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Can 'tourism product development' compensate the social cost of carbon pollution? A case study in Sri Lanka

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Abstract

The study examines how tourism product development can help generate sufficient revenue for park management to offset the social cost of carbon pollution associated with tourism product development. The results show that the social cost incurred at present due to observing wildlife at Wasgomuwa National Park (WNP) is Sri Lanka Rupees (SLR) 1.88 million (12912.56 USD) and the mean social cost per person is SLR 94.93 (0.65 USD) though only SLR 60.00 is recovered as the park entrance fee. If the existing park entrance fee is used for a carbon minimizing environmental conservation programme, the net loss per visitor would be SLR 34.93. However, if the mean WTP values are considered as the park entrance fee, the per person contribution for compensating the social cost of carbon pollution will be SLR 67.52 and SLR 82.66, respectively, under the recreational schemes 1 and 2. This saving can be utilized to offset the social cost of carbon pollution.

Keywords: carbon footprint, social cost, contingent valuation, tourism product development

1. Introduction

National parks are charged with the dual mandate of providing quality recreation opportunities to visitors while protecting park resources. Managers of protected areas in many parts of the world share similar responsebilities [1]. Accordingly, recreational planning in national parks has to ensure a balance between the objective of maximizing people's enjoyment of their stay with those of minimizing the impacts on habitat and wildlife and enhancing the visitor's interest in and commitment towards environmental conservation [2]. Enhancing the welfare benefits of visitors, in line with these objectives, is one of the expected outcomes of recreational planning in national parks. Tourism product development is a part of this recreational planning process.

All industries are characterized by a generic product and production process. For tourism to be considered an industry, it is necessary to show that such a generic product and process exist. According to Smith [3], the tourism product consists of five elements: the physical plant, service, hospitality, freedom of choice, and involvement. He formalizes the intuitive notion of many authors that tourism products are fundamentally experiences. In accordance with his notion, recreational schemes are now understood to contain 'tourism products.

The Contingent Valuation Method (CVM) and the Hypothetical Travel Cost Method (HTCM) have been used by many to study recreational planning and tourism product development in national parks [4–7]. Several economic studies have been done in national parks Sri Lanka applying CVM and HTCM. In Sri Lanka Rathnayake and Gunawardena [8] and Rathnayake [9] have done HTCM studies at Kawdulla and Wasgomuwa National Parks in Sri Lanka for recreational planning and management. Further, the economic values i.e. willingness to pay (WTP) values were applied by Rathnayake [10–12] applying CVM for ecotourism and recreational planning in national parks of Kawdulla, Minneriya and Rekawa Sanctuary in Sri Lanka. Both HTCM and CVM were applied by Rathnayake [13] for recreational planning in Horton Plains National Park in Sri Lanka. In line with these previous studies, in the present study, we too have used CVM to study recreational planning at Wasgomuwa National Park (WNP), Sri Lanka.

It is by now well-established that Green House Gases (GHG) contribute to global warming and that the Global Warming Potential (GWP) of methane over 100 years is 23, meaning that 23 tons of CO_2 would need to be emitted to cause the same effect as one ton of methane [14]. Today, the Carbon Footprint (CFP) is a widely used term and concept in the public discourse on responsibility and abatement action against global climate change which describes 'a measure of the exclusive total amount of carbon dioxide emissions that is directly or indirectly caused by an activity or is accumulated over the life stages of a product or service' [15]. According to Grubb and Ellis (2007), a carbon footprint is a measure of the amount of CO_2 emitted through the combustion of fuels. It may also reflect the fossil energy represented in a product or commodity reaching the market [15].

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The social cost of CO_2 is an estimate of the economic damages associated with a small increase in CO_2 emissions, conventionally one metric ton, in a given year. The social cost of CO_2 is meant to be a comprehensive estimate of climate change damages and includes, among other things, changes in net agricultural productivity, human health, property damages from increased flood risk and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning. Scholars predict that climate change will lead, and in some cases has already led, to negative consequences such as the spread of disease, decreased food production, coastal destruction, and many more. The social cost of carbon pollution calculates the economic cost of these problems and estimates the damage done by each ton of CO_2 [16] that is spewed into the air which, at current estimates, is about USD 40 [17]. This dollar figure also represents the value of damages avoided for a small emission reduction

