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Potentials of community-based-ecotourism to improve human wellbeing in Cambodia: an application of millennium ecosystem assessment framework

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ABSTRACT

Community-based Ecotourism (CBE) has been promoted and widely adopted as an approach for funding conservation initiatives, while at the same time contributing to the wellbeing of the host communities. However, it often fails to live up to its promise and thereby lets the local people return to their old ways of doing things. The study is to explore the potentials of CBE on the indigenous human wellbeing by conducting a case study in the Veun Sai-Siem Pang National Park (VSSPNP). For this research work, tourists, indigenous households, key informants, and local leaders were interviewed. We found that the participants received only 6% of the total revenue per year, despite 63% annual growth in number of tourists. The gibbons increased the recreational value of forest and significantly contributed to enhance tourist satisfaction. The program had significantly reduced their freedom for livelihood activities, and feeding condition of their families. On the contrary, it had significantly increased their groups and networks, and collective action and cooperation for conservation. But the wellbeing regarding basic materials and health conditions were not significantly changed by the ecotourism program. Therefore, without addressing the wellbeing of the participants, ecotourism programs would struggle in achieving sustainable outcomes.

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1. Introduction

Community-based Ecotourism (CBE) is an increasingly popular approach for ecosystem conservation across the developing countries. It has been recognized for its potentials in becoming an effective method for addressing myriad socio-ecological issues and thereby ensuring greater sustainability in managing natural resources (Stronza and Gordillo 2008; Anup et al. 2015). The benefits associated with CBE for improving human wellbeing adequately justify the efforts to further CBE developments (Agyeman et al. 2019). It is estimated that every year ecotourism generates about US\$29 billion in developing countries (Kirkby et al. 2011) indicating that ecotourism is a potential source of revenues for local people and for biodiversity conservation. Among many other measures being introduced, ecotourism could be a measure to address the problems of natural resources depletion (Kirkby et al. 2011).

Nevertheless, in many parts of the world, CBE benefits are often low and periodic. Bookbinder et al. (1998) found that in Nepal's Royal Chitwan National Park only 6% household of the studied villages earned income directly or indirectly from ecotourism program. Those who made financial profit from the tourism stated that it was an unstable source of income

subjected to seasonal fluctuations, economic and political events (Wood 1998). As a result, they are not able to effectively improve local residents' wellbeing and their patterns of resource extraction (Kiss 2004). Consequently, the local people return to their previous ways of livelihoods immediately after the incentives for tourism development diminishes or become insufficient (Wilkinson and Pratiwi 1995). For instance, in the Monarch butterfly reserve in Mexico, many local people resumed logging activities, since the project failed to generate the employment and income opportunities that were initially promised (Barkin 2003).

In Cambodia, deforestation is a major issue since 1980s. The first election after Khmer Rouge brought Royal Government of Cambodia in power which instituted 'private concession' to boost the struggling economy. More than two million hectares have been leased so far to the foreign and domestic companies. Within the concession, the deforestation rate is 29% to 105%; overwhelmingly higher than the land areas outside concessions. Thus, Cambodia has rapidly reached one of the highest deforestation rate in the world (Davis et al. 2015). The country is of global conservation importance because it contains the largest remaining examples of habitats that were previously found across much of Indochina and Thailand, and which still contain nearly intact species assemblages,

albeit at heavily reduced densities (Loucks et al. 2009). Protecting the wildlife and their habitats from over exploitation is a major challenge for the conservationists. Without engaging local forest users properly and providing them alternative income options, no conservation effort would attain sustainability (Safa 2004; Ameha et al. 2014).

Over the last decades, establishing ecotourism to conserve the national forest in Cambodia has received significant attention. The initiatives intended to develop a mutually beneficial socio-ecological system and promote sustainable development (Reimer and Walter 2013). Human wellbeing in socio-ecological system emerges and is sustained through the complex relationships between ecosystem services and dependent communities (Power 2010; Domptail et al. 2013). Ecotourism has been promoted worldwide for conserving the nature as well as generating incentives for local people (Xiang et al. 2011). There is a growing trend in flagship species-based tourism as it can potentially increase the number of tourists and underpin long-term sustainability (Sharpley 2007; Xiang et al. 2011). However, deforestation has been one of the biggest challenges in establishing successful CBE.

The inherent complex relationships between the forest and the people put restrictions in broadening the research focus to reveal the impacts of forest ecosystem on different dimensions of human wellbeing. While the research has explored the contributions of the CBE on employment and income, little or no attention has been given on the other dimensions of human wellbeing (Babulo et al. 2008; Adam et al. 2013; Angelsen et al. 2014). Income is not necessarily the

only determinant of human wellbeing, instead various factors influence an individual's ability to live well including inequality, poverty, malnutrition, political instability, and access to resources (Ashton and Jones 2013). While acknowledging the conservation and human wellbeing achievements is difficult, there is still little understanding of wellbeing both in theory and practice in the complex set of social and ecological aspects (Domptail et al. 2013; Akinsete et al. 2019). Limited studies exist that take an integrative approach to capture the diverse implications of ecotourism on wellbeing of the communities. In addition, the linkages between ecotourism and the wellbeing dimensions are under-researched (Chirenje 2017). The objective of our research is to understand the importance of CBE in conservation and its potential to improve the wellbeing of the dependent communities. Exploring the contribution of ecotourism program on human wellbeing would assist the authority to better manage the park and generate valuable scholarship for improving community-based ecosystem conservation approach elsewhere in Asia.

