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Willingness to pay for mangrove restoration to reduce the climate change impacts on ecotourism in Rekawa coastal wetland, Sri Lanka

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ABSTRACT

This study investigates tourist preferences and willingness to pay (WTP) for restoration of mangroves to reduce the effects of climate change (CC) on ecotourism at Rekawa coastal wetland, Sri Lanka, using a double bounded discrete choice elicitation format in a contingent valuation method. The survey also included socio-economic, demographic, and attitudinal characteristics of respondents. The results reveal that domestic and foreign tourists on average were willing to pay 2.65 USD and 11.4 USD per person, respectively, for mangrove restoration in Rekawa wetland. Among socio-demographic variables, education, age, and occupation had a significant effect on WTP. Furthermore, we show that foreign respondents with greater trust in the role of mangroves in mitigating the impacts of CC on sea turtles, and domestic tourists who believed effects of mangrove restoration in reducing the future vulnerability of urban expansion, were willing to pay more for the proposed mangrove restoration fund. Based on tourists' preferences and WTP for mangrove protection, our results support the establishment of an environmental protection fund from the collection of tourists' entrance fees using a dual pricing strategy, and the use of the funds for planting mangroves, patrolling mangrove areas to prevent illegal activities, and promoting nature-based tourism activities.

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Contingent valuation method; double bounded discrete choice; mangrove restoration; climate change; sea turtles; dual pricing

1. Introduction

Mangrove forests are receiving growing attention in the climate change (CC) debate due to their capacity for 'blue carbon' sequestration (Friesen, Dunn, and Freeman 2017). [1] In tropical climates, mangrove ecosystems act as efficient carbon sinks in terms of their capacity for carbon sequestration in both above-ground biomass and below-ground biomass and in sediments (Donato et al. 2011; Huxham et al. 2015; Pham et al. 2018). Mangroves have an array of features that contribute to their resilience to significant environmental change such as storm damage and sea-level rise (SLR), and catastrophic events such as tsunamis, hurricanes, tidal bores and cyclones (Alongi 2008).

Despite knowledge about the importance of mangroves for adapting and mitigating CC impacts, large mangrove areas in Asia are still being cut down to provide space for agricultural and

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aquaculture activities, as well as urban spread. This development is causing substantial policy challenges in relation to mangrove conservation and management (Richards and Friess 2016). As a result, issues arising due to CC impacts may be exacerbated in the future (Ward et al. 2016). More than 50 per cent of Sri Lankan mangrove forests have been destroyed in the past 30 years due to prawn farming, hotel development, settlements, logging, tourism, agriculture and pollution (Mombauer 2019). Although it is now illegal to cut down mangroves, immense damage has already been done to mangrove forests. Therefore, restoring and replanting mangroves is of great importance for the future, and studies are needed for estimating willingness to pay (WTP) for such activities.

The existing literature has given considerable attention to mangrove restoration but only a few studies have focused on estimating WTP for the restoration of mangroves in the context of CC (Pham et al. 2018; Tuan et al. 2014). Those studies have used the Contingent Valuation Method (CVM) with a single-bounded discrete choice (SBDC) approach to estimate mean WTP for mangrove restoration. Answer to a SBDC question format only reveal whether the WTP value of the respondent is lower ('no' response) or higher ('yes' response) than the amount the respondent was asked to pay. In a double bounded discrete choice (DBDC) format, a respondent receives two bids. If (s)he accepts the first bid (s)he receives a higher bid in the second round. If (s)he instead rejects the first bid (s)he is offered a lower bid. Only one study (Trung, Nguyen, and Simioni 2020) is found applying the DBDC format, investigating how socio-economic, demographic and attitudinal characteristics of respondents influence their WTP for mangrove restoration in Vietnam.

The studies mentioned above have estimated WTP for mangrove restoration within households that interact with mangrove forests for their livelihood and that will have to deal with CC impacts (Pham et al. 2018; Tuan et al. 2014). There are a few economic studies of tourists' WTP for restoration of mangroves due to the benefits from the ecosystem services provided by the mangroves (Ramli 2017; Spalding and Parrett 2019). However, to the best of our knowledge, none of these studies have linked the WTP for restoration of mangroves to reduction of the negative impact of CC on ecotourism and used *in situ* eco-tourists to assess the matter using the DBDC approach.

