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A protected area between subsistence and development

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Abstract: Conserving nature and managing protected areas are fraught with risks, especially when done against the preferences of local communities. The relative dependency of local communities on ecosystem services, perceptions of the economic potential of a protected area by the local population, and the belief that the locals will share in the potential benefits of the protected area determine whether the protected area will be opposed, tolerated or supported. Working from a sample of 686 interviews in Hoang Lien National Park in Vietnam, the effective use of the park, the perception of the park and its management as well as the valuation of potential benefits are described. As various ethnicities are living in the core zone the analyses allow the consideration of various degrees of dependency on and perceptions of ecosystem services of the locals. The results show that the weak link in the intended development chain "protection – value of a protected area – better life for local population" is that an important part of the interviewees do not perceive that the local communities benefit from the

national park. This implies that not only distribution of compensation payments but especially communications of the benefits (cash or local public goods) are core elements for sustainable conservation of natural resources.

Keywords: Conservation and management, ecosystem services, Hoang Lien National Park, local population, perceptions

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Abbreviations

ASEAN	Association of Southeast Asian Nations
CBD	Convention on Biological Diversity
CICES	Common International Classification of Ecosystem Services
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
ES	Ecosystem Service
GDP	Gross Domestic Product
HLNP	Hoang Lien National Park
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
MA	Millennium Ecosystem Assessment
MONRE	Ministry of Natural Resources and Environment
NP	National Park
PA	Protected Area
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WVS	World Values Survey

1. Introduction

The ongoing loss of biodiversity, degradation of ecosystems and subsequent reduction in goods and services is one of the greatest global challenges faced by governments and civil society. A significant portion of biodiversity is located in developing countries (Fisher and Christopher 2007; Giam et al. 2010; Lenzen et al. 2012; Adenle et al. 2015). Here, biodiversity is under intense develop-

ment pressure due to poverty (Fisher and Christopher 2007), weak institutions unable to prevent exploitation (Clement and Amezaga 2008; Andrea et al. 2013; Robinson et al. 2013; Thapa Karki and Hubacek 2015) and high economic growth rates linked to rapid infrastructure development (Dietz and Adger 2003; Soubbotina 2004). Protected areas (PAs) are a particularly important tool for halting the loss of biodiversity, conserving extraordinary landscapes and wildlife (Pietrzyk-Kaszyńska et al. 2012) and providing various important ecosystem services (ESs) in these contexts (Dudley et al. 2011). ESs are the benefits provided by ecosystems that sustain human life (Daily 1997; Daily et al. 1997; Díaz et al. 2006), as described by the common international classification for a systematic assessment of ESs (CICES 2018). Recently, the ES-concept (de Groot et al. 2002; Reid 2005) has been extended within the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) conceptual framework towards a new concept, taking the important role that culture plays in defining links between people and nature explicitly into account (Díaz et al. 2018). In this study we use biotic and abiotic ES categories along with the definitions of the CICES guidelines (Haines-Young and Potschin 2017).

Many developing countries have institutionalized a considerable number of PAs (IUCN 2016b). A clear top-down political intention and the status as a PA are not sufficient to provide effective and efficient protection for the ecosystem (Brown et al. 2015) and/or to ensure a PA to be a permanent fixture (Mascia and Pailler 2011; Mascia et al. 2014; Pack et al. 2016). The "fences and fines" principle (Mariki 2013; Mutanga et al. 2015) has provided only limited success. Various studies have shown that the chances of achieving successful environmental protection can be enhanced if the protection goals are shared and supported by the local population (Dickman 2010; Lindell and Perry 2012). To reach this support, management strategies need to acknowledge the interlinked nature of social and ecological systems and actively consider and incorporate local inhabitant's voices, knowledge and expectations (Delgado-Serrano and Ramos 2015). In this regard at least two prerequisites need to be met: First, the establishment of a PA has to have potential for future development with associated benefits for the local affected population (Cardozo 2011; Canavire-Bacarreza and Hanauer 2013; Pullin et al. 2013). Second and even more important is that these benefits are perceived by the locals (Karanth and Nepal 2012). Locals must view the benefits as appropriate compensation for the developmental limitations experienced as result of a PA (Newmark et al. 1993; Spiteri and Nepal 2008; de Oliveira and Berkes 2014).

Many studies deal with the optimal management of PAs based on the opinion of experts or selected representatives of various stakeholders (Juutinen et al. 2011; Karthauser et al. 2011; Robinson et al. 2013; Zielinska 2014; Sessindilascio et al. 2015). The literature reports on numerous studies of the perception of PAs by tourists (Hearne and Salinas 2002; Karthauser et al. 2011; Tran et al. 2015; Muboko et al. 2016). However, it is surprising that only very few papers exist that study the preferences of the population living in the buffer zone or the core zone of a PA as measured from a representative sample of the population (Coe 2013; Kari

and Korhonen-Kurki 2013; Masozera et al. 2013; Robinson et al. 2013; Nguyen Thi Thuy 2014; Pham et al. 2014). Although stakeholder groups can already be diverse and may have different perceptions, the local population is particularly affected by the establishment of a national park and its associated restrictions, and therefore it is essential examining the locals homogeneity (or not) with regard to the perception of the park.

This paper aims to contribute to closing this gap by analyzing the perception of the locals in the core or buffer zone of a national park (NP). Hoang Lien National Park (HLNP) in Vietnam was selected as the study area because of its great biodiversity, the remarkable number of endangered species occurring there, the provision of important ESs to local, national and international beneficiaries, and the increasing economic pressures from the rapid development of transport infrastructure (e.g. highway from Hanoi to Lao Cai) and of touristic infrastructure (e.g. cable car to the top of Fansipan Mountain). Vietnam is politically engaged in protecting valuable ecosystems by establishing a large number of PAs while at the same time experiencing annual GDP growth rates of about 7% (RAMSAR 1971; The CITES Secretariat 1983; The CBD Secretariat 1993; MONRE 2014; IUCN 2016a,b; UNDP 2016; UNEP 2016; World Bank 2016). The selected study area is characterized by the tight connection between wilderness and cultural landscape, both contributing to biocultural diversity (Cocks and Wiersum 2014). Similar conditions can be found in many NPs in developing countries (Wells and Brandon 1993; Tiwari and Joshi 2009; Görmüş 2016). Therefore, the present case study contributes some generalized findings applicable to the regulation and management of PAs beyond HLNP.