2. Methodology

2.1. Study site

VSSPNP has been purposively selected for this study. The park is located in the Veun Sai District of Ratanakiri Province and Siem Pang District of Stung Treng Province (Figure 1). Veun Sai-Siem Pang National Park in North-eastern Cambodia has been listed as a Key Biodiversity Area in the World Biodiversity Database

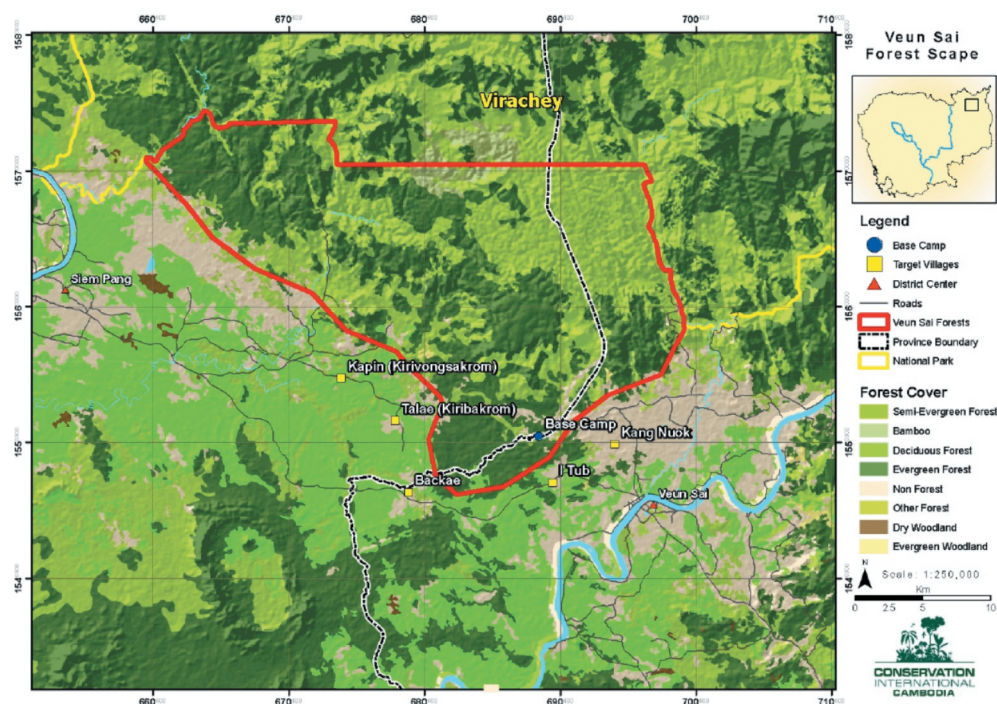


Figure 1. The Veun Sai-Siem Pang Conservation Forest (red boundary); Source: Ramachandra et al. (2012).

and is also part of the Virachey Important Bird Area (Chan et al. 2004). Ecologically, the area is located within the Indo-Burma hotspot (Myers et al. 2000), and is a part of the 200 globally most important ecoregions, the Eastern Indo-China Dry and Monsoon Forest (Olson and Dinerstein 1998) and Critical Ecosystem Partnership Fund's (CEPF) Cambodia-Lao PDR-Vietnam Tri-border Forests priority corridor (Critical Ecosystem Partnership Fund 2012).

In Veun Sai-Siem Pang National Park 255 animal species have been recorded of which four are classified as Critically Endangered, 12 as Endangered, and 19 as Vulnerable on the IUCN Red List of Threatened Species (Ramachandra et al. 2012). Primates of this area are of special conservation concern. The population of gibbons at the site is considered globally significant (Rawson and Bach 2011) as it is believed to be the biggest population of the species *Nomascus annamensis* in existence. Due to chronic poverty, illegal logging and poaching activities are threatening the site's ecological integrity (Figure 2) which when paired with other human-induced ecosystem changes and general impacts of climate change, may result in catastrophic consequences (POH-KAO 2012).

2.2. Data collection and bootstrapping

Data about the ecotourism program and its growth trend were collected from the official records of the park, and conducting in-person-interview with the tourists and the CBE participants. To collect household data, families were visited by the lead author and the household head was interviewed from each family. We also interviewed the key informants and conducted group discussion with other elderly villagers. By the household interview we collected data on four general wellbeing dimensions adopted from the Millennium Ecosystem Assessment Framework that includes basic materials of good life, health and sanitation, freedom

of choice, and social relations (MEA 2005). Respondents were asked to identify the wellbeing dimensions and relevant indicators, and how each indicator affects human wellbeing using in 0–5 Likert scales. The dimensions, indicators and scores were subsequently crosschecked with follow-up discussions with elderly villagers, members of local NGOs and government officials.

For this study, in total 71 persons were interviewed (Tourist: 36, Household head: 35) by the lead author. Each tourist was interviewed when he/she arrived at the CBE base-camp and after the visit of the gibbons inside the forest. Extracting resources from the forest was the only livelihood activity for the families around the forest; hence, it was difficult to find a person to interview. Many of them declined to be interviewed as they were reluctant to give information perhaps because of the involvement in illegal logging and haunting. Most of them also used their own language and barely able to understand Khmer (national language of Cambodia). The area was very remote and foreigners were not safe in all areas; therefore, our sampling and data collection faced constant challenges during the interview. However, in order to perform statistical analysis we used bootstrap method to increase the total number of sample to $m = 1000$. When the dataset size is not large one, then it may suffer from bias of this estimate and the accuracy of the confidence interval based on the normality assumption. Therefore, we extracted random and with replacement $m = 1000$ samples of size from the original dataset. These resamples are called bootstrap samples which create dataset similar to normal distribution. The bootstrap idea (Efron 1979) is to mimic the sampling distribution of the statistic of interest through the use of many resamples with replacement of the original sample.