Only a few studies have examined the effect of respondents' perceptions towards mangroves as significant predictors of their WTP for mangrove conservation (Pham et al. 2018; Trung, Nguyen, and Simioni 2020). This study will contribute to the literature on economic valuation of mangrove restoration by introducing tourists' perceptions about roles of mangroves in reducing CC impacts on ecotourism, and thereby provide a more comprehensive understanding of WTP for mangrove restoration.

As ecotourism consists of nature-based recreation, it will be influenced by CC through the alteration of the composition and quality of the ecosystems, and thereby their services, on which ecotourism depends (Salpage, Aanesen, and Amarasinghe 2020). Restoration of mangrove forests plays an important role in reducing the vulnerability of ecotourism to CC impacts, especially in coastal wetlands. Examples of effects of mangrove restoration include mitigating the impact of CC on sea turtles' terrestrial reproductive phase by providing shade to beaches and preventing coastal erosion (Fuentes, Fish, and Maynard 2012) and helping to protect against SLR by accumulating sediments and stabilizing weak shorelines (Huxham et al. 2015; Tuan et al. 2014; Gunawardena and Rowan 2005). Furthermore, restored and protected mangrove ecosystems prevent increased future vulnerability of mangroves due to urban expansion into low-lying coastal areas, protect buildings and infrastructure from damage caused by storms, and provide habitats for a variety of terrestrial, estuary and marine species, while creating new livelihood options in mangrove areas such as nature-based ecotourism (Tuan et al. 2014).

Traditionally, mangrove forests are not thought of as attractive sites for tourism and recreation. However, harbouring a vast range of wildlife, many such sites have been transformed into tourism destinations with the realisation of fascinating and educational experiences (UNEP-WCMC 2006). Therefore, mangrove ecosystems promote ecotourism in two ways. First, being an attractive tourism site and second, reducing the vulnerability to CC impacts on ecotourism. Hence, the objectives of this study are to estimate tourists' WTP for restoration of mangroves to reduce the impact of CC

on ecotourism using a DBDC elicitation format and include effects of socio-economic, demographic, and attitudinal characteristics of respondents on the WTP.

The paper is structured as follows. Section 2 presents the material and methods. Section 3 shows results, and finally, Section 4 presents the discussion and conclusions.

2. Material and methods

2.1. Survey area

The Rekawa coastal wetland is located in Hambantota district on the Southern coast of Sri Lanka (Figure 1). This ecosystem is rich in diverse coastal, terrestrial and wetland habitats, which include Rekawa lagoon surrounded by mangrove forests, beaches, coral reefs, and sea grass beds (Ganewatta et al. 1995). Irrigated freshwater is brought into the lagoon by a canal system, and it is connected to the sea via two outlets, one natural and the other human-made.

The Rekawa lagoon can be considered the most important Southern coast lagoon with respect to species diversity of the mangroves and importance of fisheries (Hettiarachchi and Jayatissa 2004). The brackish water environment offers an ideal habitat for mangroves (Perera et al. 2005). The extent of mangrove and mixed mangrove vegetation found in the Rekawa area is over 200 ha (Ekaratne et al. 2000). Approximately 11 out of 21 true mangrove species and over 20 species of mangrove associates are recorded in Rekawa wetland (Jayatissa, Dahdouh-guebas, and Koedam 2002a). The Rekawa mangroves provide a home for more than 100 bird species including 15 migratory birds that roost and nest there on seasonal movements from colder climates (IUCN and CEA 2006). In addition to local and migratory birds, the lagoon hosts a wealth of wildlife including fish, shellfish, reptiles, mammals and invertebrates (Ganewatta et al. 1995). The Rekawa coast has been declared a sea turtle sanctuary since 2006 as five species of globally threatened sea turtles; Green turtle, Loggerhead turtle, Leatherback turtle, Hawksbill turtle, and Olive Ridley, visit the Rekawa beach for nesting.