National parks are charged with the dual mandate of providing quality recreation opportunities to visitors while protecting park resources. Managers of protected areas in many parts of the world share similar responsibilities. Tourism product development is a prerequisite for satisfying visitors' changing demands and insuring the long term profitability of the industry. According to Smith [3], ideally, tourism products meet market place demands, are produced cost-efficiently, and are based on the wise use of the cultural and natural resources of the destination. Therefore, for a high quality visitor experience new tourism products have to be introduced by the park managers. As described by Layman et al. [6], Loomis [18] and Rathnayake [8 –13], if new tourism products under a particular recreational scheme are introduced, the intended number of visits to a particular site will increase. On the other hand, travel to a particular destination is bound to affect both the carbon footprint and the social cost of carbon pollution. In the meantime, when park managers decide to introduce new tourism products under a particular recreational scheme, they also need to increase the park entrance fee in order to compensate for the expenditure incurred in developing and introducing the new products. The increase in entrance fees will lead to an increase in park revenue, a portion of which can be utilized for environmental conservation programmes such as a programme to increase the green cover which helps to reduce the carbon level in the environment and to offset the social cost due to carbon pollution.

As described by Mitchell & Carson [5], CVM involves directly eliciting from people what value they would place on an amenity if a market exists for it. The elicited WTP values are contingent upon a hypothetical market situation, or scenario, which is described to the respondent prior to investigating the amount he or she is willing to pay.

2. Research objective(s)

In the present study, the proposed recreational schemes are considered as a hypothetical market in order to examine how tourism product development affects the social cost of carbon pollution. It will also estimate the allocation required for environmental conservation programmes that would offset the social cost of carbon pollution in terms of a visitor's Willingness to Pay (WTP) 'vis-à-vis' for different tourism products.

3. Materials and methods

3.1 Study area

Wasgomuwa National Park (WNP) is located between the latitudes 7° 34' and 7° 57' N and longitudes 80° 51' and 81° 05'E (Figure 1). Tropical Dry Mixed Evergreen Forest predominates in the WNP and it is a prime habitat for large mammals, birds and reptiles. Though the total land area of the park is 395.85 km^2, tourism is confined to only one third of the park. Wildlife safari, camping and the opportunity to stay at three bungalows are the main tourist activities in the park. At present, the Park attracts only around 20,000 visitors. It is located in a remote area, 240 km from the capital of Sri Lanka.

3.2 Models for the Estimation of WTP Values, Carbon Footprint and Social Cost

3.2.1 WTP Estimation Model

It is assumed that if the quality of visitor experience is high, the intended number of visits to a particular site will increase which can be shown as follows:

$$\text{Number of intended visits} = \int Quality\ of\ visitor\ experience \quad (1)$$

The following model was applied in estimating WTP (demand) for observing elephants at WNP:

$$Probability\ (Yes/No) = \int bidvalue, gender, hhince, education, age, environment, tourism, distance + \varepsilon_i \quad (2)$$

where ***bidvalue*** represents the random amount the visitor is asked to pay, ***gender*** is a dummy variable denoting whether the respondent is a male or female (1 = male, 0 = female), ***hhince*** indicates the respondent's household level of income, ***education*** denotes the level of education in number of years, ***age*** denotes the age in number of years and ***environment and tourism*** are dummy variables denoting whether the respondent is a member of an environment- or tourism-related organization/field respectively (1= member of environment or tourism-related organization, 0 = not a member of environment or tourism-related organization).

Figure 1 Location map of Wasgomuwa National Park
Source: Management plan for Wasgomuwa National Park, Department of Wildlife conservation, Sri Lanka

'**Distance**' is also a dummy variable denoting whether the respondent is residing within a 50 km radius of the park or not (1 = respondent is residing within a 50 km radius of the park, 0 = respondent is residing more than 50 km away from the park). ε_i is the error term.

It is possible to estimate the individual i^{th} WTP assuming that it can be modeled as the following linear function [19].

$$WTP_i(z_i, u_i) = z_i\beta + u_i \tag{3}$$

where, z_i is a vector of explanatory variables, β is a vector of parameters and u_i is an error term. It is expected that the individual will answer "yes" when his WTP is greater than the suggested amount t_i (i.e., $WTP_i > t_i$). If so, the probability of $y_i = 1$ is a function of explanatory variables and can be written as:

$$\begin{aligned} \Pr(y_i = 1 | z_i) &= \Pr(WTP_i > t_i) \\ &= \Pr(z_i\beta + u_i > t_i) \\ &= \Pr(u_i > t_i - z_i\beta) \end{aligned} \tag{4}$$

Researchers commonly use probit and logit models when the dependent variable is binary ([19], [20], [21]). In this study, given that the outcome is binary, the probit model was applied for data analysis. STATA 14 statistical package was used for data analysis.