We place special emphasis on how the population deals with the dual objectives of conservation and economic development, given the local context of poor economic conditions and strong dependence on the provision of ESs (Vietnam 1995; HLNP 2012; Nguyen Thi Thuy 2014). Conservation programs in an environment of economic pressure on the locals need special attention in order to achieve conservation effectiveness of a protected area (Albers et al. 2017; Delgado-Serrano 2017; Kohler and Brondizio 2017). The degree of conflict between these two objectives depends on the locals' perception of the NP and its restrictions as well as on the locals' time horizon. If the park is mainly perceived as an obstacle over the short-term, the population will not support the park. Contrarily, if the park is seen as a long-term investment in "natural capital" for sustainable development, the population's support can be expected (Karanth and Nepal 2012; Oldekop et al. 2015). This paper attempts to determine the preferences of the local population and whether there are significant differences between the people living in the core zone and the buffer zone, for example due to their dependence on ESs to a greater and lesser extent (Aymoz et al. 2013; Mamo 2014). As the perception of nature is deeply rooted in tradition and culture, different ethnic groups can be expected to have different perceptions of a PA (Cocks and Wiersum 2014; Cuni-Sanchez et al. 2016). A more differentiated picture of the needs and desires of the population may help design an efficient park strategy in order to implement a coherent park

management (Wells and McShane 2004; Bennett and Dearden 2014; Delgado-Serrano 2017).

Therefore, our main research questions are: 1) How much do the locals depend on ESs?; 2) Do the locals approve the objectives of the park depending on the degree of subsistence economy?; 3) Is the park perceived as an obstacle to economic development?; 4) Do the locals discern sustainable tourism as a possibility to mitigate the conflict between protection and development?; and 5) Are the locals a homogeneous or a diverse stakeholder group, a circumstance that has to be considered for successful management?

As methodology we chose a quantitative approach using a questionnaire with standardized items. Our work is based on the assumption that a broad-based survey can provide a differentiated snapshot of locals' perceptions of a protected area.

2. Methods

2.1. Study area – Hoang Lien National Park

Hoang Lien National Park (HLNP) was recognized as an Association for Southeast Asian Nations (ASEAN) Heritage Park by the Environmental Ministers of ASEAN in 2006 (Nguyen Thi Thuy 2014). HLNP lies at the southeastern extent of the Himalayan chain in the northwestern region of Vietnam between the districts of Sapa in Lao Cai and Than Uyen in Lai Chau provinces (220 09′30"–220 21′00" N and 1030 45′00"–1040 59′40" E) (cf. Figure 1).

HLNP covers an area of 29,845 hectares, which comprises a PA of 11,875 hectares, a forest rehabilitation area of 17,900 hectares and an administration services area of 70 hectares. HLNP is characterized by rich forests and high biodiversity. The flora consists of 2343 vascular plants belonging to 1020 genera and 256 families. Of these, 34 species are listed on the IUCN Red List of Threatened Species (Walter et al. 1998) and 82 species in the Red Data Book of Vietnam (MSTE 1996), for example, the Botsford's Leaf-litter Frog (*Leptolalax botsfordi*), the golden coin turtle (*Cuora trifasciata*), or the Fansipan fir (*Abies delavayi ssp. Fansipanensis*) are listed as critically endangered. With regard to the fauna, the park is home to 555 species of vertebrates (Sobey 1998) and includes 16,626 hectares of natural forest, of which 6484 hectares are timber forest (cf. Figure 2).

The population of the survey area consists of 24,006 people living in 4362 households. The core zone of the park is constituted by the communes Bản Hồ, Lao Chải, San Sả Hồ and Tả Van (all together 14,460 inhabitants). The town of Sapa with 8975 inhabitants constitutes the main portion of the buffer zone (The People's Committee of Lao Cai Province 2016). The core zone is the area for strict conservation. It only opens for example for strictly monitored ecotourism activities. In the limited restricted area tourism activities should be strictly supervised in order to minimize their environmental impacts, but natural resources can be used for tourism with a controlled and limited amount. This zone is considered as the buffer zone of the park to maintain biodiversity of the prohibited area and

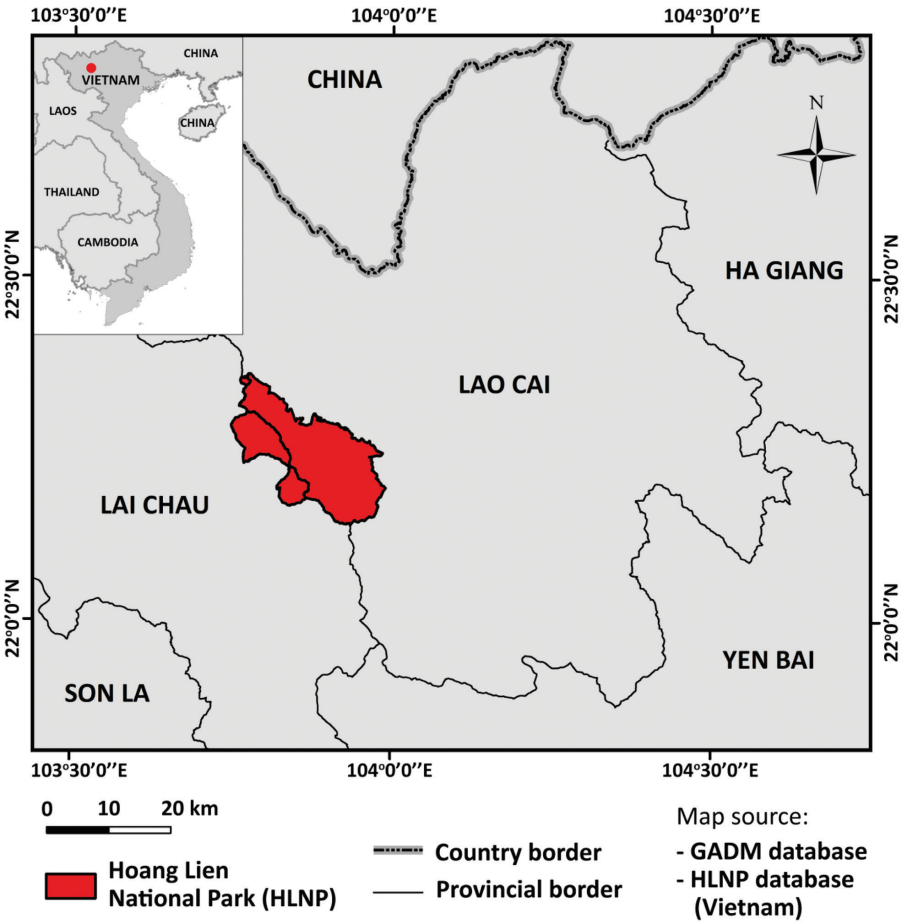

Figure 1: Map of Vietnam showing the location of HLNP.

support conservation function (Nguyen Thi et al. 2008). According to the strictness of the park's regulations likely a gradient of the intensity of ESs use is existent and therewith different perceptions of HLNP.