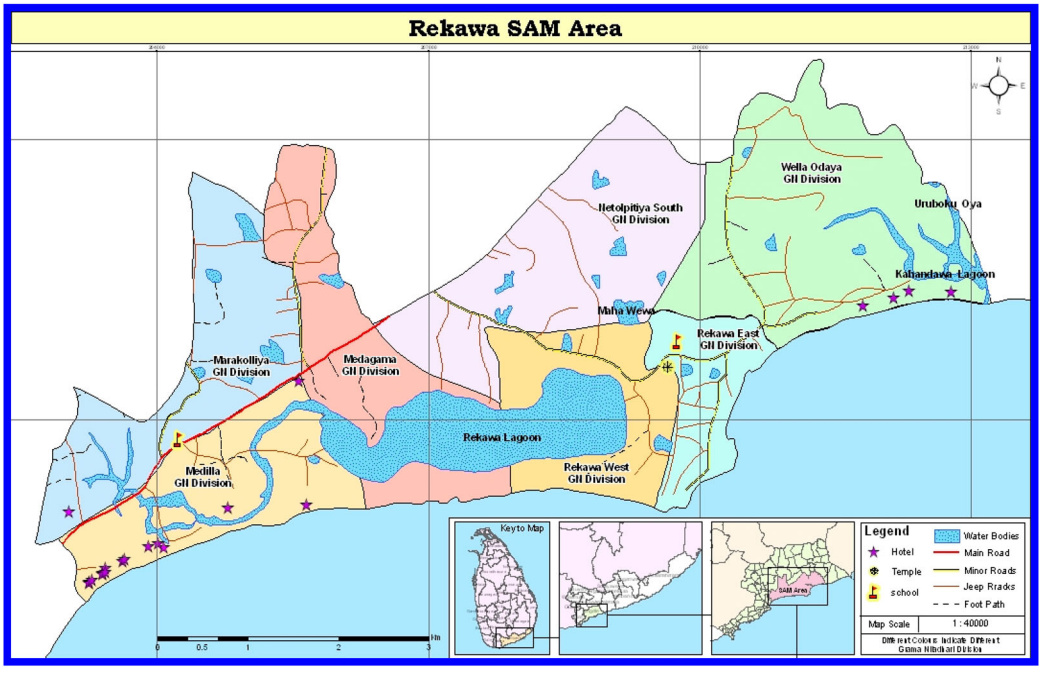

Figure 1. Location of the study area in Sri Lanka. Source: Rekawa Special Area Management Coordinating Committee, Sri Lanka (1996).

There is a substantial potential for ecotourism development in Rekawa coastal wetland as it has favourable conditions for outdoor recreation such as turtle watching, beach recreation and enjoying biodiversity in mangrove forests (Salpage, Aanesen, and Amarasinghe 2020). However, the coast is vulnerable to rising sea level and the narrow barriers protecting the lagoon could be eroded away in the future (Weerakkody 1997).

2.2. Survey design and data collection

The survey questionnaire comprised three parts. The first part described the objective of the study, background information, and status of ecotourism at Rekawa coastal wetland. To underline short- and long-term climate effects, we developed two CC scenarios[2] for Rekawa coastal wetland, one for 2025 and one for 2050 using three climatic variables; temperature, rainfall and SLR, with three climate-induced biophysical variables; the number of turtle nesting sites, mangrove cover and beach inundation area. The two CC scenarios for 2025 and 2050 predict a higher maximum temperature for Rekawa, increasing from 27°C today to 29°C and 29.5°C, and a reduction of rainfall from 2000 mm today to 1264 and 1330 mm, respectively (Salpage, Aanesen, and Amarasinghe 2020). Prediction of SLR values for Sri Lanka for 2025 and 2050 are 50 and 65 cm, respectively, relative to the sea level of year 2000 (UNDP 2012). We predicted numbers of nesting sites to be reduced from 350 today to 250 and 200 in 2025 and 2050, respectively (Salpage, Aanesen, and Amarasinghe 2020). It is estimated that today's mangrove cover declines in Rekawa at 3 and 12 per cent in the future scenarios for 2025 and 2050, respectively (Salpage, Aanesen, and Amarasinghe 2020).

