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'Elephant Watching' for Mitigating Human-Elephant Conflict: A Case Study in Sri Lanka

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Abstract

The ongoing Human-Elephant Conflict (HEC) in Sri Lanka results in the death of more than 300 elephants every year. Although HEC mitigation plans are in place, the mitigation measures are not always implemented due to fund limitations. In the present study, the visitor demand for HEC mitigation strategies as the visitors' willingness to pay a conservation tax at park level has been estimated which could be used for implementing HEC mitigation measures to conserve elephants in the wild. A discrete choice experiment (DCE) was conducted at three national parks presenting different options for mitigating HEC. The study found LKR 112.11, LKR 85.38 and LKR 95.37 (1USD = LKR 180) as the maximum conservation tax that visitors were willing to pay for conserving elephants at the Minneriya (MNP), Wasgamuwa (WNP), and Udawalawe (UNP) National Parks which are located in the North Central, Central and Southern Provinces, respectively, in Sri Lanka. These economic values constitute useful and reliable information for policy makers in determining appropriate entrance fees for visitors to national parks including a conservation tax for mitigating HEC.

Keywords: Conservation tax, National parks, Sri Lanka, Human Elephant Conflict, willingness to pay

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INTRODUCTION

The Asian elephant (Elephas maximus maximus) in Sri Lanka is the most prominent symbol of conservation as a 'true flagship species' (Desai, 1998). Attempts to ensure its continued survival in the wild is supported by a majority of Sri Lankans who consider it to be a valued resource (Bandara and Tisdell, 2003a, and b). But according to Santiapillai et al. (2010) the Human-elephant conflict (HEC) is one of the biggest environmental and socio-economic crises of rural Sri Lanka (s. The intensification of HEC in recent times has been due primarily to the cumulative impact of the increase in human population, especially around the forest fringes, and the concomitant loss and fragmentation of habitats of Asian elephants (Santiapillai et al., 2010). The establishment of human settlements in wildlife habitats or corridors (i.e., elephant migration routes) is one of the major causes of HEC. The corridors are the connecting paths of protected areas in which preferable habitats, mainly water and food sources, are available. In the HEC reported areas, it is not unusual to see land encroachments including illegally cultivated areas and human settlements. It is also not unusual to see school children as well as men and women either walking or traveling on bicycles while elephants are present. Hence, they harass the elephants to scare them away whereas such behavior only makes elephants more aggressive rather than making them scared of people. In the year 2019, alone, three hundred and seventy-six elephant deaths were reported in Sri Lanka while 114 people died due to elephant attacks, mostly in their own villages and fields (DWC, 2019). Further, according to the records available, annually elephants cause over USD 10 million damage to crop and property.

The cost of HEC is three- fold: direct, indirect, and opportunity costs (Thirgood et al., 2005). Crop damage and human injuries and deaths are the major direct costs associated with the human-elephant conflict. Santiapillai et al. (2010) have calculated that an average farmer in elephant-impacted areas of Sri Lanka loses over USD 300 annually in crop damage. In 2019, the Department of Wildlife Conservation (DWC), which is responsible for conserving elephants in Sri Lanka, paid more than LKR 60 million as compensation for human deaths, injuries, and property damage. It also spent more than LKR 10 million for the capture and translocation of marauding elephants (DWC, 2018). Of the HEC incidents recorded from around the country, more than 60% were recorded from the areas where MNP, UNP and WNP were located (DWC, 2016). These three national parks are not only the

main habitats of wild elephants as well as prime sites for elephant conservation in Sri Lanka, they also provide the recreational opportunity of 'elephant watching' for visitors so that they can enjoy observing wild elephants in their natural habitats. Although more than LKR 550 million is allocated for elephant conservation and compensation and for implementing HEC mitigation measures by the DWC, these outlays in expenditures have not succeeded in mitigating HEC (DWC, 2018). Due to budgetary constraints, the Government of Sri Lanka (GOSL) finds itself unable to spend more funds to implement mitigation measures in order to solve HEC. In the meantime, wildlife and nature lovers who visit national parks for 'elephant watching' express their concern, over the death of elephants due to HEC, arising partly out of an altruistic desire to prevent their extinction and partly out of a desire to observe these majestic animals in the wild during visits to national parks (DWC, 2003).

The present paper investigates whether visitors to these national parks are willing to 'pay a tax' for elephant conservation (which is called 'conservation tax') or for mitigating HEC in addition to their entrance fee. We argue that the revenue earned through taxing could be used by the Government of Sri Lanka to implement HEC mitigation measures. With this in mind, the main objective of the present study is to estimate the visitors' willingness to pay a conservation tax which could then be used to implement strategies for the purpose of mitigating HEC in Sri Lanka. In addition, visitors' views on reasons for HEC and obstacles for HEC mitigation are identified.