The local people living in HLNP mainly belong to five ethnic (minority) groups that have different cultures and traditions. These groups are Dzao, Dzay, Hmong, Kinh and Tay. Of these groups, the Hmong ethnic minority has the largest population and inhabits all six communes in HLNP. The local economy is based on agriculture, forestry, aquaculture and some tourism. During the last few years an exponential increase in tourism has been observed (In 2015 more than four times as many tourists as in 2013 were registered, VTOCO 2015). This development is triggered by fast growing incomes in Vietnam and fast development of the

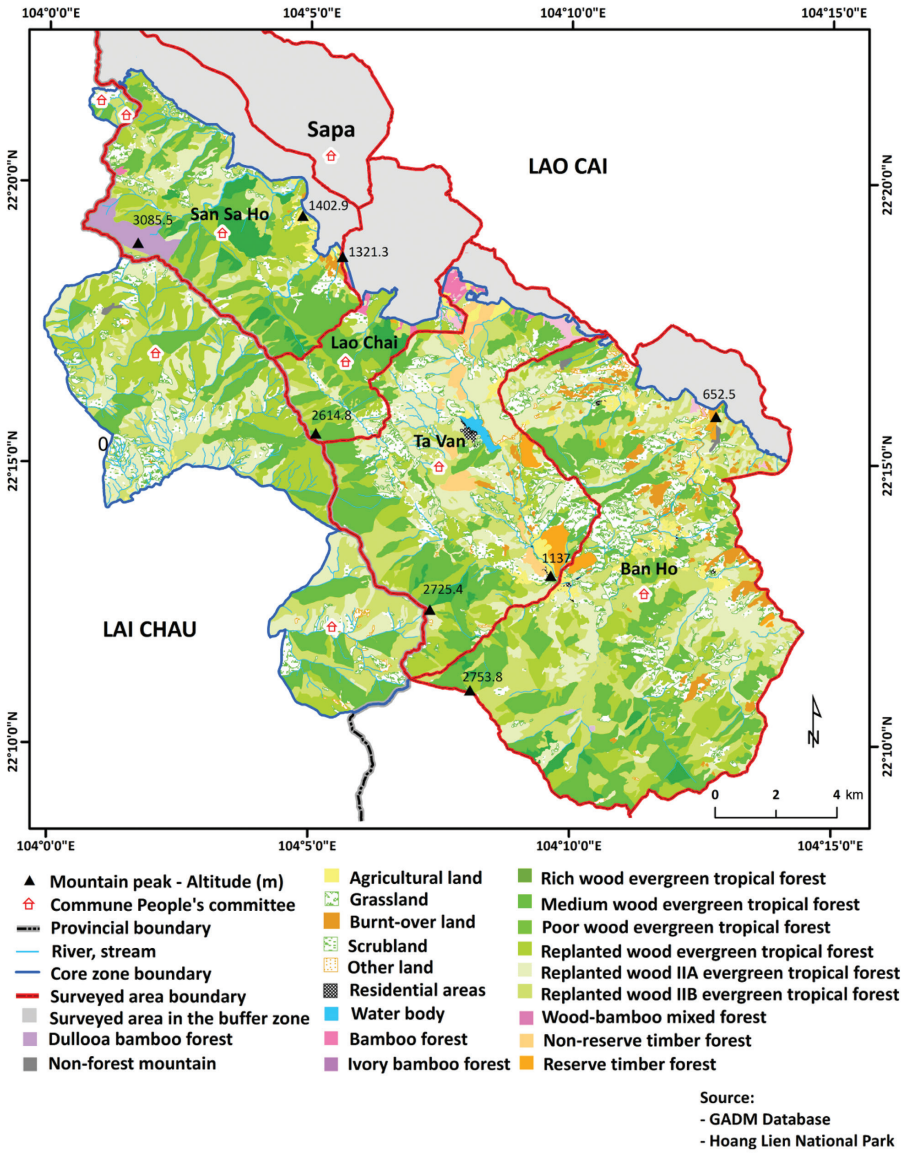

Figure 2: Land use map.

infrastructure, for example construction of the highway from Hanoi to Lao Cai. However, the HLNP landscape (including core and buffer zone) are economically less developed than Vietnam (The People's Committee of Lao Cai Province 2016; World Bank 2016). Hence, we investigate a buffer to core zone transect to capture various kinds and intensities of ES use. The existence of ethnicities within the NP

enables us to evaluate whether and to what extent the use of ESs and consequently the perception of the NP's benefits are influenced by various cultural and educational backgrounds.

2.2. Questionnaire & data

A questionnaire was developed to survey the perception and views of the local population about HLNP and its regulations and management. A sample of the local population living in the core zone and the buffer zone of the HNLP was interviewed and their responses were statistically analysed. With a broad-based quantitative survey a representative picture of the perception of the park by the local population should be achieved with the consequence that qualitative questions were not integrable in the quantitative approach. Although interesting insights can be gained through open questions, they were not the subject of this study.

The questionnaire included sociodemographic questions (like age, gender or education), questions concerning the use and importance of ESs, experience with the park administration and attitudes towards complying with park regulations. Whenever possible, the same item as used in the World Values Survey (WVS) wave 5 (2005–2008) (Inglehart et al. 2014) was applied in order to have reliable items as well as national and international benchmarks for the HLNP results using this rich data set.

We focused mainly on biotic and abiotic provisioning services, since rural, economically less developed countries tend to depend on natural resources for their survival (Locatelli et al. 2017). Furthermore, in many mountain areas of developing countries, increases in food production at the expense of regulating and cultural services have been observed (Locatelli et al. 2017). Hence, we did not focus in detail on cultural ecosystem services (CES), which are also highly context specific (Daniel et al. 2012). Therefore, we analysed only two CES, a proxy for the population's rootedness in cultural traditions (use and importance of the HLNP for cultural or religious aspects) and a proxy for recreational activities of tourists (offering homestay). The full list of analysed ESs is given in the seventh row of Table A.1 in the Appendix. The classification of the ESs is based on CICES (2018) and adapted for the purpose of this study.

In order to assess the importance of the ESs we evaluated the perceived importance of each ES for an interviewee and how often this ES is used by him. This approach does not just allow a differentiation between perception and actual use but the combination of these two allows a broader concept of importance of an ES. The absence of actual use together with a high perception of perceived importance of an ES flags a different kind of importance of an ES than high perceived importance in the presence of high actual use. The latter may express more economic relevance for the life of the locals. Additionally, people's expressed socio-cultural values towards ESs, i.e. people's preferences for ES, is a commonly accepted non-monetary measure for people's demand for ESs (Villamagna et al. 2013; Wolff et al. 2015).

To obtain and simultaneously benchmark the perception of economic status and life quality by the local population as compared to that of the Vietnamese population we asked how satisfied the interviewee was with the household's financial situation and his personal life. These two questions were also asked in the WVS wave 5 and the data can be downloaded from the official homepage[1] and are employed for the comparisons between the population of Vietnam and our sample (cf. Table A.1).

Given the degree of dependence on HLNP for economic support and the perception by the local population of their economic status, we asked how HLNP itself and its rules are perceived. Various statements about HLNP and its regulations were read (e.g. "The restrictions on HLNP cause fewer opportunities for regional development.") and the degrees of agreement were recorded using a Likert scale (cf. Table A.1). Another standardized WVS question was employed in order to evaluate the conflict between environmental protection and economic development. The respondents had to decide which of the two statements comes closer to their own point of view: (1) Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs; or (2) Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent.

For all questions "Don't know" was offered as a possible response. A complete list of questions used in this study with their values is provided in Table A.1 in the Appendix.