The estimated number of visitors to WNP under a particular scheme at a proposed bid value is estimated as follows:

Estimated number of visitors = Probability of visiting at proposed fee × Total number of visitors (5)

The total revenue under a particular proposed bid value is estimated as follows:

Total revenue = Number of visitors × proposed bid values as entrance fee (6)

The probability of visitation at a proposed fee is computed using the results of the above probit model.

3.2.2 Carbon Footprint and Social Cost Estimation Models

Economists estimate the social cost of carbon pollution by linking together a global climate model and a global economic model. The resulting models are called Integrated Assessment Models (IAMS). This integration helps economists take a unit of carbon emissions (e.g. from a car being driven or coal being burnt in a power plant) and translate that into an estimate of the cost of the impact that emissions have on our health, well-being, and quality of life in terms of dollars.

Table 1 Developed recreational schemes for contingent valuation study at WNP

Scheme 1	Scheme 2
• Opportunity for at least 10-20 elephant sightings in undisturbed environs • Interpretive talks on visitor safety measures • Safe viewing points established at lakes • Proper visitor centre operation- film show, interpretive talks • Restaurant facility for meals • Clean wash room facility • Vehicle park facility • Safe drinking water facility	In addition to the services provided under scenario 1, the following services/facilities would be provided • More opportunities for animal sightings (more than 30) in undisturbed surroundings • More viewing decks along the road network • Wildlife officers at each view point • Guide/interpretive service along the road system • Providing a free brochure/self-guided brochures • More wayside exhibits for interpretation • Elephant safari services • Establishment of bird/crocodile hides

These models are based on the best available science and economics from peer-reviewed publications, the three most cited models being William Nordhaus's Dice Model, Richard Tol's Fund Model, and Chris Hope's PAGE Model. In the present study, Sprangers's [22] equation was applied to estimate the Carbon Dioxide emission (CO_2).

$$\textit{Carbon Dioxide Emission} = \textit{Activity data } (\textit{kilo grams, kilo metres, litres}) \times \textit{Emission factor } (\textit{Carbon Doxide per unit}) \quad (7)$$

The emission factors were obtained from referring to the emission factors developed by the Department of Environment, Food and Rural Affairs [23].

The social cost of carbon pollution is estimated as follows:

$$\textit{Social Cost in USD} = \textit{Number of Carbon Dioxide Tons} \times \text{USD 40} \quad (8)$$

Per person social cost can be estimated as follows:

$$\textit{Per person social cost} = \textit{Total social cost} / \textit{Total number of visitors} \quad (9)$$

3.3 Data Collection

3.3.1 Survey on Identifying the Visitor Perceptions

We conducted a questionnaire survey in order to gather data on visitor perceptions regarding existing recreational activities and services. Visitor perceptions were elicited for the purpose of developing two recreational scenarios for a hypothetical travel cost study. The sample size in the first questionnaire survey was 120 and, in accordance with formulae developed by Khan [24], the data were obtained through a systematic sampling method where every 5th visitor to WNP was interviewed using a pretested questionnaire. If someone rejected to response, next visitor was selected to interview.

3.2.2 Survey on CVM

1) Developing Two Hypothetical Recreational Schemes

Based on resulted visitor perceptions, two recreational schemes were developed (see Table 1) that were then presented to the respondents. Of the two, scheme 2 was the one most preferred by visitors, because, from a visitor's perspective, it appeared to offer the most improvements. In scheme 1, we outline a situation where there are improvements in basic visitor facilities such as clean toilets and drinking water, visitor centres and museum, and cafeteria, souvenir shops, camp sites and nature guide service while also ensuring more wild animal sightings. In scheme 2, in addition to the visitor services and facilities mentioned in scheme 1, we proposed an interpretive service throughout the safari, more wayside exhibits and viewing decks along the road system, opportunities for bird/crocodile watching through the construction of hides, and elephant safaris for more wildlife viewing. These two scenarios were included in the same questionnaire.