LITERATURE REVIEW

Several scholars have found economic valuation as a useful tool for addressing wildlife management and conservation issues during past two decades (Gren et al., 2018; Rathnayake, 2015; Pack et al., 2013; Shwiff et al., 2013; Mawdsley et al., 2009; White et al., 2001), with some estimating the demand for endangered species conservation in terms of Willingness to Pay (WTP) using the Contingent Valuation Method (CVM). The economic value of an endangered species resides in its varied economic, ecological and socio-cultural attributes. For example, substantial economic benefits, as estimated by Gunatilake and Vieth (1998), are derived from elephant-based tourism and recreational activities. Bandara and Tisdell (2005) have also shown that the willingness to pay for the conservation of Asian elephants in Sri Lanka varies with hypothetical variations in abundance. Neupane et al. (2017), on the other hand, have evaluated the economic viability of elephant conservation in Nepal

within the context of current and proposed HEC mitigation scenarios.

Several scholars from around the world have also found choice experiment (CE) useful for studies focusing on wildlife management (Subroy et al., 2018; Wallmo and Lew, 2012; Decker and Watson, 2016; Wielgus et al., 2003; Gazzani et al., 2008; Wallmo and Kosaka, 2017; Greiner et al., 2014). For example, in the study on the management of the Ningaloo Reef in Australia, Gazzani et al. (2008) showed that creating an economic incentive for conservation through the introduction of users' fees could be a valuable solution for reef conservation. Greiner et al., (2014) emphasized that designing of effective and efficient payments for ecosystem services schemes was important to safeguard the north Autralia's biodiversity values. These studies confirm that the economic valuation of endangered species helps policy makers to formulate efficient, effective, and sustainable conservation and management policies. However, none of these CE studies has estimated the visitors' demand for paying a conservation tax for mitigating HEC.

RESEARCH METHODOLOGY

The study was carried out in three national parks, namely, MNP (249km2), UNP (308.21 km2) and WNP (395.85 km2), in Sri Lanka, which is an island located in the Indian Ocean (see Figure 1). The tropical, dry, mixed, Semi Evergreen Forest predominating in all three sites offers a prime habitat for large mammals including Asian elephant, Leopard (*Panthera pardus kotiya*), Sloth bear *(Melursus ursinus*), Golden jackal (Canis aureus), Water buffalo (*Bubalus bubalus*), Slender loris (*Loris tardigradus*), Wild boar (Sus scropa), Spotted deer (*Axis ceylonensis*), Barking deer (*Muntiacus muntjak*), Sambar (*Cervus unicolor*), Black napped hare (*Lepus nigricollis*), and Fishing cat (*Prionailurus viverrinus*). In addition to these, avifauna such as endemic birds and large reptiles such as Mugger crocodile (*Crocodylus palustris*), estuarine crocodile (*Crocodylus porosus*) and Python (*Python molurus*) are also found in the parks. The main tourist activities in the three parks are wildlife safari, camping and overnight stays at the bungalows within the parks. In 2018, the MNP, UNP and WNP attracted 196,103, 330,381 and 31,609 visitors, respectively, where the majority of the visitors came to enjoy 'elephant watching'.