The second part of the questionnaire starts with a matrix presenting a few management options to mitigate impacts on vulnerable coastal ecosystems in Rekawa and asking respondents to indicate how important they find the different options with regard to reducing the vulnerability of the study area. A five-point Likert scale (very important to not important at all) with a 'no opinion' alternative is used to measure the viewpoints of the respondents. Based on the existing literature (Tuan et al. 2014), the following ecological effects of mangroves were focused on: (i) 'Helping to protect against sea-level rise by accumulating sediments and stabilizing weak shorelines', (ii) 'Mitigating the impact of climate change on sea turtles' terrestrial reproductive phase by providing shade to beaches and preventing coastal erosion', (iii) 'Preventing increased future vulnerability due to urban expansion into low-lying coastal mangrove areas, by ensuring that mangrove ecosystems are restored and protected', and (iv) 'Providing habitats for a variety of terrestrial, estuary and marine species while creating new livelihood options in mangrove areas such as nature-based ecotourism'.

Then, we presented a payment vehicle in the form of a payment to an 'Environmental Protection Fund' aiming at implementing a project for mangrove restoration with the objective of reducing the effect of CC on ecotourism. The project included planting mangroves and coastal plants to reduce the impact of CC, patrolling mangrove areas to prevent illegal activities, and promoting nature-based ecotourism activities (e.g. bird watching and boat trips). Planting and restoration of mangroves could be expected to help reduce the CC vulnerability of coastal ecosystems in Rekawa by enhancing the ecological effects of mangroves described earlier. Patrolling mangrove areas is important for protection, to prevent illegal activities such as harvesting for timber, clearance of mangroves for tourism and urban development. Rekawa lagoon and mangrove ecosystems provide a home for a variety of terrestrial, estuary, and marine species including many fish, shellfish, reptiles, mammals, invertebrates, and local and migratory birds (Ganewatta et al. 1995). Thus, mangroves can support ecotourism by creating an attractive site for tourists and reducing the vulnerability of CC impacts on ecotourism. This currently untapped ecotourism potential in Rekawa coastal wetland could be utilised effectively by promoting nature-based ecotourism activities.

We used a DBDC elicitation question to query tourists' WTP towards the Environmental Protection Fund, to protect and restore the mangroves in Rekawa coastal wetland. Table 1 shows the bid options proposed to the respondents. We conducted a preliminary investigation with a few domestic and foreign tourists found in Rekawa and collected their WTP values for the proposed

Table 1. Bid options (in LKR[a]) proposed to respondents. A–J are bundles of initial, lower and upper bids.

Options	Initial bid (Bid)	Lower bid (BidL)	Upper bid (BidU)
For domestic tourists			
A	100	50	150
B	200	100	300
C	300	150	450
D	400	200	600
E	500	250	750
For foreign tourists			
F	500	250	750
G	750	375	1125
H	1000	500	1500
I	1250	625	1875
J	1500	750	2250

[a]1 USD = 150 LKR on average from December 2016 to February 2017

mangrove restoration project. We found that WTP for domestic tourists ranged from 100 LKR to 500 LKR and it varied from 500 LKR to 1500 LKR for foreign tourists. Based on that information we fixed the initial bid levels for domestic and foreign tourists. If the initial bid was accepted, then a higher bid was proposed. If a respondent rejected the first bid (s)he would get a lower bid. Hence, there are four response categories; (Yes, Yes), (Yes, No), (No, Yes) and (No, No).

After the second bid question, we asked for reasons for accepting or rejecting the first bid. The following reasons were included; 'I think the management plan is a good one', 'I feel this is a reasonable amount to pay', 'I am concerned about the loss of mangroves/biodiversity' and 'It is what I can afford to pay'. Reasons for declining to contribute to the 'Environmental Protection Fund' included 'I do not believe the system would bring the changes you describe', 'It is the government's responsibility', 'I believe that this improvement will take place without my contribution', 'I have no spare income but would otherwise contribute', and 'I need more information before I decide to pay'.