2) Questionnaire Designing

We designed a questionnaire for the study which was pretested many times in order to collect accurate information on WTP. The survey questionnaire consisted of three parts. The first part captured visitor information including socio-economic characteristics, used vehicle type, number of heads in the vehicle and distance traveled to WNP. The second part collected information on visitor recreational behaviour, including knowledge of wildlife and recreational activity and their previous visits to WNP. The third part included questions relating to the CVM exercise and attempted to measure a user's mean WTP for access to the WNP under different entrance fees (bid values) and under two different recreational schemes in addition to the existing recreational facilities and services. The two different recreational schemes and the existing situation were included in the same questionnaire. The current park entrance fee is SLR 60.00. The, entrance fees of SLR 100.00, SLR 125.00, SLR 150.00, SLR 175.00 and SLR 200.00 were taken as the proposed bid values in the study. Each respondent received only one offer or opportunity to accept a bid. The bid offers were randomly made having been moulded on a pre-determined range of offers.

3) Sampling and Questionnaire Survey

A sample size of 500 was statistically chosen with every fifth safari vehicle coming out of the park having observed wildlife chosen for the sample. At the park entrance office, either the leader, or a member from each group who volunteered to provide information, was interviewed face to face. In addition, the respondent was asked about the intended number of visits to WNP under each recreational scheme on a given bid value. We preferred this technique because it was possible to get a precise sample while simultaneously being easy to implement. The average time taken for each interview was about 10-15 minutes. The survey resulted in a total of 479 completed questionnaires. Through the data analysis, the WTP values and marginal effects were estimated. Before the data analysis, the endogeneity bias was tested; it was found that there was no endogeneity bias among the explanatory variables.

4. Results and Discussion

4.1 WTP Estimation

The following results were obtained for the existing recreational services and proposed recreational schemes by running the 'probit regression' (Table 2). The effects of the socio-demographic variables were as expected in line with other CVM studies done by Peters and Hawkins [25], Mmopelwa, Kgathi and Molefhe [26], Togridou, Hovardas and Pantis [27] and Shultz, Pinazzo and Cifuentes [28]. In conformity with *a priori* theoretical expectations, the coefficient on the 'hhince' (household monthly income) variable was positive and significant, implying that 'hhince' is an important factor affecting the WTP for the proposed recreational schemes: that is, respondents with more 'hhince' were likely to pay more for the novel visitor experiences under the proposed recreational schemes than those with lower household incomes. A study by Loomis and Keske [29] has shown that a reduction in peak load price for hiking in the alpine peaks could occur, due not so much to income effects, than to availability of substitution sites. But, in the case of WNP, there were no substitution sites close enough to affect the WTP for better services at WNP. The variables 'gender' and 'age' were not significant in the probit regression model because interest in wildlife is little dependent on age while the safari groups, in the case of our sample, were led by either females or males with female respondents comprising 33% of the sample. The study shows the education levels of respondents to be positively, and in a statistically significant way, correlated with WTP with the probability of willing to pay an entrance fee for recreational schemes 1 and 2 at 0.235 and 0.199 respectively. Similarly, being a member of an environment-related organization increases the probability of a respondent's willingness to pay an entrance fee for the recreational schemes 1 and 2 by 0.924 and 0.729 respectively. There was a significant increase in the probability of willingness to pay an entrance fee on the part of visitors who worked in tourism-related fields with 1.220 and 1.542 for recreational schemes 1 and 2 respectively.

The regression result shows that all estimated coefficients have the expected sign. The WTP rises as households become richer. The WTP is high if the respondent works in an environment- or tourism-related organization. More educated respondents were similarly ready to pay higher fees for the proposed recreational schemes. Although the estimated mean WTP for the existing recreational scheme offered by the park management was SLR 43.36, the park management currently charges SLR 60.00 as the entrance fee. Therefore, it is clear that visitors to the WNP are not satisfied and hence, according to the findings relating to visitor satisfaction and perceptions, improvements in both visitor facilities and services as well as visitor safety are called for. As Table 3 shows, the estimated WTP values for the proposed recreational schemes are SLR 162.45 and SLR 184.30 respectively. Therefore, if more visitor services and facilities are provided, respondents would be willing to pay a higher park entrance fee. The park entrance fee at present is SLR 60.00. Hence, if the proposed recreational schemes were introduced, visitors would be willing to pay a