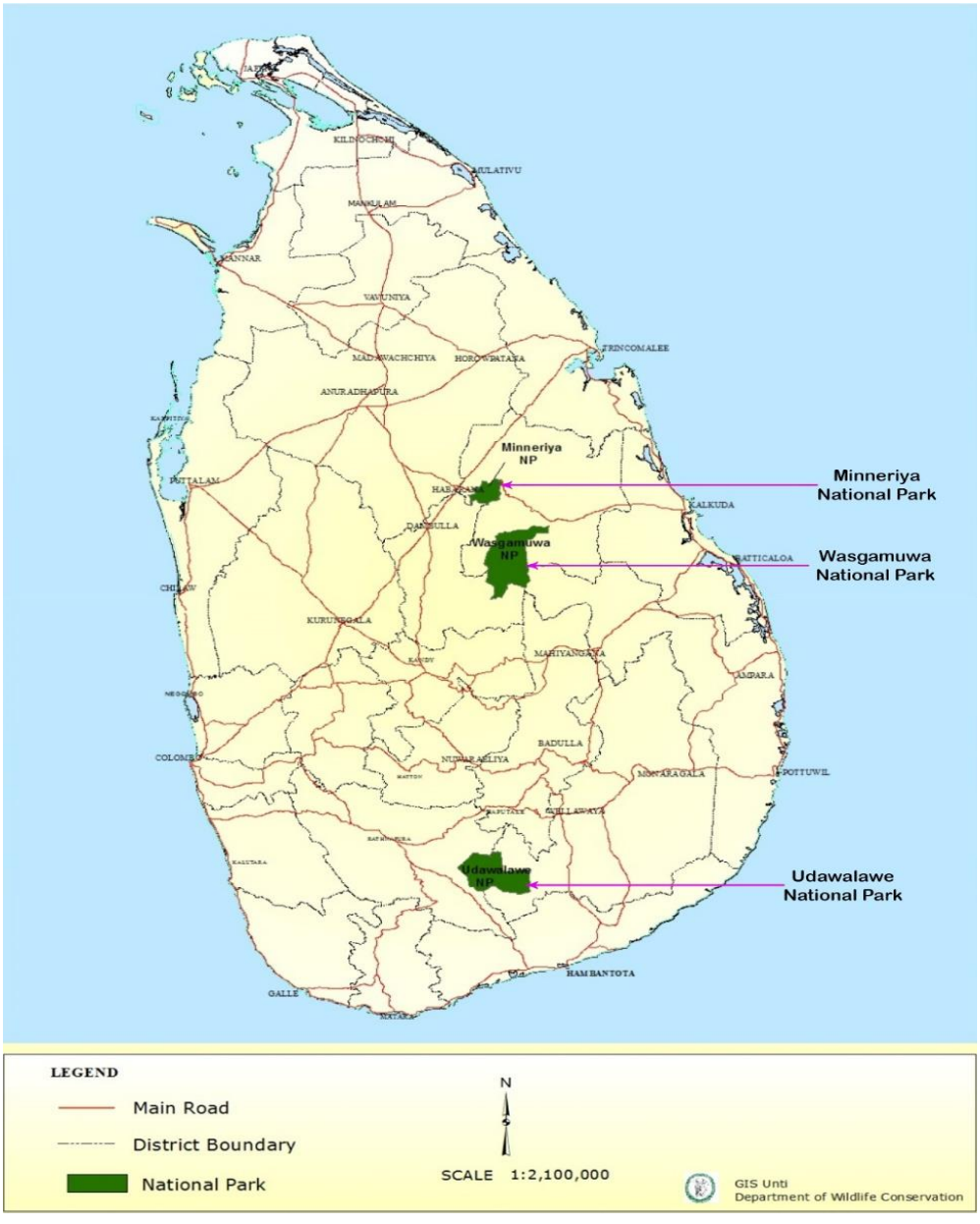

Figure 1: Location map of study sites in Sri Lanka

Following Bateman et al. (2002) and Hanley et al. (2002), the attributes and their levels found in DCE were defined and finalized based on a thorough discussion with local villagers around the three national parks and consultation with local experts. This method assumes that choices with regard to the mitigation of HEC can be described using a set of mitigation attributes such as 'Implementation of short-term, medium term and long-term HEC mitigation measures', 'Education and awareness', and 'Contribution to mitigation

measures through paying a conservation tax'. It also assumes that individuals are agreeable to a trade-off between having more of one desirable attribute against less of another desirable attribute as well as to a trade-off of all product attributes against the price of that product. The attributes and levels, once selected, were combined into choice sets using experimental design procedures (Rose and Bliemer, 2009). Each individual in the survey responded to a sequence of choices while statistical modeling was then used to infer the preferences for each attribute. Importantly, these preferences can be expressed in terms of WTP using the parameter estimates for the conservation tax attribute.

Assuming that an individual's preference can be represented as a function, each choice (alternative) is represented with an indirect utility function. The utility function consists of an observable deterministic or systematic part (V) and an unobservable stochastic or random element (ε).

Therefore, the indirect utility function of the i^{th} individual for the j^{th} alternative can be represented as

$$\boldsymbol{U_{ij}} = \boldsymbol{V_{ij}} + \varepsilon_{ij} \quad \text{..... (1)}$$

The individual would choose the alternative j in the choice set to any alternative k if *Uij* > *Uik.*

According to McFadden (1973) and Bateman et al. (2002), under the multinomial logit model (MNL), equation (2) gives the Willingness to Pay (WTP) welfare measure for a given policy change that affects the environmental good.

$$WTP = b_y^{-1} \ln \left[\frac{\sum_i \exp\,(V_i^1)}{\sum_i \exp\,(V_i^0)} \right] \quad \text{..... (2)}$$

The coefficient by is the coefficient of the monetary attribute and $V_i^1$and V_i^0represent the utility of the initial state and alternative state, respectively (Bateman et al., 2002). For the linear utility index, the above equation can be written as;

$$WTP = -b_c/b_y \quad \text{..... (3)}$$

where b_c is the coefficient of any of the attributes and *by* is the coefficient of the monetary attribute (Bateman et al., 2002).