Finally, we collected respondents' socio-demographic factors which included respondents' age, gender, level of education, income and being a member of an environmental non-governmental organisation. In addition, we collected data on respondents' concerns regarding the climate when selecting a tourist destination, and attitudes regarding CC in Rekawa. The perception of CC and its consequences for Rekawa is divided into four categories: 'I do not have any idea about climate change in Rekawa', 'Climate change is happening and its consequences are visible', 'Climate change is happening but its consequences are not yet visible' and 'Climate change is not happening'.

We pre-tested the questionnaire on-site at Rekawa and revised it based on feedback received from tourists, tour guides and Rekawa community inhabitants, including staff members of a turtle conservation project. We used two versions of the survey; English and Sinhala (a local language) for foreign and domestic tourists, respectively. A team of five trained Sri Lankan graduate students were employed to conduct face-to-face interviews from December 2016 to February 2017. This data collection period coincided with one of the peak seasons for tourists to this site. For the interviews, we randomly selected every second tourist or tourist group at predefined sampling sites, such as a turtle watching site and a lagoon site. We interviewed all adult members in each randomly selected group as the groups consisted of only 4–5 members. Each respondent received the survey after giving their consent to take part. Then data collectors explained future climate scenarios for Rekawa coastal wetland, to facilitate the respondents' understanding of the two scenarios. A total of 365 complete questionnaires were collected, consisting of 213 foreign and 152 domestic tourists.

2.3. Econometric model

In the CVM literature, it has been shown that the DBDC elicitation technique increases the efficiency of the parameter estimates relative to the SBDC technique (Hanemann, Loomis, and

Kanninen 1991; Haab and McConnell 2002; Nayga, Woodward, and Aiew 2006). It enables clear boundaries on the WTP for the response pairs 'Yes, No' and 'No, Yes'. For the response pairs 'No, No' and 'Yes, Yes' the second question contributes to further restrict the distribution of the WTP compared to the SBDC. Asking twice yields twice the number of observations for the analysis compared to the SBDC technique, and more (relevant) data is always preferable for estimation purposes.

Formally, when WTP is the actual, but unobservable, WTP of a respondent and Bid, BidL, and BidU are the first bid, the lower bid if the respondent answers 'no' to the first bid, and the higher bid if the respondent answers 'yes' to the first bid, respectively, then we have the following interpretation of the four possible responses:

$$\begin{aligned}
&(\text{Yes, Yes}) \rightarrow \text{WTP} \geq \text{BidU} \\
&(\text{Yes, No}) \rightarrow \text{Bid} \leq \text{WTP} < \text{BidU} \\
&(\text{No, Yes}) \rightarrow \text{BidL} \leq \text{WTP} < \text{Bid} \\
&(\text{No, No}) \rightarrow \text{WTP} < \text{BidL}
\end{aligned} \tag{1}$$

With these known bid values and answers from respondents, probabilities for each response can be presented as follows:

$$\begin{aligned}
P^{YY} &= \text{Prob}[(\text{Yes, Yes})] = \text{Prob}[\text{WTP} \geq \text{BidU}] = 1 - G(\text{BidU}) \\
P^{YN} &= \text{Prob}[(\text{Yes, No})] = \text{Prob}[\text{Bid} \leq \text{WTP}, \text{BidU}] = G(\text{BidU}) - G(\text{Bid}) \\
P^{NY} &= \text{Prob}[(\text{No, Yes})] = \text{Prob}[\text{BidL} \leq \text{WTP}, \text{Bid}] = G(\text{Bid}) - G(\text{BidL}) \\
P^{NN} &= \text{Prob}[(\text{No, No})] = \text{Prob}[\text{WTP} \leq \text{BidL}] = G(\text{BidL})
\end{aligned} \tag{2}$$

where $G(\cdot)$ is the cumulative distribution function of a known statistical distribution such as logistic and normal (Trung, Nguyen, and Simioni 2020).