An (independent) bootstrap sample is a simple random sampling of size n taken with replacement from



Figure 2. (a) Large patches of the forest has been converted to agricultural land, (b) Fire is used to prepare the converted land for paddy cultivation.

the data x_1, x_2, \dots, x_n . We denote a bootstrap sample as $x_1^*, x_2^*, \dots, x_m^*$ which consists of members of the original data set x_1, x_2, \dots, x_n with some members appearing zero times, some appearing only once, some appearing twice, and so on. Let $\hat{\theta}$ be a statistic calculated from a sample of n observations. In the ordinary nonparametric bootstrap, we drew observations with replacement from the original data to create a bootstrap sample or resample, and calculated the statistic $\hat{\theta}^*$ for this sample. Therefore, we extracted random and with replacement $m = 1000$ samples from the original data-set. The bootstrap statistics comprise the bootstrap distribution. We use each distribution to estimate standard error, biases, and t-distribution as follows (Efron and Tibshirani 1993; Manly 2007):

The bootstrap standard error is the sample standard deviation of the bootstrap distribution (Equation (1)):

$$SE^* = \sqrt{\frac{1}{m-1} \sum_i^m (\hat{\theta}_i^* - \bar{\hat{\theta}}^*)^2} \quad (1)$$

The joint distribution of \bar{X} and s (sample standard deviation), and distributions of statistics are dependent on both $\hat{\theta}$ and θ . To estimate the sampling distribution of $\hat{\theta} - \theta$, we use the bootstrap distribution of $\hat{\theta}^* - \hat{\theta}$. The bootstrap bias estimate is $E(\hat{\theta}^* - \hat{\theta})$, an estimate of $E(\hat{\theta} - \theta)$. To estimate the sampling distribution of a t-statistic we used the Equation (2):

$$t = \frac{(\hat{\theta} - \theta)}{SE} \quad (2)$$

Where SE is a standard error calculated from the original sample. The bootstrap counterpart of such a function in Equation (2) is expressed as in Equation (3):

$$T = \frac{(\hat{\theta}^* - \hat{\theta})}{SE^*} \quad (3)$$

The function denotes the 100s-th bootstrap percentile of T by b_s (bootstrap replications) and considers the statement: T lies within $[b_{.005}, b_{.995}]$. After the substitution $t = (\hat{\theta} - \theta)/SE$, the above statement translates to θ lies within $(\hat{\theta} - SE^*b_{.995}, \hat{\theta} - SE^*b_{.005})$. This range for θ is called bootstrap-t based confidence interval for θ at coverage level 99%. Such an interval is known to achieve higher accuracy which is referred to 'second-order accuracy'. Efron proposed correction to the rudimentary percentile method to bring in extra accuracy. These corrections are known as Efron's 'bias-correction' and 'accelerated bias-correction'. The bootstrap-t automatically takes care of such corrections (Efron and Tibshirani 1993).

2.3. Data analysis

The data obtained by interviewing tourists were used to explore the demography, choice ranks about the ecotourism elements, and the economic benefit distribution. These data were collected, as the program was intended to increase the income of the CBE participants and thereby improve their wellbeing. In order to understand the CBE effects on their wellbeing, we used criteria of five constituents of human wellbeing – basic materials, health and sanitation, social relation, security, and freedom of choice (Narayan et al. 2000; MA 2005; OECD 2013). We adopted this multi-dimensional conceptualization of human wellbeing because it incorporates a wide array of both objective and subjective wellbeing indicators (Costanza et al. 2007). Based on interviews and group discussions the effect of each criterion on the wellbeing was measured through the use of scores varying from large to small impacts (Table 1). The differences of composite wellbeing scores of two groups – Before and After the ecotourism program introduction were tested by performing paired sample t-test with SPSS V22.0 software.

3. Results

3.1. Attractions and rankings

Gibbons in the wild (Figure 3(a)) were the first priority (86%) to visit the tourism site which was further increased after observing gibbons (91%). Although some tourists put it in second choice, after watching gibbons all of them changed their mind. But the tourists (3%) who put gibbons in third place was found increased even after coming back (6%) from the gibbon watching site. It was surprising that few tourists put gibbons on the fourth position (2.9%), even though they came for 'gibbon tour' and none of them changed mind even after seeing gibbons. Some tourists (9%) did not put gibbons on first place after visiting the site because they could not see the gibbons as they (gibbons) did not call in the morning (Table 2).

Forest of the park was primarily second choice (59%), but after seeing the forest, many tourists updated forest from third position to second most enjoyable part of the tourism (81%). Nevertheless, all of the tourists showed concerns over the deforestation had been occurring in/around the park (Figure 2). The highest rank for birds was given two by the tourists (21%) which was reduced (17%) on returning from the site. Majority of the tourists (43%) marked birds as third choice of enjoyment, but after the tour, this was reduced (33%). After returning from the tour birds were ranked fourth by half of the tourists, while fifth preference was not found. The highest number of tourists (46%) kept indigenous people in the fourth choice which was significantly reduced (20%) after returning from the forest. Some tourists marked

Table 1. Codes and weights of the variables of human wellbeing of the study area.