Questionnaire Survey and Data Collection

Table 1 gives the attributes, levels and choice sets that have been considered in the choice model experiment of the present study. The survey questionnaire consisted of three parts. The first part of the questionnaire captured visitor information including socio-economic information on age, gender, education and income. The second part attempted to understand the visitor's recreational behavior including his/her knowledge of wildlife, his/her knowledge as well as attitudes toward issues of the environment and HEC, and prior history of visits to national parks. The third part included questions related to the CE. In the present study, four attributes were identified.

Table 1: Attributes and levels used in the choice experiment

Attribute	Levels	Current situation
Implementation of immediate mitigation measures for HEC	1. Removal of marauding elephants from the area 2. Proper compensation package for crop losses, property damages and human injuries and human deaths 3. Each household to be given thunder flares to safeguard themselves	Removal of marauding elephants from the area
Education and extension programs for HEC	1. Awareness programs on Human-Elephant Conflict 2. Awareness programs on household level mitigation measures on Human-Elephant Conflict 3. Combination of (1) and (2) activities.	Awareness programs on Human-Elephant Conflict
Implementation of long-term mitigation measures	1. Establishment and maintenance of village level electric fences 2. Establishment and maintenance of park boundary electric fence	Establishment and maintenance of park boundary electric fence

	3. Habitat enrichment programs in National Parks (i.e., construction of water holes and weed eradication)	
WTP for preventing HEC (i.e., tax for preventing HEC per household unit)	1. LKR 0 (No) 2. LKR 50/- 3. LKR 100/-	LKR 0 (No)

Following Louviere and Islam (2008), the experimental design technique or the conjoint choice modeling technique in main effects was applied to generate different orthogonal combinations which were blocked into five choice sets (see Table 2). The five choice sets were selected by conducting a preliminary survey through interviews with 100 visitors (Table 2).

Table 2: Chosen alternatives (choice sets) with attributes and levels under each attribute

Choice Set	**Preference %**	**Levels of Attribute 1** *Implementation of immediate mitigation measures for HEC*	**Levels of Attribute 2** *Education and extension programs for HEC*	**Levels of Attribute 3** *Implementation of long-term mitigation measures*
1.	10.53	Proper compensation package for crop losses, property damages and human injuries and human deaths	Awareness programs on Human-Elephant Conflict and Awareness programs on household level mitigation measures on Human-Elephant Conflict	Establishment and maintenance of village level electric fences
2.	12.54	Proper compensation package for	Awareness programs on Human-Elephant	Establishment and maintenance of park boundary

		crop losses, property damages and human injuries and human deaths	Conflict	electric fence
3.	11.34	Removal of marauding elephants from the area	Awareness programs on Human-Elephant Conflict and Awareness programs on household level mitigation measures on Human-Elephant Conflict	Establishment and maintenance of village level electric fences
4.	26.12	Proper compensation package for crop losses, property damages and human injuries and human deaths	Awareness programs on household level mitigation measures on Human-Elephant Conflict	Establishment and maintenance of park boundary electric fence
5.	36.47	Proper compensation package for crop losses, property damages and human injuries and human deaths	Awareness programs on Human-Elephant Conflict	Habitat enrichment programs in National Parks (i.e., construction of water holes and weed eradication)

Through the interviews, the visitors were clearly introduced the proposed attributes and the importance of levels under each attribute for elephant conservation. Under the CE, it is obvious that a large number of choice

sets can be generated based on visitor preferences and their knowledge, but through the above survey, the most preferred five choice sets were identified for the main survey. Accordingly, under each choice set, we proposed a different bid value to the visitors and gauged their willingness to pay the bid as the proposed 'conservation tax' for mitigating HEC. We chose the tax fee as a realistic measurement of use value since Sri Lankans, as well as foreigners, are used to the levying of taxes for activities at recreation sites (Lee, 1997). The sample included 1760 respondents (comprising only those visitors whose main intention in visiting the Park was 'elephant watching') representing 680, 620 and 460 visitors from MNP, UNP and WNP, respectively, with every fifth safari vehicle coming out of the park having observed elephants being chosen for the sample. At the exit gate of the park, either the leader of the group, or a member from each group who volunteered to provide information, was interviewed face to face. The multinomial logistic regression is used when the dependent variable is nominal and that falls into any one of a set of categories that cannot be ordered in any meaningful way. In the present study, the multinomial Logit model was applied for data analysis using the 'STATA 14' statistical software package.

DATA ANALYSIS AND PRESENTATION

Demographic Profile of Visitors

Table 3 gives the socio-demographics of the respondents. It shows that the mean education level of visitors is roughly 13 years and that their household monthly income is LKR 64,640.52.