When the distribution function is logistic, the log-likelihood function can be represented by

$$\ln L = \sum_{j=1}^{J} \left[\begin{array}{c} d_j^{yy} \ln(\exp(a - bt_j^U)) + d_j^{nn} \ln(1 - \exp(a - bt_j)) + d_j^{yn} \ln(\exp(a - bt_j) \\ - \exp(a - bt_j^U)) + d_j^{ny} \ln(\exp(a - bt_j^L) - \exp(a - bt_j)) \end{array} \right] \tag{3}$$

where d_j^{yy} is an index taking the value 1 if respondent j has answered *yes* to both bids, d_j^{nn} is an index taking the value 1 if respondent j has answered *no* to both bids, d_j^{yn} is an index taking the value 1 if respondent j has answered *yes* to the first bid and *no* to the second bid, d_j^{ny} is an index taking the value 1 if respondent j has answered *no* to the first bid and *yes* to the second bid, a is a constant, b is the parameter of the bid and t_j is the bid respondent j receives. U and L denote upper and lower (Aizaki, Nakatani, and Sato 2014).

Individual characteristics are included in the constant a as follows:

$$a = \gamma + \sum_{k=1}^{K} \gamma_k X_k \tag{4}$$

The γ is a constant term and γ_k is the parameter of individual characteristic k (Aizaki, Nakatani, and Sato 2014). X_k is a vector of socio-economic characteristics of the respondent.

Model parameters are estimated by applying the maximum likelihood techniques on Equation (3) using DCchoice package in R (Nakatani, Aizaki, and Sato 2020).[3]

3. Results

3.1. Socio-demographic characteristics of the respondents

A summary of socio-demographic and attitudinal characteristics of the respondents is shown in Table 2. Male tourists dominated among domestic tourists while for foreign tourists the proportion of males and females was about the same. The average age of domestic tourists and foreign tourists was 32 and 35 years, respectively. We collected data covering several categories of occupations, such as civil servant, private sector employee, self-employed or own business, student, housewife/homemaker (unpaid) and retired. However, in the data analysis, we divided them into two groups; those who belonged to the labour force and those who did not. The latter group includes pensioners, homeworking persons not receiving any salary and students. A majority of the tourists we interviewed belonged to the labour force. Secondary education was the most frequent level of education among domestic tourists, while over 80 per cent of foreign tourists had higher education with bachelor or postgraduate degrees.

About 76 and 95 per cent of the domestic and foreign tourists, respectively, were concerned about the climate when selecting a tourist destination. Data on perception of CC and its consequences for Rekawa revealed that nobody believes that CC is not happening. We observed a difference between domestic and foreign tourists where the latter more frequently 'do not know' whether CC takes place and/or is visible in Rekawa. Approximately 56 and 48 per cent of domestic and foreign tourists, respectively, believed that consequences of CC are visible.

3.2. Stated perception of effects of mangrove restoration

Results revealed that a majority of the respondents either strongly agreed or agreed with the proposed effects of mangroves as a measure to reduce the climate vulnerability of the coastal ecosystems in Rekawa (see Table 3).

In Table 3, we observe that the majority of tourists, both foreign and domestic, agree with the four statements. An interesting result is that almost 20 per cent of domestic tourists disagree

Table 2. Socio-demographic characteristics of respondents and their perceptions towards CC.

Characteristics	Domestic tourists	Foreign tourists
Total number of tourists	152	213
Gender		
Male	130 (85%)	108 (51%)
Female	22 (15%)	105 (49%)
Average age	32	35.5
Occupation		
Contribute to labour force	102 (67%)	189 (89%)
Unpaid work	50 (33%)	24 (11%)
Level of education		
Primary education	8 (5%)	0
Secondary education	92 (60.5%)	12 (5.5%)
Technical diploma	13 (8.5%)	28 (13%)
Bachelor's degree	33 (%)	117 (55%)
Postgraduate degree	6 (%)	56 (26.5%)
Being a member of environmental society		
Yes	21(13.8%)	53 (24.9%)
No	131 (86.2%)	160 (75.1%)
Concern about climate when selecting a tourist destination		
Yes	90 (76%)	178 (94.7%)
No	30 (24%)	10 (5.3%)
Perception on CC and its consequences for Rekawa		
I have no idea	14 (9%)	64 (30%)
Consequences are not yet visible	53 (35%)	47 (22%)
Consequences are visible	85 (56%)	102 (48%)

Table 3. Stated perception of the effects of mangrove restoration by foreign (F) and domestic (D) tourists (in %).