The questionnaire was developed in English and pre-tested twice using a sample of advanced students and staff members of the University of Innsbruck. Subsequently, the questionnaire was translated into Vietnamese and checked and reverse translated by two native speakers. Finally, the questionnaire was pretested in a pilot study directly on site in Vietnam.

It was necessary for the interviewing team to consider the local circumstances, assist participants with limited literacy, communicate in the local language and visit participants in their secluded homes. Before beginning the survey, participants were informed of the goal of the interviews in a statement shown and read by the interviewer and assured that the data would be analyzed anonymously (see supplementary information in the Appendix). Interviews were conducted after obtaining the respondent's verbal consent to participate.

For representativeness, a stratified sampling technique was applied. Across the five communes conducted interviews represented a transect from the buffer zone (town of Sapa) to the core zone (San Sa Ho, Lao Chai, Ta Van, Ban Ho). For each commune a random sample was drawn from the list of all adult inhabitants provided by the chief of each village. The interview language was Vietnamese and local interpreters were present to support communication with local ethnicities. To collect data a computer-assisted face-to-face protocol using tablet PCs

[1] http://www.worldvaluessurvey.org/WVSDocumentationWV5.jsp.

was applied. During September and October 2015 a sample of 1000 persons was contacted; 893 agreed to be interviewed and 686 interviewees answered all questions completely.

2.3. Statistical analysis

Statistical tests were conducted using the software R (R Core Team 2013). Student's t-tests for independent and dependent samples as well as their robust alternatives, the Mann-Whitney-U test and the Wilcoxon sign rank test, were applied. Proportions were statistically tested using the two-proportion z-test.

If findings did not change qualitatively with respect to the considered measurement level (ordinal versus metric) mean and standard errors (se) are shown for ease of interpretation. As sample size (n) the number of the corresponding valid answers is given.

Differences in mean, median, proportions or distributions are interpreted as statistically significant using a significance level of 5%. Asterisks besides the results indicate the size of the p value of the corresponding statistical test, i.e. *** denotes a p value less than 0.001, ** indicates a p value < 0.01 and * $p < 0.05$.

3. Results

3.1. Socio-economic characteristics of the locals

The sample of 686 interviewees (completely answered questionnaires out of 893) consists of 57% women and 43% men. Mean age is 38 years; the age of the mid 50% of the interviewees ranges from 26 to 48 years. Of the interviewees 18% have no formal education, 47% have a primary or secondary school education, and 35% a diploma or higher education. Regarding profession, 62% of the interviewees work in agriculture and forestry, 16% in tourism, 7% in public administration, and 2% in manufacturing. About 13% have diverse other occupations like trader, pharmacist, or soldier. Of the interviewees 74% live in the core zone and 26% in the buffer zone. Of the five ethnicities Kinh and Hmong are predominant (30.9% and 30.5%, respectively) followed by Dzay (15.2%), Tay (13.6%), and Dzao (8.9%). Other ethnicities account for 1%. With the exception of the residential area, where the core zone is overrepresented, the sample is in line with official demographic data.

3.2. Use and perception of ESs

Figure 3 presents information on the percentage of people using an ES and the percentage considering this ES to be of importance. Nearly the whole local population often or sometimes uses the ES types food (growing plants), raw material (fodder/grazing, firewood), and drinking water. For these ESs the frequency of use is also quantitatively similar to the corresponding importance and can therefore be considered as economically important for locals. Quantitatively important exceptions are offering homestay, collection of plants and aquaculture. We

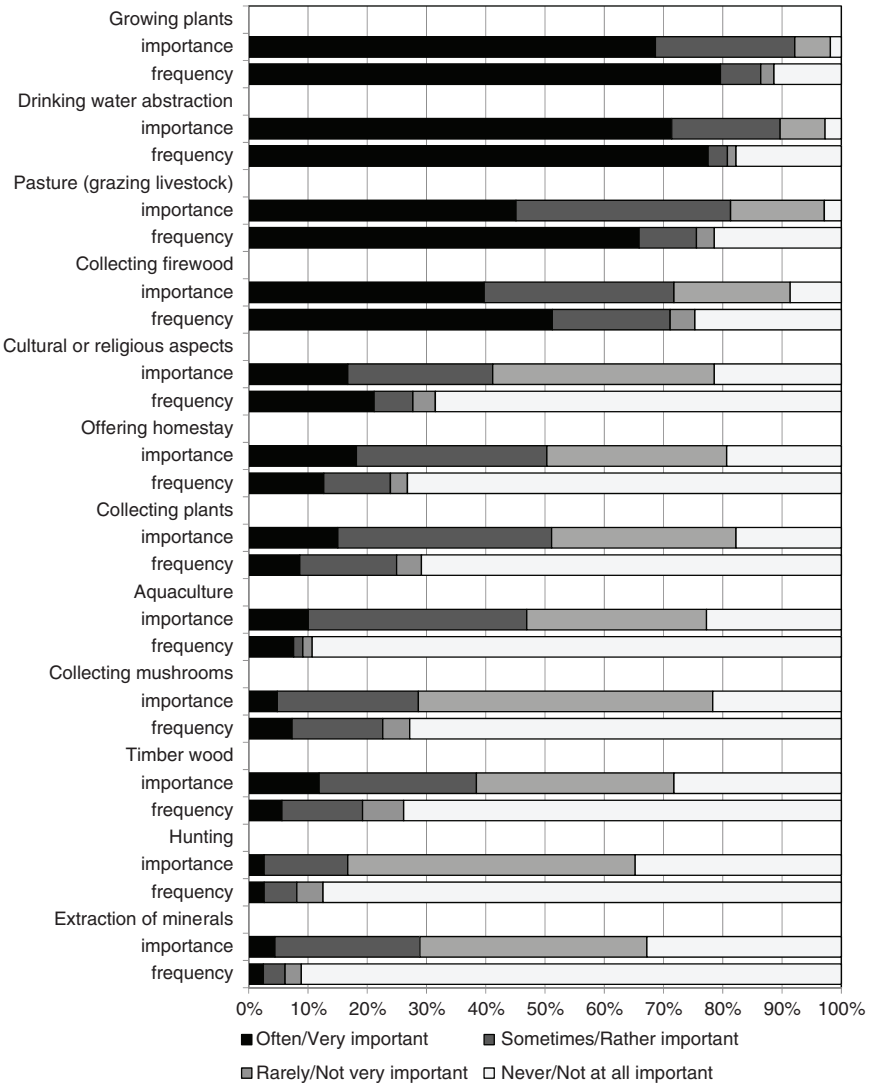

Figure 3: Percentages of valid (n = 765) answers are given for frequent use of the ESs and for evaluating the ESs as important. (Note: Offering homestay is used as a proxy for recreational activities of tourists).

summed the answers "often" and "sometimes" as well as "very important" and "rather important" and tested the so obtained proportions for a significant difference. For all three ECs, i.e. offering homestay (p value < 0.001), collection of plants (p < 0.001), and aquaculture (p < 0.001), importance is perceived to be