Table 3: Demographic characteristics of respondents to the three study sites

Variable	Mean	Std. dev.	Minimum	Maximum
Age (years)	34.90	0.5901	26	78
Education (number of years)	11.55	2.12	8	18
Household monthly income (LKR)	64640.52	3778.44	19500.00	168000.00
Gender (1= male, 0= female)	0.67			
Working in tourism-related field (1= yes, 0= no)	0.23			
Working in tourism-related field (1= yes, 0= no)	0.18			

The age of the surveyed respondents ranged from 26 to 78 years with an average age of 34.90 years. A high percentage of the respondents (67.35%) was male while most visitor groups were led by males. Only a few respondents were found to be working in tourism-related (2.3%) and environment-related (1.8%) fields.

Identification of visitors' views on reasons for HEC and obstacles for HEC mitigation

When we solicited the opinion of visitors on the prioritization of issues relating to conservation of wildlife, they identified elephant killing by farmers as the major problem, followed by habitat encroachments, and poaching of other wildlife. 82% of the respondents also mentioned HEC as the most important issue relating to wildlife to be addressed at the national level. Respondents were also asked to express their opinion on the current HEC mitigation activities (i.e., erecting electric fences, distributing thunder flares, elephant drives, and habitat enrichment programs) adopted by the DWC. Most of the respondents (67%) expressed dissatisfaction with the current HEC mitigation activities conducted by the DWC.

Table 4 gives the major obstacles identified by the respondents as impeding the adoption of HEC mitigation activities. A majority of respondents mentioned the lack of fund allocation for HEC by the government to implement the HEC mitigation plans developed by the DWC as the major impediment. 72% of respondents also identified unplanned and unsustainable development activities in the country as one of the determiners of HEC. Another problem identified was the lack of inter-agency coordination, which is a major limitation when implementing a particular elephant conservation plan.

The respondents also recognized the importance of awareness and education programs with regard to elephant conservation for people and communities in adjacent areas to national parks as another requirement in HEC mitigation. The other requirement for HEC mitigation that they highlighted was the importance of motivation of staff of DWC and support by the Government of Sri Lanka.

Table 4: Major obstacles identified in adopting HEC mitigation activities

Major obstacles in adopting HEC mitigation activities	Acceptance (%)	Rank
Lack of funds for implementing HEC mitigation activities	76%	1
Unplanned development activities in the country	72%	2
Lack of inter-agency coordination for implementing HEC mitigation plan	67%	3
Lack of awareness and education programs on HEC for surrounding community	65%	4
Lack of support from national government to mitigate HEC	59%	5
Lack of motivation of staff for HEC mitigation	56%	6

Visitors' preference for different choice sets

In the choice experiment, the main reason for the choice also had to be reported using the list of levels under the four attributes applied in the study. The respondents' preference for each choice set is given in Figure 2. It shows that the highest preferences were recorded for Choice 5, Choice 4 and Choice 2. The lowest preferences, on the other hand, were recorded for Choice 1 and Choice 3. Further, as seen in Figure 3, the preference of a majority of respondents (88.66%) for a particular choice set was mainly determined by the presence of a particular level, that being "Proper compensation package for crop losses, property damages and attacks on humans and human deaths. For 36.47% of the visitors, their choice was determined by the level "Awareness programs on Human-Elephant Conflict". The presence of the level "Establishment and maintenance of park boundary electric fence" was the reason that some choice sets were selected by about 38.66% of the respondents. Hence, it is evident from the above that the visitors interviewed seem to prefer these levels (or activities) as a long-term solution for HEC. Accordingly, Choice 5, Choice 4 and Choice 2 were recorded as the most preferred choice sets in which the above levels were found. Further, no respondent said that in selecting their choice set, they were influenced by the monetary values included under each choice set. "Removal of marauding elephants from the area" and "Establishment and maintenance of village level electric fences" were the least preferred levels in making a choice by the visitors. These two activities were short-term solutions. Only a few visitors seemed to prefer them as the best

solutions for mitigating HEC.