Table 2 Results of the probit model regression

Variables	Existing Recreational Schemes	Scheme 1	Scheme 2
bidvalue	-0.01893***	-0.01861****	-0.01885***
	(0.00264)	(0.001877)	(0.00202)
gender	0.03378	0.21393	0.10969
	(0.21304)	(0.15582)	(0.15792)
hhince	0.000068***	0.0000236***	0.000021***
	(8.15e-06)	(5.26e-06)	(5.34e-06)
education	0.14371***	0.23560***	0.19906***
	(0.04486)	(0.04466)	(0.04274)
age	0.00233	-0.0009732	-0.004435
	(0.008237)	(0.00595)	(0.00598)
distance	-0.63288**	-0.08929	-0.09993
	(0.27064)	(0.2374)	(0.23808)
environment	0.79258***	0.92369***	0.72959**
	(0.25114)	(0.29826)	(0.31872)
tourism	1.29228***	1.23030***	1.5424***
	(0.31485)	(0.36057)	(0.44824)
constant	-4.97100***	-1.38056**	-0.27120
	(0.83285)	(0.67953)	(0.67002)
Observations	479	479	479

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
(distance: 1 = less than 50 km away from WNP; hhince- household income)

Table 3 Estimated WTP for the existing recreational scheme and proposed recreational schemes

Existing Recreational Scheme	Recreational Scheme 1	Recreational Scheme 2
SLR 43.36	SLR 162.44	SLR 184.30
(10.2314)	(4.5774)	(5.5148)

(Standard error in parentheses)

higher park entrance fee which is higher than the existing fee as shown by Rathnayake ([9], [11], [12] and [13]), Abala [30], Peters and Hawkins [25], Mmopelwa *et al.* [26], Togridou *et al.* [27], and Shultz *et al.* [28].

4.2 Carbon Footprint of Arrived Vehicles to WNP.

Table 4 shows the DEFRA emission factors and units. The emission factors convert the existing data sources into CO_2 equivalent (CO_2e). The carbon footprint is measured in tons of CO_2 equivalent (t CO_2e). According to Table 6, in 2015, 3997 vehicles were recorded at WNP. It also records the round trip distance traveled and the travel distance to WNP for each vehicle. The Table also shows that jeeps and double cabs constituted the category of vehicles most recorded at WNP, with motor cars coming in at a distant third at only 327. Based on Equation 8, kg CO_2e was calculated for each vehicle type which gave a total of 322.814 t CO_2e. Since the number of visitors to WNP in 2015 was 19,858, the per person carbon footprint came to 16.256 kg CO_2e. Hence, the total social cost incurred in 2015 for visiting WNP was SLR 1.88 million (or USD 12912.56) while the mean social cost per person was SLR 94.93 (or USD 0.65).

4.3 Relationships between the WTP Value and Social Cost of Carbon Pollution

Table 5 shows the intended number of visits to WNP by visitors, the estimated number of visitors to WNP, and the estimated annual revenue under the existing recreational scheme as well as the proposed recreational schemes 1 and 2 under different bid values as entry fee including WTP values. As seen Table 5, a significant percentage of visitors were willing to pay high entrance fees for the

Table 4 Carbon footprint of arrived vehicles to WNP in 2015

Vehicle Type	No. of Vehicles	DEFRA Conversion Factor	kg CO_2 e
Jeeps/Cabs	2804	0.109	243427.81
Busses	866	0.109	60865.83
Cars	327	2.191	18520.10
Total	**3997**		**322813.74**

Table 5 Estimated number of visitors to WNP and revenue and social cost and actual profit under recreational schemes 1 and 2

Scheme 1						Scheme 2				
Bid value (SLR)	Intended No. of visits	Expected No. of visitors	Revenue (SLR million)	Social cost (SLR million)	Actual profit (SLR million)	Intended No. of visits	Expected No. of visitors	Revenue (SLR million)	Social cost (SLR million)	Actual profit (SLR million)
60	1.53	30365	1.82	2.88	-1.06	1.73	34365	2.06	3.26	-1.20
100	1.50	29876	2.99	2.84	0.15	1.69	33467	3.35	3.18	0.17
125	1.39	27543	3.44	2.61	0.83	1.62	32156	4.02	3.05	0.97
150	1.33	26354	3.95	2.50	1.45	1.58	31367	4.70	2.98	1.72
162.45	1.32	26276	4.27	2.49	1.77	1.53	30287	4.92	2.87	2.05
175	1.09	21546	3.77	2.04	1.73	1.48	29373	5.14	2.79	2.35
182.30	1.07	21176	1.14	2.01	-0.87	1.44	28654	5.22	2.72	2.50
200	1.05	20786	0.97	2.07	-1.10	1.22	23192	4.64	2.20	2.44

implementation of schemes 1 and 2. Therefore, although the expected number of visitors decreases with bid values, revenue generation increases gradually with an increase in the entrance fee up to the mean WTP after which the revenue decreases. Simultaneously with the above, the social cost of carbon pollution too gradually decreases with the increase in proposed entrance fees. As is evident from the Table 5, the actual profit, which is the difference between revenue and social cost, has increased up to the WTP value and decreased gradually thereafter.