Criteria	Determinants	Variables	Codes and weights
Basic materials	Water	a) Distance of water source b) Source of water c) Availability d) Taste e) Cleanliness* f) Health risks	a) <0.5 km = VHW, 0.5 km to 1km = NHNL, >1 m = VLW b) Own well = VHW, Others well = HW, River/Stream = LW c) Sufficient = VHW, Moderate amount = NHNL, 2–3 months short = HW d) Good = HW, Fair = NHNL, Bad = LW e) 1 to 5 scale where 1 = VLW and 5 = VHW f) High risk = VLW, Don't know = LW, Minor = HW, Not at all = VHW
	Food availability	a) Purchased b) Chronic shortage c) Sudden shortage d) food enough*	a) All = VLW, Major amount = LW, Moderate amount = NHNL, Little supplement = HW, Not all = VHW. b) High = LW, Moderate = NHNL, Low = HW c) >3 month = VLW, 3 months = LW, >2 to <3 months = NHNL, 1 to 2 months = HW, <1 month = VHW d) 1 to 5 scale where 1 = VLW and 5 = VHW
Health & sanitation	Good physical health	a) Physical weakness* b) Disease per year of family me c) Chronic diseases of family members	a) 1 to 5 scale where 1 = VLW and 5 = VHW b) >15 = VLW, 10–15 = LW, 5–10 = NHNL, 3–5 = HW, 1–3 = VHW c) The more severe disease, the less wellbeing
	Good mental health	a) Happiness* b) Self-esteem* c) Stress* d) Anger*	a) 1 to 5 scale where 1 = VLW and 5 = VHW b) Codes are as (a) c) Codes are as (a) d) Codes are as (a)
Freedom of choice	Social Freedom	a) Free to do what is preferred* b) Villagers respect each other's preferences* c) Other restrict him/her* d) Impartial justice exist e) React against threat	a) 1 to 5 scale where 1 = VLW and 5 = VHW b) Codes are as (a) c) Codes are as (a) d) Yes = VHW, No = VLW e) Flee = VLW, Bribe = LW, Apologize = VHW, No need to react = HW
	Economic freedom	a) Open market b) Produce freely	a) Free market = VHW, Restricted market = VLW b) Yes = VHW, No = VLW
Social relation	Trust and solidarity relations	a) Most of the people can be trusted * b) Most of the people are willing non-financial help* c) Most of the people are willing to help financially*	a) 1 to 5 scale where 1 = VLW and 5 = VHW b) Codes are as (a) c) Codes are as (a)
	Collective action and cooperation	a) How likely people work to protect ESS* b) How many people work in protecting forest	a) 1 to 5 scale where 1 = VLW and 5 = VHW b) Most of the villagers = VHW, Half of the villagers = HW, Several/ Ecotourism Program member = NHNL, Few = LW, Nobody = VLW
	Groups and network	a) No. of group membership b) No. of close friends/ families	a) 0 = VLW, 1 = LW, 2 = NHNL, 3 = HW, ≥4 = VHW b) <5 = VLW, 5 to <10 = LW, 10 = Nether nor, >10 to 15 = HW, >15 = VHW
Security	Social cohesion	Togetherness*	1 to 5 scale where 1 = VLW and 5 = VHW
	Personal security	How much security is for personal assets*	1 to 5 scale where 1 = VLW and 5 = VHW
	Institutional protection	Institutions defend	Him only, NGOs, Public office = LW
	Certainty of ecosystem services availability	How much certain is to find and collect ESS*	1 to 5 scale where 1 = VLW and 5 = VHW
	Difficulty with emergency money	Easiness to receive	The easier to get loan from a person/organization, the higher wellbeing
	Health or life insurance	Having an insurance	Yes = HW, No = LW

* data were collected on the scale of 1-strongly agree, 2-agree, 3- NHNL, 4-disagree, 5-strongly disagree. But for wellbeing the data were reversely coded i.e. 1→5 (VHW), 2→4 (HW), 3→3 (nether nor), 4→2 (LW), 5→1 (VLW). ESS= Ecosystem services. Note: Due to lack of sufficient data, „Security„ wellbeing was not separately measured, instead avaialbe data of relevant determinants were used to measure the wellbeing of „Freedom of choice„.

enjoying indigenous people in second position which also came down to 7%. The enjoyment rank of first and fifth was found increased after the tour finishes from 4 to 8% to 13% (Table 2). There was no spate arrangement for tourists from enjoying the indigenous traditions and culture. However, they mentioned that they enjoyed some of the traditional customs and cultures of indigenous communities while they were in the tour especially resin collection (Figure 3(b)), rituals for ancestors (Figure 3(c)), and woman's expertise in mat weaving (Figure 3(d)). Tourists expressed their interests in observing the indigenous traditions and cultures. Tourists informed that they enjoyed the hospitality, food and cooking technique of indigenous people.

There was a significant change in high level of satisfaction from before (17%) to after visiting the site (77%). Those who had moderately high (40%), and moderately low level of satisfaction (14%) were significantly reduced after the tour (9% and 0% respectively). Few tourists (3%) expressed the tour as a very bad experience, though before the tour they were not in such kind of situation may be because of being unfortunate to see gibbons. Moreover, some tourists complained about the services were not value for the money. Irrespective of satisfaction level majority of the tourists (71%) were willing to recommend their family and friends which was higher after the tour (82%). Due to the lack of proper transport and other