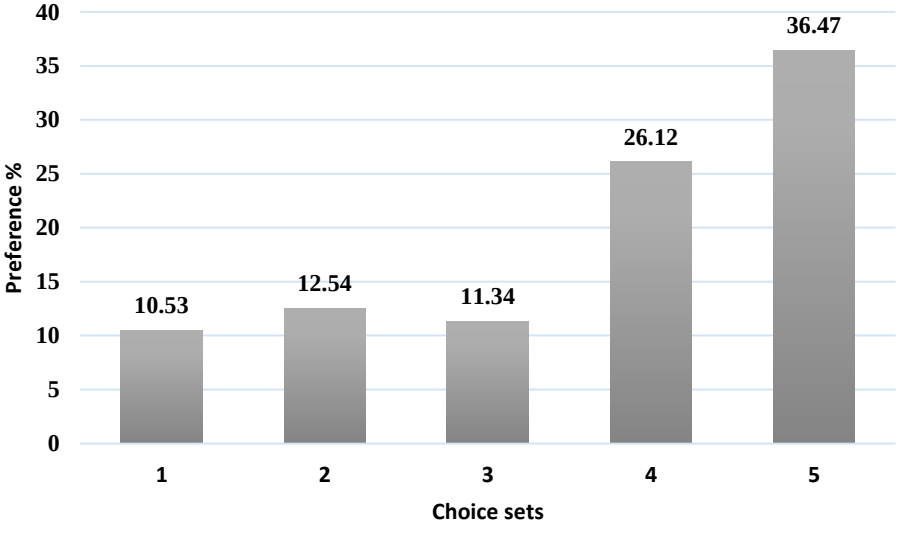

Figure 2: Preference percentages for each choice set

Choice Experiment Analysis

The acceptance of alternative options was determined by running the multinomial logit model (Table 5). The effects of the socio-demographic variables were in line with other CE studies (Thuy, 2007; Rai and Scarborough, 2012; Khai and Yabe, 2014). This suggests that the concern with regard to mitigating HEC differs from one socio-economic group to another. In line with the results of studies by Carlsson et al. (2003), Othman et al. (2004), and Wang et al. (2007), the model shows that older respondents were more likely to select the status-quo alternative compared to younger respondents since the interaction variable of Age has a significantly negative parameter at the level of 5%. The coefficients of the variables, education and household income (hhinc), interacting with ASC are significantly positive at less than the 5% level ($p < 0.05$) indicating that respondents with higher education levels are more likely to support the biodiversity conservation project while those with higher income are willing to pay more. These results are consistent with the results of previous studies (e.g., Morrison et al., 1999; Carlsson et al., 2003; Othman et al., 2004; Birol et al., 2006; Do and Bennett, 2009). However, the variable 'gender' was not significant in the regression model. On the other hand, the coefficient of the variable 'work' (work in an environment- or tourism-related field) was significantly positive showing that those respondents working

in an environment- or tourism-related field were willing to pay a conservation fee in the form of a tax.

Table 5: Results of Multinomial Logit models with socio-economic variables for the three study sites

Variables	Coefficients
ASC	-0.7631**
	(0.0014)
Implementation of immediate mitigation measures for HEC	-0.6136***
	(0.0547)
Education and extension programs for HEC	0.1963**
	(0.0365)
Implementation of long- term mitigation measures	0.3693***
	(0.0843)
WTP for preventing HEC (tax for preventing HEC per household unit)	0.0287***
	(0.0065)
ASC*Education	0.1079**
	(0.0284)
ASC*Age (number of years)	-0.0043*
	(0.0076)
ASC*Work	0.4024**
	(0.0646)
ASC*Gender	0.4435
	(0.2601)
ASC*Hhinc	0.000054***
	(3.03e-06)
Constant	-0.6438***
	(0.4783)

Standard errors are in parentheses
***p<0.001, **p<0.05, and *p<0.01

Estimation of 'Conservation Tax' in terms of WTP

Table 6 shows the MNL model results of the choice experiment data. Almost all the levels of the four environment management attributes and the alternative constants are statistically significant at less than 5% ($p < 0.05$). The WTP of the first level of the attribute, "Implementation of immediate mitigation measures for HEC," is negative, implying that the respondents do not prefer the mitigation activity of "Removal of marauding elephants from the area". The negative coefficient for people's WTP for mitigating HEC suggests that people

do not wish to spend their money on HEC mitigation. In discussions with the visitors in the questionnaire survey, we found that they feel it is the government's responsibility to bear the expenses for HEC mitigation. In the meantime, the other levels of attributes 2 and 3 had positive coefficients, which indicate that the respondents feel that these two alternatives would help mitigate HEC. According to the chosen levels under each attribute by visitors, it is clear that visitors expect the Department of Wildlife Conservation to implement these measures to mitigate HEC because only the Department of Wildlife Conservation has the technical capacity to implement these measures. With regard to the third level of the attribute, "Education and extension programs for HEC," which included two actions, i.e., "Awareness programs on HEC" and "Awareness programs on household level mitigation measures for HEC", the coefficient was positive and significant.

