamilton and others 2000; Abbot and others 2001; Archabald and Naughton-Treves 2001; Jim and Xu 2002; Sekhar 2003; McClanahan and others 2005), such a relationship can only prove meaningful to park conservation objectives if a link is perceived by residents between the benefits received and the conservation of natural resources (Bauer 2003; Gadd 2005). The results indicate a direct link between conservation and local livelihoods leads to high levels of support for the park. The relationship between linkage and attitudes as perceived by local residents can be understood from the following two statements from villagers in Sauraha:

We need the park for a lot of reasons. We now depend on the park so much that we cannot live without it. This entire village lives on income from tourism. We also need it to protect the forests.

I like the park very much because if there was no park then we could not see these disappearing wild animals. The park has developed tourism, so that we local people get benefits in direct and indirect ways, such as getting jobs and doing business in local products like vegetables, milk, etc.

These findings corroborate other studies (Gadd 2005), and support the relationship between perception, linkage and attitudes.

A recognized connection between benefits from the park and conservation of the park resources can be achieved in two main ways in CNP: (1) people identify the need to conserve the resource in order for them to benefit from sustainable resource extraction; or, (2) the tourism industry, which has evolved and developed due to visitors' desire to see the charismatic mega fauna and their jungle habitat, provides the primary source of funds for most benefits, both direct and indirect, and the continuation of future benefit depends on the region's ability to conserve the flora and fauna of the park. The results suggest some conservation incentives may have been successfully established by IBPs for those who consider the 'benefit/livelihood-tourism-park conservation' connection integral to their livelihood. However, some residents either do not recognize that park-related tourism provides funding for development projects in their community or cannot benefit from certain development projects because they cannot even meet the basic livelihood needs for their households, IBPs that would be most successful in establishing livelihood linkages for these residents would have to take advantage of the 'benefit/livelihood-resource extraction-park conservation' connection. Extraction opportunities available in the park and through IBP-sponsored community forestry projects are limited for resource-dependent residents, and, therefore, the ability of IBPs to establish linkages based on fulfilling resource extraction needs are insufficient—why protect something you are not allowed to access.

The major factor inhibiting the ability of IBPs in CNP to alter extractive behaviors of all residents is the inability to deliver benefits throughout the population surrounding the park (Spiteri and Nepal 2008). Benefits are concentrated in villages located at the main tourist entry point to the park. Residents away from these tourist centers and in areas where tourism-induced indirect benefits have not materialized do not perceive the linkages between livelihoods and conservation, and, therefore, have no incentive to conserve resources amidst the consequences of park-imposed access restrictions and wildlife damage (Spiteri and Nepal 2008). Consequently, despite success in establishing a perceived direct connection between benefits and livelihoods, residents surrounding CNP continue to disregard legal restrictions on resource collection.

While residents surrounding CNP acknowledge the need to conserve natural resources and support the conservation role of the park, attitudes toward park management are less favorable. The individual questions used in the attitude scale suggest some respondents do not believe the park authority is concerned with the needs and problems of local people, and does not value the role of local people in

conservation. Many residents in villages closest to the park entrance voiced concerns over the failure of the park authority to curb poaching and provide adequate facilities for tourists within the park. In villages located outside of the main tourist areas, negative attitudes toward park management are often associated with the park's inability or indifference to limit human-wildlife conflicts.

Based on observations in the field, the overwhelming positive support voiced for conservation did not coincide with conduct. IBPs based on perceived direct linkages with local livelihoods may lead to improved attitudes toward protected area management and conservation in general, but unless benefits outweigh the opportunity costs of conservation, IBPs will not guarantee an abandonment of behaviors in conflict with conservation objectives (Kremen and others 2000; Barrett and others 2001; Holmern and others 2007). One villager summarizes how cost-versus-benefit considerations influence local actions: "Villagers can be both poachers and guardians of the park, depending on which benefits them more." Personal observations, survey results and accounts from villagers confirm the widespread occurrence of poaching by individuals for personal use or economic return. Poaching in CNP is often carried out to fulfill subsistence needs of local people, including the collection of forest products for house construction, livestock fodder, and consumption. Villagers and park authorities also report poaching by poor local residents for organized parties involved in trade in animal body parts. Such incongruence between stated support for conservation and poaching has been found in another study around CNP (Nepal and Weber 1993).

Observations of illegal collection of resources increased during Maoist imposed strikes. During strikes, the army was preoccupied with minimizing political turmoil, thereby reducing the presence of guards in the park. Residents, normally afraid of fines and imprisonment, take advantage of the lower likelihood of being caught, and hundreds of people can be seen collecting resources on these days. Enforcement, not benefits, appears to be the incentive keeping some residents from extracting resources from the park. Despite the linkage established between livelihoods and conservation in the CNP buffer zone, overall a tragedy of commons scenario occurs with villagers condemning poaching while, at the same time, openly admitting to participating in poaching.

Conclusions

Overall, this study shows that as acknowledgement of benefit increases, so does the perception of linkage between the resource and livelihoods. Similarly, when perceived benefit increases, positive attitude towards management is likely to occur. However, positive attitude towards park

management is influenced more by perception of livelihood dependence on resources than on benefits received from the park. In spite of the positive attitudes and high perception of linkage, people did not necessarily behave in a way compatible with conservation. This suggests that while benefits alone can lead to positive attitudes, without clear linkages to conservation, the IBP may lose persuasion when alternative options—conflicting with conservation objectives—arise promising to provide greater economic benefit.

CNP is endorsed as an exemplary model of IBPs. While CNP has made notable achievements in delivering IBP benefits with a recognized link to livelihoods, barriers to the successful implementations of the approach remain. Benefits can only act as incentives among those who receive them. Around CNP, benefit receipt remains contingent on a household's proximity to the tourist centre (Spiteri and Nepal 2008). The social and ecological circumstances surrounding CNP suggest IBPs will never preclude the need for effective enforcement mechanisms. The human population residing in the buffer zone is comprised largely of immigrants from the mountains and middle hills, thereby creating a diverse social mosaic. Such social foundations lead to uncertainties stemming from a disconnected human population, and when combined with the lack of ownership over park land and resources typical of the national park approach, over-exploitation of the commons is likely (Ostrom 1990; Dolšák and Ostrom 2003). In addition, the wildlife protected by the park cause substantial damage to local livelihoods and hold high value in the illegal international market for endangered animal parts. Under such conditions, the absence of effective enforcement is likely to threaten the biodiversity contained in the park.

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