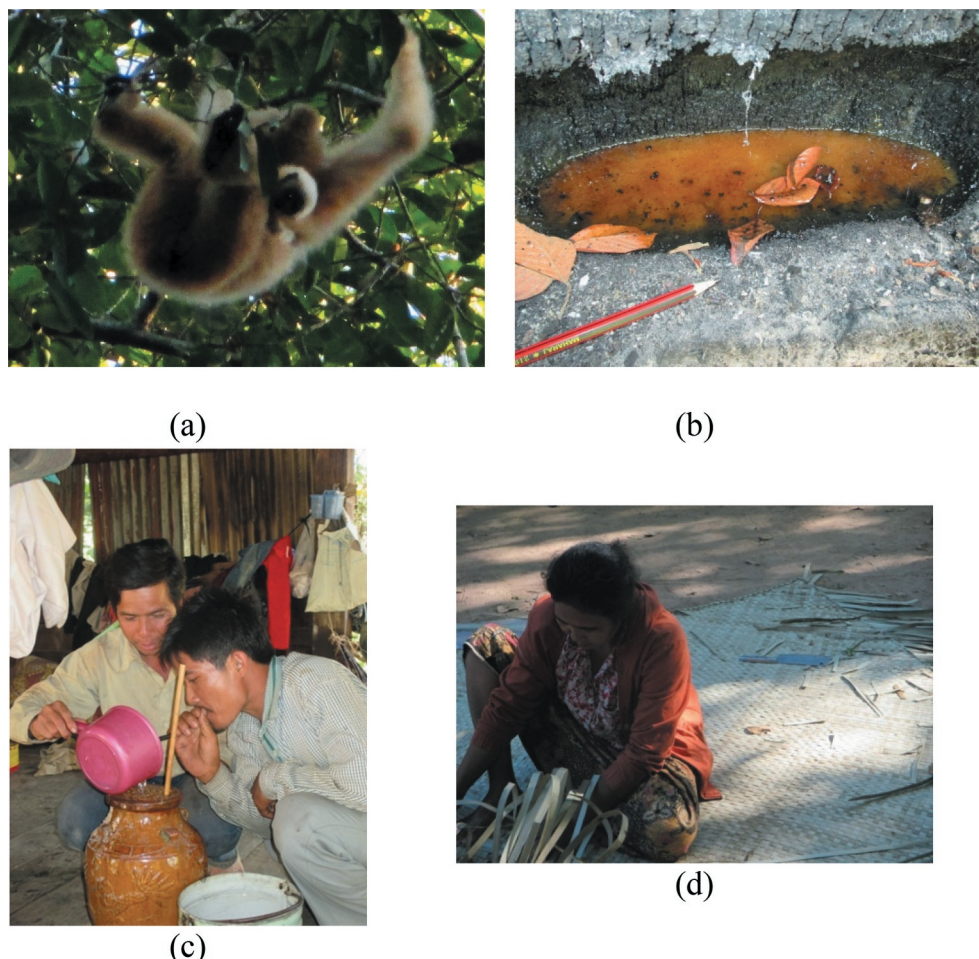


Figure 3. (a) The northern buffed-cheeked gibbon (*Nomascus annamensis*) the main attraction of the CBE, (b) Resin deposited in the hole of a *Dipterocarpus* spp made by an indigenous man in VSSPNP, (c) Two indigenous men are preparing traditional wine to seek blessings of their ancestors believed to be living inside the forest, (d) An indigenous woman is weaving a mat with the leaf collected from the forest.

services including accommodation and food, little more than a quarter of the tourists was in dilemma to recommend someone about the tour which was reduced (12%) at the end of tour (Table 2).

3.2. Ecotourism benefit distribution

It was noticed that tour operators were grabbing the maximum benefits (US\$14241 yr⁻¹) constitutes 70% of the total revenue. The tourism managing authority also received quarter of the total benefits (US\$3918 yr⁻¹). But they had to spend for providing the services of the tourists from that revenue as well as community development (e.g. building roads, and credit to participants). Although the authority had their won arrangement for arranging the tour, it failed to make the package popular online. Hence, very little number of tourists arranged the tour through the website. Moreover, tour-operators were able to physically reach tourists while booking for other tour package and recommend them for the gibbon tourism program. But it was not surprising that participants of the ecotourism program

received only US\$1197 yr⁻¹ (Table 3). Figure 4 shows local people get only 6% of the total annual revenue referring to US\$2.53 yr⁻¹household⁻¹ across the villagers of the total benefits derived from the ecotourism program and rest of the benefits goes to tour-operators and management authority (services to tourists, site maintenance, and community development).

3.3. Gibbons for human wellbeing

3.3.1. Basic materials of good life

There was no significant difference found in the participants' basic materials of good life. However, among the participant's families, there were some small but positive changes noticed in this wellbeing category. It was widely agreed that air quality of the area was good. The dependence on the natural water bodies had slightly decreased after implementing ecotourism program while there was a little increase (3%) in in-house water facility. Majority of the people (82%) mentioned that the water tastes good to fairly good but few families (6%) disagreed with this. Cleanliness of the

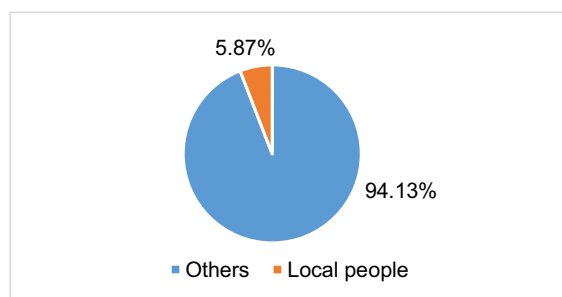
Table 2. Comparing gibbon's potentials in improving perception of the CBE program (at random and with replacement $m = 1000$ samples from the original dataset).