The results show that if the recreational schemes 1 and 2 were to be implemented, there would be a 209.24% (or SLR 2.49 million) and 256.57% (or SLR 2.72 million) maximum achievable annual revenue increase, respectively, in the entry fee with regard to WNP the mean WTP values. The computation of revenue changes shows recreational scheme 2 to be highly marketable among the visitors, with visitors expressing themselves willing to enjoy and to pay for the 'tourism products and services' proposed under scheme 2. At the same time, the social cost has decreased gradually with the increase in park entrance fee under the two schemes. Under the present park entrance fee, the social cost is greater than the revenue to be earned, as previously mentioned, under both the recreational schemes. Hence, the actual profit from 'tourism product' marketing will be a loss unless the park management takes a policy decision to increase the park entrance fee from the current fee of SLR 60.00 to at least SLR 100.00.

As shown in Table 5, the expected number of visitors to WNP at the mean WTP values under the proposed recreational schemes 1 and 2 were 26276 and 28654 respectively. The maximum actual profit recorded at these mean WTP values for the purpose of obtaining the maximum tax or allocation at the mean WTP value was SLR 67.52 and SLR 82.66 respectively, for the two schemes. For example, if a visitor were to pay SLR 162.45 as park entrance fee, SLR 67.52 could be allocated for an environmental conservation programme. Devoting a portion of the actual profits generated from recreational schemes that are designed to enhance visitor satisfaction to environmental conservation programmes would be one way to offset the social cost of carbon pollution generated from the 'tourism product development' process at WNP.

5. Conclusions

Our study attempted to explore how tourism product development affects the social cost of carbon pollution. The results of our study show that the existing visitor satisfaction level is 45.2% and that the satisfaction level could be improved if tourism products are developed and implemented as recreational schemes. On the other hand, the existing social cost incurred due to observing wildlife at WNP was SLR 1.88 million (or USD 12912.56) and the mean social cost per person was SLR 94.93 (or USD 0.65) although only SLR 60.00 was recovered as the park entrance fee. Hence, if the existing park entrance fee is used for carbon minimizing environmental conservation programmes, the net loss per visitor would be SLR 34.93. Under CVM, the estimated mean WTP value for the existing recreational schemes is SLR 43.36 (USD 1 = SLR 144). However, if the proposed recreational schemes were to be developed and the park entrance fee were to be increased, the revenue will show a marked increase a portion of which can be utilized to offset the social cost of carbon pollution. Our results show that the maximum difference between the estimated revenue and social cost of carbon pollution can be attained at the mean WTP values. If the mean WTP values were to be considered as the park entrance fee, the per person contribution to fight the social cost of carbon pollution would be SLR 67.52 and SLR 82.66 respectively under the tourism products described in the recreational schemes 1 and 2. The estimated social cost under the scenarios 1 and 2 are SLR 2.49 million and SLR 2.01million per year, which are the estimated costs of an environmental programme. Therefore, park managers should allocate those amounts of money to social cost minimizing environmental conservation programmes. A net profit of under each scenario is SLR 64.93 and SLR 99.64 per person, moreover, can be earned by the park management under the two schemes, respectively.

The findings of the study therefore enable us to conclude that tourism product development will enable both revenue generation and implementation of carbon-minimizing environmental conservation programmes. Therefore, the park management of WNP or the Department of Wildlife Conservation would do well to adopt a policy decision to increase the park entrance fee by a reasonable amount and to allocate a portion of that fee for an environmental conservation programme in order to offset the inevitable social cost of carbon pollution attendant upon the introduction of 'tourism products' at WNP. Our study considered only carbon pollution due to visitor travel to WNP. It did not consider other CO_2 generating activities, particularly CO_2 generation attendant upon the development of tourism products and implementation of recreational schemes. If these values were also to be considered in the present study, the social cost of carbon pollution at WNP would undoubtedly be much more than the present value.

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