Table 6: Estimations of multinomial Logit models for HEC mitigation levels

Variables	**MNP**		**UNP**		**WNP**	
	Coefficients	**Mean WTP (LKR)**	**Coefficients**	**Mean WTP (LKR)**	**Coefficients**	**Mean WTP (LKR)**
Attribute 1: Implementation of immediate mitigation measures for HEC						
Removal of marauding elephants from the area	-0.1764 (0.303)	-9.28	-0.454* (0.0547)	-27.91	-0.1586 (0.004)	-7.66
Proper compensation package for crop losses, property damages and human injuries and human deaths	0.7*** (0.212)	38.1	0.3515* (0.2904)	21.56	0.5** (0.230)	27.9
Attribute 2: Education and extension programs for HEC						
Awareness programs on HEC	0.128* (0.213)	6.77	0.2658 (0.1987)	16.31	-0.2751 (0.236)	13.2

Awareness programs on household level mitigation measures for HEC	0.60** (0.207)	31.6	0.2545* (0.171)	15.61	0.54** (0.256)	26.5
Both 1 and 2 activities above	0.684* (0.268)	36.0	0.51*** (0.1868)	31.73	0.6642 (0.324)	32.0
Attribute 3: Implementation of long-term mitigation measures						
Establishment and maintenance of village level electric fences	0.58** (0.21)	30.7	0.36* (0.30)	22.39	0.44* (0.23)	21.2
Establishment and maintenance of park boundary electric fences	0.72** (0.43)	37.9	0.52* (0.21)	32.09	0.52 (0.52)	35.3
Habitat enrichment programs in National Parks (i.e., construction of water holes and weed eradication)	0.67* (0.28)	35.5	0.48* (0.36)	29.56	0.55* (0.19)	26.9
WTP as a conservation tax	0.01** (0.003)		0.01** (0.00)		0.02* (0.00)	
Constant	1.7*** (0.39)		2.48*** (0.32)		1.50) (0.49)	

Standard errors are in parentheses
***p<0.001, **p<0.05, and *p<0.01

The marginal willingness to pay (MWTP) is the amount of money an individual is willing to pay in order to receive more of a given attribute, holding the other attributes constant. It could also be described as the ratio between the coefficient for a given non-monetary attribute level and the coefficient for the monetary attribute which gives the implicit price or MWTP for that particular non-monetary attribute. The positive implicit values for visitors' willingness to pay for mitigating HEC shows that people prefer to pay a tax for HEC mitigation. Accordingly, as the Implicit Prices in Table 6 shows, the visitors are willing to pay a conservation tax for all levels under the given attribute except the level called 'Removal of marauding elephants from the area' under the first attribute, i.e., "Implementation of immediate mitigation measures for HEC'. The negative implicit value indicates that the respondents will suffer a welfare

loss if a conservation tax is charged from visitors to mitigate HEC using this particular measure.

According to Table 6, the highest MWTP values, ranging from LKR 21.27 to LKR 37.90, were recorded for the options, in terms of levels, under the attribute 'Implementation of long-term mitigation measures'. Under this attribute, visitors are willing to pay more, ranging from LKR 32.09 to LKR 37.90, for the option 'Establishment and maintenance of park boundary electric fences'. The results of the study also show that visitors are willing to pay more for a proper compensation package for crop losses, property damages, attacks on humans, and human deaths at UNP and MNP, the amount being LKR 21.56 and LKR 38.17, respectively. But visitors to WNP are willing to pay more for the option 'Each household is given thunder flares to safeguard themselves' under the above attribute. Under the attribute called 'Education and extension programs for HEC', the visitors are willing to pay more, ranging from LKR 6.77 to LKR 31.68, for the combined options of 'Awareness programs on HEC' and 'Awareness programs on household level mitigation measures for HEC'. If the total of the highest MWTP values resulting from each preferred attribute is considered as a conservation tax for mitigating HEC, the conservation tax will be LKR 112.11, LKR 85.38 and LKR 95.37 at MNP, UNP and WNP, respectively.

DISCUSSION OF THE FINDINGS

In Sri Lanka, a few number studies have been carried out by scholars on WTP for conserving the wild elephants applying the contingent valuation method. For example, according to Gunatilake and Vieth (1998), the majority of the visitors expressed support for the conservation of the Asian elephant during their visit to the Pinnawala Elephant Orphanage in Sri Lanka. Although the study does not mention a tax, the visitors' WTP for conserving endangered elephants through wildlife-based recreation facilities had been recorded at LKR 55.09 and LKR 409.39 for domestic and foreign visitors, respectively. Bandara and Tisdell (2005) showed that the mean monthly WTP of urban residents for conserving the wild elephants was LKR 110.17. In the study done by Neupane et al. (2017) in the eastern and western Terai of Nepal, the mean monthly WTP values of villagers per household for elephant conservation ranged from NPR 63 to NPR 93 ((USD 0.81 to NPR 1.20). Hence, the resultant WTP values under the present CE study are similar to the values resulting from studies done in other Asian countries. Gunatilake's and Vieth's study was carried out 1989 and

it could be considered that the value of the LKR, during that period was much greater than the LKR value recorded today.