	% of tourists		
Gibbon's value	Before visiting site	After visiting site	Sig. (2-tailed)
Enjoyment priority			
First			
Gibbons	86.1	88.9	.599
Forest	11.1	2.82	.150
Birds	-	-	-
Indigenous people	2.82	5.62	.109
Second			
Gibbons	8.3	-	.150
Forest	58.3	72.2	.113
Birds	16.7	8.33	.190
Indigenous people	8.32	2.81	.020***
Third			
Forest	25	11.1	.135
Gibbons	2.8	5.6	.109
Birds	33.3	16.7	.049***
Indigenous people	19.4	19.4	-
Fourth			
Forest	2.82	2.82	-
Gibbons	2.82	2.82	-
Birds	25	25	-
Indigenous people	30.6	8.3	.007***
Fifth			
Birds	2.82	-	.112
Indigenous people	5.61	5.61	-
Level of satisfaction⁵	3.61	4.58	.001***
Will you suggest others			
Yes	71.4	82.9	.104
No	2.91	5.72	.128
May be	25.7	11.4	.069

Superscript values represent the scales of measurement. ***Significant at $\alpha = 0.01$ level.

Table 3. Benefit distribution of the CBE in the VSSPNP.

Beneficiaries	Total annual revenue (US\$)	% of total revenue
Tour operator booking	14241	69.81
Ecotourism program booking	3918	24.32
English Guide	1044	5.12
Local people		
Cleaner	140	0.69
Transporter	1040	5.10
Porter	17	0.08
Total	20400	

**Figure 4.** Financial benefit composition of local people and other stakeholders from the ecotourism program.

water was not improved; instead, there was a strong agreement among some villagers (3%) that the water was cleaner before ecotourism program. Some families (12%) could afford to buy water from the market but

most of the villagers (88%) relied on the free sources of water. More than half of the population (62%) informed that they did not suffer from any health problem due to water. A large number of villagers (30%) was completely unaware of any water-born health issues (Table 4).

Food sufficiency of the families in general was somewhat enough, but it was little lower after the ecotourism program period (2.35). Their dependence on the market for food was also slightly reduced. Despite the higher availability of some food items, there was no difference in the level of food shortage. They commonly experienced about three months of food shortage and there was a persistent chronic shortage of the food (Table 4).

3.3.2. Health and sanitation

There was no change observed in physical strength of the collectors. Frequency of seasonal diseases of the family members also remained unchanged. There was a little increase in chronic health problems. Gastro-pain was increased by 4% while hypertension and tooth gum pain was 0.3%, respectively, across the male members. There was a wide level of ignorance regarding health and sanitation across the society. None of the families in the village found using sanitary toilet other than the forest. Although there was a little increase in awareness after ecotourism, many of them still had little or no knowledge about health and sanitation. Mental health including sense of happiness, stress, self-esteem and anger levels were identical in before and after ecotourism program period (Table 4).

3.3.3. Freedom of choice

Indigenous people reported that they had nobody but them to protect their livelihood. But after ecotourism program there was higher number of people (12%) started to believe that the NGO (Conservation International) came to defend their livelihood. Before the implementation of ecotourism program 94% of villagers experienced zero restriction in collecting ecosystem services but after ecotourism program this percentage was significantly dropped (65%) due to significantly higher restraint to illegal collectors (24%) as a result of combined effort by the NGO and Forestry Administration rangers. Across the society there was a great level of respect to each other and it was increased by 3% after introducing ecotourism program. Before ecotourism program 62% collectors did not even require any reaction for any restrictions but after the conservation program this percentage was significantly reduced (41%). Eventually, on the spot negotiation for money was increased significantly (before: 38%, after: 18%) but other parameters of the criteria showed no significant change as a result of ecotourism program. This clearly entails that the

Table 4. Comparison between the basic materials of life, and health & sanitation between before and after CBE (at random and with replacement $m = 1000$ samples from the original dataset).

Wellbeing dimension	Elements	Before ecotourism program	After ecotourism program	Sig. (2-tailed)
Basic materials	Air is clean⁵	2.35	2.44	
	Water for drinking/cooking			
	Distance from source of water (% of HH)			
	Very close	38.2	41.2	.128
	30–50 m	14.7	11.7	1.00
	50–100 m	47.1	47.1	
	Source of water (% of HH)			
	Own well	38.2	41.2	.112
	River/stream	47.1	44.1	.112
	Others' well	14.7	14.7	-
	Availability ³	1.20	1.20	-
	Taste of water ³	1.29	1.29	-
	Cleanliness ⁵	1.97	2.02	.119
	Need to pay (% of HH)			
	Yes	11.8	11.8	-
	No	88.2	88.2	-
	Health risk of the water ⁴	3.20	3.20	-
	Food			
	Food is enough to feed family ⁵	2.47	2.35	.624
	Purchasing food ⁵	2.14	2.02	.060
	Chronic food shortage ⁵	2.00	2.00	
	Sudden shortage (% of HH)			
	Not at all	17.6	17.6	-
	<3 months	67.7	67.7	-
	3–5 months	2.91	2.91	-
	>5 months	12.7	12.7	-
Health & sanitation	Physical health			
	Physically feels weak ⁵	2.08	2.08	
	Diseases (Frequency per year)			
	Male	3.76	3.82	.555
	Female	5.28	5.28	
	Children	4.36	4.43	.136
	Chronic diseases/health issues			
	Male (% of HH)			
	Gastro pain	3.43	6.72	.133
	Hypertension	3.43	3.31	-
	Tooth gum pain	3.43	3.31	-
	Female (% of HH)			
	Gastro pain	3.4	3.4	-
	Migraine	17.2	17.2	-
	Asthma	3.42	3.42	-
	Children (% of HH)	-	-	-
	Health awareness (% of HH)			
	Sanitary Toilet	-	-	-
	Unsanitary toilet	100	100	-
	Knowledge of health ⁵	3.67	3.70	.102
	Mental health			
	Generally feels happy ⁵	1.91	1.91	-
	Self-esteem is high ⁵	2.47	2.47	-
	Regularly stressed ⁵	2.17	2.14	.136

Superscript values represent the scales of measurement. HH = Household.

program has a lot to do to improve their freedom of choice (Table 5).