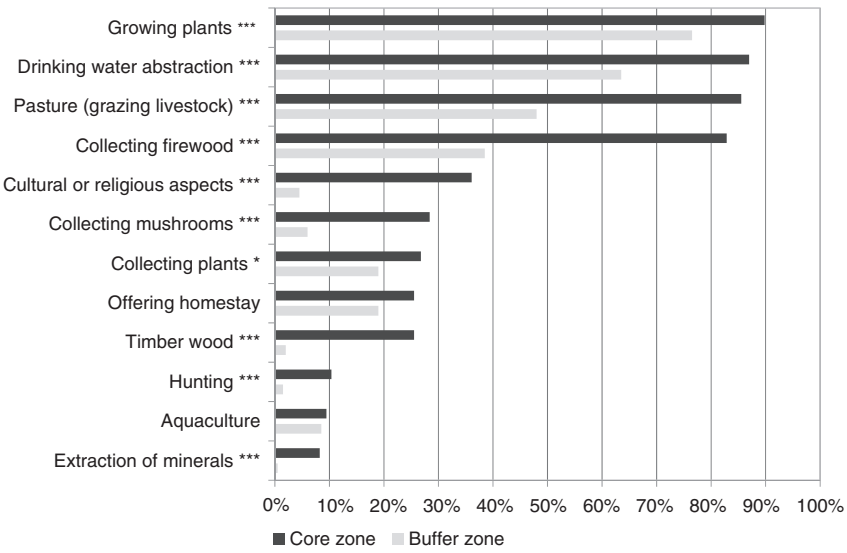

Figure 4: Percentages of ESs used often or sometimes by residential area are plotted (offering homestay as proxy for recreational activities).

higher than effective use. ESs like extraction of minerals, collecting mushrooms, or hunting are quantitatively of much less use and perceived importance.

Although hunting is not done very often and not that important for the locals, poaching is widely accepted by the local population. Regarding the question whether illegal hunting in the HLNP can never (coded as 1) or always (coded as 10) be justified, or somewhere in between, a mean of 6.4 (median of 7) with a standard error of 0.1 (inter quartile range from 4 to 10) is obtained.

Differences for the core zone and the buffer zone with regard to ES use are shown in Figure 4. The percentages of the core zone (n=557) and buffer zone (n=200) are tested for differences by the two-proportion z-test. Asterisks besides the name of the ESs in Figure 4 denote whether the difference in the proportions is statistically significant or not, i.e. *** denotes a p value less than 0.001 and * denotes $p < 0.05$.

Even though the population in the buffer zone uses ESs much less often, with percentages between 39% and 76%, the use is still noteworthy. The findings demonstrate that the population in the core zone uses ESs (statistically significantly) much more often for religious and cultural purposes than does the population in the buffer zone.

3.3. Economic situation and need for development

On a scale of 1 (not satisfied) to 10 (completely satisfied) the average value for life satisfaction given by the sample (n=706) in HLNP is 6.59 (se=0.08) compared to a mean of 7.1 (se=0.05) from the WVS results for Vietnam (n=1482, item V22

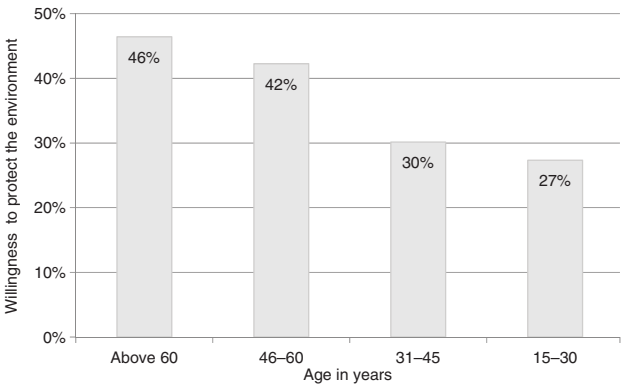

Figure 5: Percentages of responses in favour of willingness to protect the environment as compared to economic development per age group are shown.

of the WVS wave 5 for Vietnam, cf. Table A.1). The result regarding the financial situation is also very similar with a mean for the HLNP local population of 5.68 (n = 706, se = 0.08) as compared to Vietnam with an average of 6.32 (n = 1478, se = 0.05, item V68 of the WVS wave 5 for Vietnam).

The whole area of HLNP is economically less developed than the average of Vietnam with a GDP per capita of approximately USD 1481 compared to an average of USD 2109 for the country (The People's Committee of Lao Cai Province 2016; World Bank 2016). Given the poor economic condition and dependence on the use of the park's ESs, we investigated the support for environmental protection in direct comparison to economic development by the local population in HNLP compared to the population of Vietnam. Therefore the number of interviewees who gave the statement in favour of economic development priority over the statement of conservation is computed and divided by the number of valid answers (n = 685). 67% of the locals in HLNP gave priority to economic growth compared to only 30% in Vietnam (n = 1232, item V104 of WVS wave 5 for Vietnam). There is no significant difference in this regard between people living in the core zone (68% in favour of economic development) and those living in the buffer zone (67% in favour of economic development) in HLNP. The conservation empathy in direct comparison with economic development varies significantly with age. Figure 5 shows that the percentage of responses in favour of willingness to protect the environment as compared to economic development declines, the younger the respondent is. The difference between the proportions of oldest (n = 56) and youngest age group (n = 278) is statistically significant (p = 0.002).

3.4. Perception of HLNP

Figure 6 shows a large consensus on the importance of the existence of HLNP in general both for the locals in the core zone as well as in the buffer zone. More than

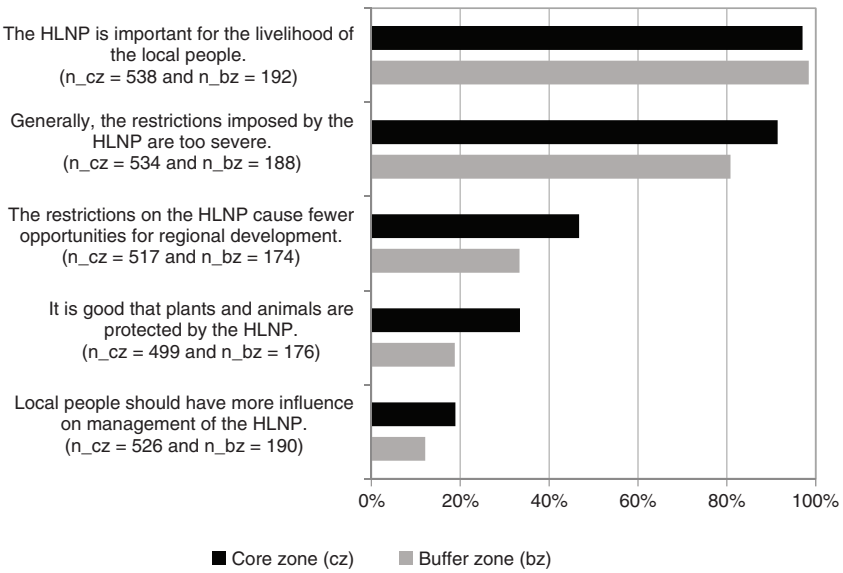

Figure 6: Perception of HLNP by the locals. Percentages of the interviewees agreeing or strongly agreeing on the given statements are shown for interviewees living in the core zone and the ones in the buffer zone respectively. The respective sample sizes are given in parentheses, n_cz (n_bz) denotes the sample size in the core zone (buffer zone).