In comparison of the WTP values resulted for conserving wild elephants with other animals, those values were comparatively lesser than the values resulted for other wild animals. Rathnayake (2015) showed that visitors' WTP as the entrance fees to Rekawa sanctuary in Sri Lanka for 'turtle watching' while conserving them were LKR 93 and LKR 143 under the recreational scenario and conservation scenario respectively. Further, it was obvious that the WTP values resulted for conserving the other wild animals in developed countries were greater than the resulted values in developing countries like Sri Lanka. For example, in their study, Subroy et al. (2018) showed that there was strong public support for increased Numbat and Woylie populations in Australia with willingness to pay, on average, at AUD 21.76 for 100 Numbats and AUD 7.95 for 1000 Woylies. Meanwhile, Decker and Watson (2016) estimated the annual willingness to pay per household for the giant Palouse earthworm as USD 20.45 based on the conditional logit model and USD 19.30 based on the mixed logit model. In the first application of a CE to coral reef valuation, Wielgus et al. (2003) estimated the marginal prices (WTP) of coral and fish diversity and water visibility at USD 2.60 and USD 1.20 per dive, respectively. In a study on wildlife product trading in Vietnam, respondents mentioned that they were willing to pay from VND 2700 to VND 16,900 for different rhino products under a legal trade scenario (Hanley et al. 2017). Accordingly, even the resulted WTP value for conserving the other animals in developed countries were much greater than the resulted value for conserving more endangered species like wild elephants in Sri Lanka. Further, a comparison of the above studies show that, comparatively, the willingness to pay for wild animals was higher in countries outside Asia.

In the present study, the following limitations were found as has also been discussed by scholars of similar studies. According to Hanley et al. (1998), the principal problems in using the CE method are the often complex nature of the statistical/experimental design and the selection of appropriate attributes and levels. The implied ranking of attributes is also dependent on the experimental design used and accompanying materials. In recognition of this limitation, in the present study, attributes and levels were identified after a series of discussions with wildlife officials, experts, and the members of the local community. The relative distances between the "good" and "bad" levels for each attribute were identified after these discussions.

A weakness of choice experiment relative to contingent valuation method is just that it is less direct. When people have a good sense of the value of a particular environmental good, it is best to ask them directly about this value instead of asking in a circuitous fashion. As in CV studies, there were limitations associated with our CE study as well. Among them were the "inability of the respondent or the difficulty they experience in estimating or even understanding values"; "individuals misrepresenting their benefits in the study on the assumption that the value results will influence public or private decisions in some manner"; "lack of interest on the individual's part in answering the questions", and "informational bias due to answers of respondents being influenced by the identity of the interviewer" (Hausman, 1993; Boyle et al. 1993; Foster and Mourato, 2003; Shavell, 1993). Further, according to Adamowicz et al. (1994), in cases of less familiar choices, or non-use values, such tests of external validity will be more difficult. This is directly equivalent to the calibration/validation problems in CV studies as applied to unfamiliar goods and/or non-use values. It may even be the case that the set of attributes that are relevant to users of a resource may be different from that which is relevant to those that derive nonuse values from the resource. Therefore, a proper training was given to the enumerators in the classroom and field on how to interview and collect correct information from the visitors under the CE study to overcome these biases and limitations to the extent possible.

CONCLUSION

This study reveals results from the application of a choice experiment to assess national park visitors' preferences and WTP as a conservation tax for different strategies for mitigating HEC in Sri Lanka. The results show that a significant portion of respondents was willing to pay for the proposed HEC mitigation measures in order to conserve wild elephants. A majority of respondents were willing to pay more for the implementation of the long-term mitigation measures status-quo alternative which means visitors believe that there should be a long-term solution for mitigating HEC. The overall average MWTP as a conservation tax was LKR 98.76 per person per visit while the existing park entrance fee to a national park is LKR 60.00 per person excluding taxes. The resultant economic values thus constitute useful and reliable information for policy makers to make policy decisions regarding the levying of a conservation tax on visitors to national parks for mitigating HEC. It will also constitute a policy direction for introducing a new fee structure for national parks in Sri Lanka including the conservation tax to the entrance fee. The study

will moreover contribute to the existing literature on how visitor taxing is applicable to HEC mitigation vis-à-vis wildlife management.

The annual total number of visitors to MNP, UNP and WNP was 558,093 and, hence, if LKR 98.76 is charged as the conservation tax, LKR 58.12 million could be generated for elephant conservation. The total annual allocation by the Government for mitigating HEC is less than LKR 500 million at present. Therefore, from these three parks alone, 11% of the total expenses can be recovered. Accordingly, if this type of conservation tax is charged at other national parks, the Department of Wildlife Conservation will easily be able to generate the required allocation for mitigating HEC. In addition, public perception of elephant conservation, as evident from the survey, would be of value in generating more awareness in society regarding the importance of elephant conservation.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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