3.3.4. Social relation

After ecotourism program there was a slight decrease in trust and solidarity relations among the villagers. Across the villages the overall intention of collectively conserving forest was significantly reduced. But the number of people in collective action to protect the forest was increased. It was mentioned that during starting the project many indigenous people stood against the initiative from the fear of stopping their livelihood activities in the forest. But gradually they started to realize the project is beneficial for their livelihood. Before the ecotourism program, none of the villagers was active in protecting the forest but this program had changed

their mind. Significantly higher number of indigenous people supported the conservation activities while before ecotourism program project only few (3%) indigenous people had intention to collect sustainably. There was significant improvement in willingness to protect the forest after ecotourism program (before: 97%, after: zero percentage) (Table 5).

Within the indigenous community, there were some informal social groups for collecting ecosystem services. It was found that before ecotourism program each household head was a member of at least one group but after the ecotourism program some of them became ecotourism program member which was significantly increased their group membership (1.6). There was also a significant increase in number of close members or friends (before: 4.76, after: 5.85)

Table 5. Results from bootstrap resampling tests comparing freedom of choice, and social relations between before and after CBE (at random and with replacement $m = 1000$ samples from the original dataset).

Wellbeing dimension	Elements	Before ecotourism program	After ecotourism program	Sig. (2-tailed)
Freedom of choice	Institutions for freedom of choice (% of HH)			
	Organization/person to defend right			
	Him only	97.1	85.3	.065
	NGOs	-	11.8	.065
	Villagers	2.92	2.92	-
	Impartial judiciary exists	94.1	94.1	-
	Organization to restrain the right			
	Nobody	94.1	64.7	.044***
	NGO and Government authorities	5.91	23.5	.044***
	Social freedom			
	Free to do what is preferred ⁵	1.00	1.00	-
	Members respect each other's preferences ⁵	1.44	1.47	.134
	Others restrict my livelihood ⁵	3.08	3.08	-
	Punishment for damaging others' rights (% of HH)			
	Yes	97.1	100	.109
	No	2.92	-	.109
	React against any threat (% of HH)			
	Money	17.6	38.2	.013***
	Flee	11.8	14.7	.062
	Apologize	8.81	5.91	.134
	No need to react	61.8	41.2	.023***
	Economic freedom (% of HH)			
	Open markets for everyone	100	100	-
	Can produce free whatever wants to	100	100	-
	Can sell the forest resources freely	83.3	76.7	.056
Social relations	Trust and solidarity relations (% of HH)			
	Most of the people can be trusted	1.35	1.50	.454
	Many people are willing to financial help	2.64	2.85	.144
	Most of the people willing for non-financial help	1.44	1.61	.107
	Collective action and cooperation			
	How likely people work for protecting forest ⁵	4.00	3.29	.008***
	How many people work together in protecting forest (% of HH)			
	Several/Ecotourism Program member	-	23.5	.004***
	Few	2.9	76.5	.001***
	Nobody	97.1	-	.002***
	Groups and network (No.)			
	Group membership	1	1.60	.001***
	Close friend/members	4.76	5.85	.028***
	Social cohesion (% of HH)			
	Togetherness	2.00	2.14	.513
	Families sharing ecosystem services (No.)	1.85	1.97	.292

Superscript values represent the scale of measurement. HH = Household. ***Significant at $\alpha = 0.01$ level.

which was a direct effect of participation in the ecotourism program. However, the improvements are yet too small to consider as substantial success (Table 5).

3.4.5. Composite wellbeing score

After introducing ecotourism program the social freedom of choice of the households was significantly reduced. Participants explained that ecotourism program gave them alternative income sources and opportunities to work in groups but the effect was too small to improve the ever-changing society. Respect across the villages was reduced than before and increased effort in forest conservation restricted their livelihood activities in the forest which required more negotiations with the authorities. Moreover, merchants in the Chinese Village adjacent to the forest supplied all the money and chainsaw to many villagers to continue cutting trees which allowed them to bribe some officials to avoid confiscation. Wellbeing regarding food and nutrition was reduced significantly after the ecotourism

program. This is mainly because the ecotourism project did not have any proper plan to improve the food situation of the households. Moreover, over exploitation of the resources made food items scarce in the forest. Ecotourism program was successful in significantly increasing collective action and cooperation (Table 6). Ecotourism program authority formed groups by including the participants to support the transportation, guiding, catering the tourists and patrolling the forest which enhanced the cooperation among them.

4. Discussion

Ecotourism program in VSSPNP has gained attention within a short period and attracted a growing number of tourists mostly because of the increased awareness of among the people regarding sustainable development and conservation (Chand et al. 2015). Tourists reported that gibbons increased the value of Forest of Veun Sai but failed to enhance the appeal of birds

Table 6. Comparing composite wellbeing score of before and after CBE (at random and with replacement $m = 1000$ samples from the original dataset).