97% of the interviewees agreed or strongly agreed on the importance of HLNP for the local people. About half of the population (57%) did not see HLNP as an obstacle to development (percentage of interviewees disagreeing or strongly disagreeing), but the protection measures are perceived as being too severe (89%) and even the positive statement concerning the protection of animals and plants receives only little support (30%). This result becomes stronger as the limited acceptance of the park is more articulated in the core zone. The population in the core zone is more affected by the protective measures.

Table 1: Perceptions of park management for the two residential areas are shown.

Statements regarding park management	Buffer zone	Core zone	p value
Under the given conditions, HLNP staff do a good job.	80.7% (n=161)	77.5% (n=488)	0.378
HLNP staff try to take care of the needs of the local people.	54.6% (n=163)	64.4% (n=505)	0.026
HLNP staff go about their tasks in a friendly way.	79.4% (n=155)	72.3% (n=505)	0.079

The percentage of the interviewees agreeing or strongly agreeing is provided as well as whether the difference between core and buffer zone is statistically significant (p value, obtained via the two-proportion z-test, is in the last column).

The differences in the proportions between core zone and buffer zone are tested using the two-proportion z-test. The percentage of the core zone regarding the statement "Generally, the restrictions imposed by the HLNP are too severe." is statistically larger than the one of the locals in the buffer zone (p value < 0.001). The same holds for the statement "The restrictions on the HLNP cause fewer opportunities for regional development." (p value < 0.01) and "It is good that plants and animals are protected by the HLNP." (p value < 0.001).

The findings exclude a strong negative impact on park acceptance due to park management (cf. Table 1). Two-thirds to up to three-quarters of the locals perceive the management style as positive. A similar positive attitude towards park management is found regarding the question of trust (n = 639): 73% of the respondents declared that they "completely trust" or "trust somewhat" the park management.

3.5. Perception and evaluation of tourism

Table 2 shows the valuation of HLNP and tourism. Nearly the whole local population agrees that tourism is an important economic base (88%) and likewise that for tourism to be successful plants and animals have to be protected (98%). The population clearly states that tourism makes sense only if the local population can obtain economic benefit from tourism (94%). This is the weak link. Two-thirds (64% in the buffer zone) to up to three-quarters (78% in the core zone) feel that the local people do not currently benefit from tourism economically and as a consequence only slightly over a third perceive tourism as an opportunity for development (43%).

3.6. Differences with respect to ethnicities

Levels of formal education differ across ethnicities. Of the Dzao people 10% have a secondary school diploma or higher education, Hmong 11%, Dzay 33%, Tay 33%, and Kinh 67%. Agriculture is the main profession among the Dzao

Table 2: Valuation of HLNP and tourism for both residential areas are shown.

Statements regarding tourism	Buffer zone	Core zone	p value
Generally speaking, tourism in the HLNP is an important economic base.	85.49% (n = 193)	89.16% (n = 535)	0.176
For tourism in the park to be successful its plants and animals have to be preserved.	96.89% (n = 193)	97.96% (n = 538)	0.400
Tourism in the park makes sense only if it is profitable for the local people.	91.98% (n = 187)	95.11% (n = 532)	0.112
The HLNP' tourism does not benefit the local people.	64.06% (n = 192)	78.29% (n = 525)	<0.001
Tourism in the park is a great opportunity for the community.	34.39% (n = 189)	45.35% (n = 527)	0.009

Significant differences are tested using the two-proportion z-test (p values are given in the last column).

Table 3: Differences in the use of ESs by the ethnicities.

Ecosystem services/activities	Dzao (n=61)	Dzay (n=104)	Hmong (n=209)	Kinh (n=212)	Tay (n=93)	Total (n=679)
Growing plants	96.7%	91.3%	95.7%	72.6%	95.7%	87.8%
Drinking water abstraction	91.8%	83.7%	87.6%	64.6%	93.5%	81.2%
Pasture (grazing livestock)	96.7%	82.7%	92.8%	43.9%	91.4%	76.2%
Collecting firewood	91.8%	67.3%	96.7%	33.0%	91.4%	71.0%
Cultural or religious aspects	54.1%	25.0%	43.5%	6.6%	22.6%	27.4%
Offering homestay	11.5%	50.0%	12.0%	22.2%	36.6%	24.3%
Collecting plants	52.5%	17.3%	26.8%	17.0%	25.8%	24.3%
Collecting mushrooms	31.1%	17.3%	40.2%	5.2%	17.2%	21.7%
Timber wood	39.3%	3.8%	36.8%	0.5%	24.7%	19.0%
Aquaculture	14.8%	9.6%	3.3%	7.5%	20.4%	9.0%
Hunting	11.5%	4.8%	12.4%	1.4%	11.8%	7.7%
Extraction of minerals	6.6%	1.0%	12.0%	2.8%	4.3%	5.8%

The percentages of the respondents using the corresponding ESs "often" or "sometimes" are shown (offering homestay is a proxy for recreational activities).

(78.7%), Hmong (70.3%), and Tay (73.1%) people. Of the ethnicities the Dzay people report the highest percentage working in tourism (26.9%). About 30% of the Kinh people work in tourism or public administration.

The Dzao ethnicity exerts the most intensive use of nearly all ESs, followed by the Hmong people (cf. Table 3). They rely so existentially on the ESs that their economy can be defined as a pure subsistence economy. On the other hand, the Kinh ethnicity is much less dependent on ESs than is the general population. The Dzay show intensive touristic use (50%) followed by the Tay (36.6%). The

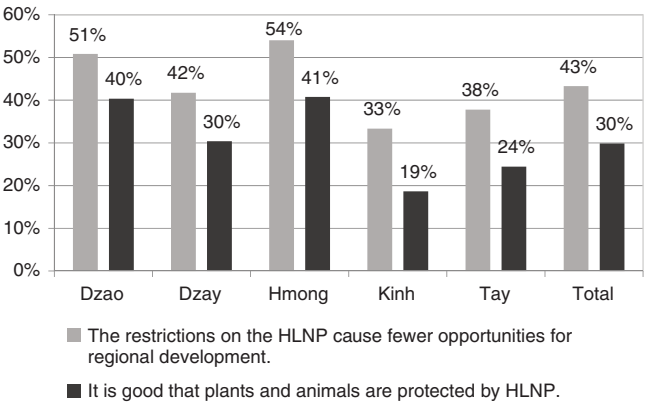

Figure 7: Perceptions of benefits and hindrances of nature protection measures in HLNP expressed as percentages of respondents strongly agreeing or agreeing with the statements are plotted.