Wellbeing criteria	Before ecotourism program			After ecotourism program			Sig. (2-tailed)
	Min.	Max.	Mean	Min.	Max.	Mean	
Social Freedom	3.60	5	4.31	3.40	5	4.25	.013***
Economic freedom	5	5	5.00	5	5	5.00	-
Institutional protection	3	3	3.00	3	3	3.00	-
Water for domestic use	3.17	4.83	4.13	3.17	4.83	4.14	.794
Food availability	2.33	4.67	3.60	2.00	4.33	3.09	.008***
Good physical health	2.40	5.00	4.47	2.40	5.00	4.48	.531
Good mental health	2.00	4.75	3.52	2.00	4.75	3.53	.113
Trust and solidarity relations	3.00	5.00	4.19	1.33	5.00	4.01	.128
Collective action and cooperation	1.00	2.50	1.51	1.50	3.50	2.47	.001***
Social cohesion	1.00	5.00	4.00	1.00	5.00	3.85	.504

***Significant at $\alpha = 0.01$ level.

and indigenous people because of fewer activities for bird watch and knowing indigenous cultures. There was a significant improvement in the level of tourist satisfaction after visiting the site. Total enjoyment exceeded the initial discontentment with the lack of proper transport and other services including accommodation and food. Diversifying the experiences in tourism sites could potentially assist in achieving sustainable outcomes (Akbulak and Cengiz 2014). Despite the growing interests, the program generated too little revenue to significantly uplift the economic conditions of the surrounding villagers. Even if CBE generates large income in some areas, many scholars argued that little or no ecotourism revenue of ecotourism reaches local people (Cobbinah et al. 2017; Regmi and Walter 2017).

There was no significant difference observed in the parameters of basic materials of wellbeing including air, water, and food. But after combining the criteria the composite food-wellbeing scores of feeding condition was found significantly lower even after ecotourism program. Due to ecotourism program, there was a slight shift in dependency from forest to the market for food items reportedly because of decreased forest productivity and increased affordability. However, there was still a widespread and chronic shortage of the food in the families which were also observed in many other forest-dependent communities worldwide (Neelakantan et al. 2020).

After ecotourism program institutional supports were not significantly increased in offering assistance to maintain their rights to collect forest provisioning services. Although significantly higher restrictions by conservation interventions significantly decreased the composite wellbeing score of social freedom, villagers were able to continue their preferred livelihood activities without any major confrontation. Often they were

not restrained but if they were caught by the authority, negotiations were made with bribe. This clearly entails that the efforts to restrict illegal extractions were significantly higher than the management without ecotourism program, but those were too little to stop people for engaging illegal activities. Yolamalinda and Febriamansyah (2017) also stated that despite the protection measures people find their way to continue both legal and illegal extraction of forest resources. In order to avoid any conflict and ensure success of the conservation program, it is required to ensure alternative livelihood for them, or at least create some opportunities by offering training as well as access to credit (Anup et al. 2015).

There was no change in physical and mental health except little increase in chronic health issues among adult members of the families. There was an absolute ignorance regarding health and sanitation across the society except for some knowledge on malaria. McDonald et al. (2010) also found that remote indigenous people are highly vulnerable to diseases due to the lack of education and health care service. Due to ecotourism program, people's intention for collective action and cooperation for conservation of the forest was significantly increased. After engaging in the conservation of the forest groups and network in the village significantly contributed to the greater cooperation among the villagers. Creating different social groups by the management authority of ecotourism program to run the activities of the program has enhanced collaboration among them. Sterling et al. (2017) also argued that formal and informal institutions benefit the participants and lead strong collective action.

Current program has not robustly addressed the human wellbeing, instead, the premise was the ecotourism would attract tourists, and income generated from ecotourism program would be an incentive for conservation and economic alternative to destructive livelihood activities in the forest; thereby, increased income will eventually enhance wellbeing of the participants. This idea is widely dismissed in many studies, as ecotourism programs often fail to generate adequate financial revenue for the people, and more importantly it is subjected to long-term investment commitment which is often not the case (Shoo 2020). Moreover, ecotourism may have negative impacts on the biodiversity that is intended to conserve (Shi et al. 2015; Salemi et al. 2019). Our study also suggests that designing a project by depending on the economic return from ecotourism program to achieve human wellbeing would not lead to the desired success. Perhaps, this is the reason ecotourism program had little effect on the participants around VSSPNP. There are different components of wellbeing which could be achieved by the existing program activities and with minimum investment.

5. Conclusion

Gibbons troussim was able to attract big number of tourists and very potential to greatly increase the value of the forest. However, the participants of the ecotourism program received only 6% of the total annual revenue generated from the tours. They had to accept significant reduction in the livelihood freedom; but, access level to the forest for subsistence remained unchanged. It might cause a significant reduction in feeding condition of the families. On the contrary, institutional support, and collective action and cooperation for their wellbeing and conservation had significantly increased. But other wellbieng criteria showed no significant change after ecotourism program. Our research suggests that ecotourism program has major shortcomings in achieving sustainability. Therefore, the project required to be revised with proper emphasize on all the aspects of human wellbeing to ensure active participation of the lcoal people.

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Conflicts of interest/Competing interests

The authors have no conflict of interests/competing interest in the subject matter discussed in the manuscript.

Ethics approval

We confirm that the study was approved by the Human Research Ethics Committee of The Australian National University, Australia. The details are created by: Abu SMG Kibria (u5429511); Record number: 6780; Protocol type: Expedited Ethical Review (E2); Protocol number: 2014/444.

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