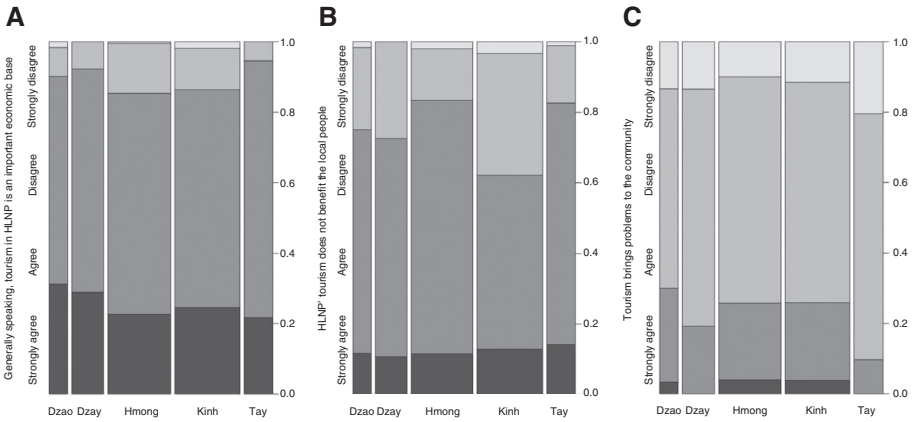

Figure 8: Percentages of interviewees who strongly agree, agree, disagree or strongly disagree with the statements (A) Generally speaking, tourism in HLNP is an important economic base (B) HLNP tourism does not benefit the local people and (C) Tourism brings problems to the community. The width of the columns denotes the relative sample size of the corresponding ethnicity.

frequency of hunting is larger for the Tay, Dzao, and Hmong as compared to the other two ethnic groups.

The two most important differences regarding the statements about the park are shown in Figure 7. The share of the number of strongly agreeing or agreeing interviewees in all given answers is computed for both statements. The two ethnicities depending mainly on ESs (Dzao and Hmong) perceive the park as an obstacle to development, while at the same time disproportionately appreciating the protective function of HLNP for animals and plants. The opposite perception is found for the Kinh ethnicity.

With regard to the ethnicities, their differentiated view of tourism is shown in Figure 8. Independent of the various cultures and dependencies on ESs, all ethnicities evaluate tourism in HLNP as an important economic base (cf. Figure 8A). Only the Kinh people report a percentage, about 38%, (statistically) significantly higher than the other ethnicities for perceived benefits from tourism for the local people (cf. Figure 8B). The percentage of persons strongly agreeing or agreeing with the statement that tourism brings problems for the community is between 20% and 30% with the statistically significant exception of the Tay people (cf. Figure 8C).

4. Discussion

HLNP is a precious but vulnerable biodiversity site. The remarkable increase in tourists visiting the park over the last ten years presents new challenges for the interaction between conservation and locals' well-being. The results of this study

show that the local economy still relies intensively on ESs produced by the park. This is particularly true for the local population in the core zone and in line with earlier official reports and studies (Vietnam 1995; HLNP 2012; Nguyen Thi Thuy 2014) which show that the local park residents have a subsistence economy based on the supply of ESs by the NP. The strong dependence on ESs, combined with additional external pressures exerted by tourism development, defines a preference by locals for economic development rather than conservation. This preference for development is particularly strong in the young generation.

Independent of age (or residential area or ethnicity), the vast majority of the locals perceive the HLNP as important for their livelihood, but its regulations are seen as impacting too severely on their personal lives. This is confirmed by the fact that there is broad social acceptance of "illegal hunting".

Dissatisfaction with restrictions imposed on access to PAs and their resources, and the resulting loss of economic opportunities for the locals, are a common problem (Ferraro 2002; Karanth and Nepal 2012; Bush et al. 2013). Concerning the evaluation of too severe park restrictions by the local people, the majority of studies additionally report that the park staff are perceived negatively (Kubo and Supriyanto 2010; Karanth and Nepal 2012; Bennett and Dearden 2014; Mutanga et al. 2015). This is not at all the case for HLNP. Positive evaluations of the park administration show that the ambivalent results are not attributable to mismanagement, poor communication or interaction between park staff and local residents, which would be easiest to remedy. The park's limited acceptance is more likely rooted in a failure to recognize the economic benefits created by the park.

Findings in the literature do suggest engaging with members of the local communities in order to appropriately consider the local needs and aspirations (e.g. Wells and McShane 2004) and argue in favor of a more intense relationship between the park and the communities (Clements et al. 2010; Bennett and Dearden 2014). However, the locals of HNLP are not interested in actively participating in park management although dissatisfied with the protection goals, which can be read as an indicator of resignation that has to be overcome for successful development of the region. Active involvement of the locals by park authorities may be necessary to (again) attain the interest, support and participation of the local population in park management.

Remarkably, we observe substantial differences in the dependence on ESs between the various ethnicities (most dependent are the Dzao and the Hmong). Therefore, a common strategy for all local peoples might not be possible. This has previously been documented (e.g. Kari and Korhonen-Kurki 2013) and reflects the more general understanding that there is no one-size-fits-all approach (Wells and McShane 2004; Leitinger et al. 2010; Wyborn and Bixler 2013). Our findings substantiate the need for a sophisticated management approach in order to improve support by the local people, starting from an understanding of their current livelihood needs and perception of ESs and the benefits offered by the HLNP (Petheram and Campbell 2010; Andrea et al. 2013; Rode et al. 2016).

Regarding its perception, the HLNP is considered an obstacle by about 40% of the population and this figure exceeds 50% for the ethnicities that mainly rely on the ESs. Even for the Dzay people, of whom 50% offer homestay, more than 40% perceive HLNP solely as a constraint. Sustainable tourism is seen by many experts as one of the possibilities for harmonizing economic development and the conservation aims of a PA (Arjunan et al. 2006; Spiteri and Nepal 2008; McCool 2009; Strickland-Munro and Moore 2013). Unfortunately, tourism is not really perceived as economically useful by the local people. About three-quarters of the interviewees stated that the local population does not benefit from tourism. The reasons are multifaceted: (1) Income obtained from tourism activities is just a small portion of household income and not perceived as a substantial part, and the main part of tourism revenue does not remain with the local residents. As income from tourism remains out of sight for the local people, they are likely to continue their traditional income-generating activities. These sorts of activities have been documented elsewhere as potentially having a negative impact on environmental conservation (Spiteri and Nepal 2008; Ezebilo and Mattsson 2010; Strickland-Munro and Moore 2013).

(2) Across all five ethnicities, it is common knowledge that tourism provides an important economic base. However, with the exception of the Kinh, all ethnicities coming into contact with tourism (either because they live near a tourist area or have some kind of tourist income) do not see tourism as really benefiting the local people. Due to their generally higher educational level, the Kinh benefit from tourism and perceive tourism as benefiting the local population. For Sapa District "more local people consider that tourism contributes to poverty alleviation" than do those who do not, but "the local tourism sector has primarily benefited the non-poor and the tour operators, resulting in conflicts of interest among community members" (Truong et al. 2014, 1071). Their findings and conclusions are supported by our results obtained in a more representative sample of the local people in HLNP. If tourism benefit-sharing mechanisms are not recognized, sustainable tourism and consequently conservation ideas are not of interest to the bulk of local residents (cf. for example Owino et al. 2012). Already Karanth and Nepal (2012) conclude in their analyses of PAs in Nepal and India that sustaining tourism will require benefits to be shared with the local people and support to be built among all stakeholders (e.g. local people, private enterprise or NGOs) for conservation initiatives.

(3) Especially among the various ethnicities living in the core and the buffer zone of HLNP, social and cultural changes that tourism may introduce include changes in value systems and community structures (Tamara 2002), with ethnicities in HLNP facing also the day-to-day problems of a touristic area (like traffic or introduction of foreign cultures). In this respect, only the Tay and Dzay people do not perceive these problems as they do not live in the touristic hub, although they are the ones mainly involved in tourism by offering homestay.

5. Conclusions

The findings provide evidence that economic development is desired by a large majority of the population, especially by the young population. HLNP is superficially accepted as important in general, but this attitude is not observed with regard to the regulations imposed by the park. Overall, the park is perceived as an obstacle to development. Tourism generated by HLNP offers a possible strategy for overcoming this problem. In fact, the population sees tourism in general as an important economic base and recognizes that tourism can be successful only if the park's protection and conservation goals are achieved. Potentially, this is a promising starting point for sustainable development. Unfortunately, the population does not agree that ongoing tourism activities in HLNP are a great opportunity for themselves, their families or communities because they do not believe the added value created goes (and will go) to the local people. This is a big challenge for the park management. A promising strategy has to bear in mind three conditions: (1) increase the value added for the locals (e.g. by tourism, whereby the current benefit from HLNP is not recognized enough by the locals), (2) change the distribution of benefits between the local population and other stakeholders with a clear focus on the core zone and (3) not least of all, implement a communication program that makes the benefits deriving from the PA visible to the broad public. Only if the population can experience sustainable tourism as a viable route to development, will they share this strategy and thus internalize the necessary protection goals.

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Appendix

Table A.1: Complete list of questions used in the study.

Wordings of questions	Scale/Values	World Value Survey (WVS) Wave 5 (2005–2009) Vietnam 2006
What is your year of birth, please? 19		V236
What ethnicity are you?	1 - Dzao, 2 - Dzáy, 3 - H'Mong, 4 - Hoa, 5 - Kinh, 6 - Tày, 7 - Mường, 8 - Nùng, 9 - Thái, 10 - Xà Phó(Phù Lá), 11 - Other, please specify:	
What is the highest educational level you have attained?	1 - No formal education, 2 - Primary school, 3 - Secondary school, 4 - High school, 5 - Higher education	
What is your main profession related to?	1 - Agriculture, 2 - Forestry, 3 - Manufacture, 4 - Tourism, 5 - Public administration, 6 - Other:	
For each of the following activities that are possible in the HLNP, please indicate: How often have you done the activity? AND How important is each of the activity for you? 1 - Growing plants, 2 - Use of park areas for pasture (grazing livestock), 3 - Use of park areas for aquaculture, 4 - Extraction of minerals, 5 - Collecting firewood, 6 - Use timber wood, 7 - Collecting plants, 8 - Collecting mushrooms, 9 - Hunting, 10 - Offering homestay, 11 - Using the HLNP for cultural or religious aspects, 12 - Using the HLNP for drinking water abstraction	1 - Never, 2 - Rarely, 3 - Sometimes, 4 - often 1 - Very important, 2 - Rather important, 3 - Not very important, 4 - Not at all important	
For each of the following statements about the HLNP, please specify whether you strongly agree, agree, disagree, or strongly disagree with it. 1 - The HLNP is important for the livelihood of the local people. 2 - The restrictions on the HLNP cause fewer opportunities for regional development. 7 - Generally, the restrictions imposed by the HLNP are too severe. 8 - It is good that plants and animals are protected by the HLNP. 9 - Local people should have more influence on management of the HLNP.	1 - Strongly agree, 2 - Agree, 3 - Disagree, 4 - Strongly disagree, 5 - Don't know	

Table A.1 (Continued)

Wordings of questions	Scale/Values	World Value Survey (WVS) Wave 5 (2005–2009) Vietnam 2006
Concerning the HLNP' staff, please indicate whether you strongly agree, agree, disagree, or strongly disagree with the following statements: 1 - Under the given conditions, HLNP' staff do a good job. 2 - HLNP' staff try to take care of the needs of the local people. 3 - HLNP' staff go about their tasks in a friendly way. 4 - Generally speaking, tourism in the HLNP is an important economic base. 5 - The HLNP' tourism does not benefit the local people. 6 - Tourism in the park is a great opportunity for the community. 7 - Tourism in the park makes sense only if it is profitable for the local people. 8 - For tourism in the park to be successful its plants and animals have to be preserved.	1 - Strongly agree, 2 - Agree, 3 - Disagree, 4 - Strongly disagree, 5 - Don't know,	
Here are two statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view?	1 - Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs. 2 - Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent. 3 - Don't know	V104
All things considered, how satisfied are you with your life as a whole these days? Using the scale of which 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied". Where would you put your satisfaction with your life as a whole?	1 - Completely dissatisfied up to 10 - Completely satisfied	V22
How satisfied are you with the financial situation of your household?	1 - Completely dissatisfied up to 10 - Completely satisfied	V68
I would like to ask you how much you trust people from various groups. Could you tell me whether you trust people from this group completely, somewhat, not very much, or not at all? 1 - Your family, 2 - Your friends, 3 - Local community, 4 - Village chief, 5 - Shaman, 6 - Education system, 7 - Health-care system, 8 - Park management, 9 - Non-Governmental Organizations (NGOs)	1 - Trust completely, 2 - Trust somewhat, 3 - Do not trust very much, 4 - Do not trust at all, 5 - Don't know	V125 - Your family

Table A.1 (Continued)

Wordings of questions	Scale/Values	World Value Survey (WVS) Wave 5 (2005–2009) Vietnam 2006
For each of the following acts please indicate whether you think it is always justified, never justified, or somewhere in between: 1 - Claiming government benefits to which you are not entitled 2 - A villager illegally cuts wood in the HLNP 3 - Illegal hunting in the HLNP 4 - Accepting a bribe in the course of someone's duties 5 - HLNP management places arbitrary rules on local people 6 - Park management allows too many tourists to visit the national park	1 - Never justifiable up to 10- Always justifiable.	V198_ Claiming government benefits to which you are not entitled V201_ Accepting a bribe in the course of someone's duties
Information recorded by interviewer		
Gender of interviewee	1 - Male, 2 - Female	V235
Survey code to identify an interviewee's living zone (buffer zone or core zone)	SP-Sapa Town, SSH-San Sa Ho, LC-Lao Chai, TV-Ta Van, BH-Ban Ho	