Statement		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Do not know
Helping to protect against SLR by accumulating sediments and stabilising weak shorelines	F	65.7	28.6	2.35	1.4	0.5	1.4
	D	24.3	47.4	9.9	15.8	2.6	0
Mitigating the impact of CC on sea turtles' terrestrial reproductive phase by providing shade to beaches and preventing coastal erosion	F	65.3	31.4	1.4	0.5	0	1.4
	D	42.1	46	4.6	3.3	0	3.9
Preventing increased future vulnerability due to urban expansion into low-lying coastal mangrove areas, by ensuring that mangrove ecosystems are restored and protected	F	69.5	27.2	1.4	0.5	0	1.4
	D	59.9	29.6	3.3	7.2	0	0
Providing habitats for a variety of terrestrial, estuaries and marine species while creating new livelihood options in mangrove areas such as nature-based ecotourism	F	68.5	28.6	2.8	0.5	0.5	0
	D	38.2	50.7	3.9	7.2	0	0

with the statement that restoration of mangrove forests helps to protect against SLR by accumulating sediments and stabilizing weak shorelines. Relatively few respondents state that they do not know their perceptions regarding these statements.

3.3. Bid responses

Reasons for being willing to pay or not are shown in Table 4. The most important reason for WTP for mangrove restoration was concern about the loss of mangroves and associated biodiversity, formulated as 'I am concerned about the loss of mangroves/biodiversity', in the survey. About 18 per cent of the respondents felt that the proposed entrance fee which ultimately contributed to the Environment Protection Fund was reasonable and 14.8 per cent believed that the proposed management plan was a good one to implement to protect mangrove forests in Rekawa.

On the other hand, 6.6 per cent believed that mangrove restoration is the responsibility of the government while 3.3 per cent did not believe the proposed restoration project would bring the changes we describe in the questionnaire. About 8 per cent of the respondents were not willing to pay for the mangrove restoration project for one of the following two reasons; insufficient information and lack of money to spend on such a project. The latter group would contribute to the project had they sufficient money.

The distribution of the respondents' answers for each option in (Yes, Yes), (Yes, No), (No, Yes) and (No, No), is displayed in Table 5. While a majority of the foreign tourists accepted both bids presented to them, very few foreign tourists refused both bids. This was different for domestic respondents, where a little more than 1/3 accepted both bids and 17 per cent refused both bids.

Table 4. Reasons for being willing to pay and for not being willing to for the first bid option.

Reasons	No: of responses (365)
Respondents' reasons for being willing to pay (244)	
I think the management plan is a good one	14.8% (54)
I feel this is a reasonable amount to pay	18.6% (68)
I am concerned about the loss of mangroves/biodiversity	31.8% (116)
It is what I can afford to pay	1.1% (4)
Other	0.5% (2)
Respondents' reasons for NOT being willing to pay (121)	
I don't believe the system would bring the changes you describe	3.3% (12)
It is the government's responsibility	6.6% (24)
I believe that this improvement will take place without my contribution	4.9% (18)
I have no spare income but would otherwise contribute	8.2% (30)
I need more information before I decide to pay	8.8% (32)
Other	1.4% (5)

Table 5. Distribution of respondents by bid options.

Options	Domestic tourists	Foreign tourists
Yes, Yes	37% (57)	54.4% (116)
Yes, No	31% (47)	40% (85)
No, Yes	15% (23)	2.3% (5)
No, No	17% (26)	3.3% (7)

3.4. Parametric estimation of WTP for mangrove restoration at Rekawa

We assumed that WTP is a function of gender, age, education, occupation and perceptions.[4] The statistical model assumes a linear combination of the perceptions, socio-demographics and the bid as explanatory variables for the likelihood of a bid being accepted. First, we tested whether it is statistically meaningful to introduce the respondents' socio-economic and demographic characteristics and perceptions in addition to the initial bid. We ran a likelihood ratio test comparing the estimated model with a model only including the bid variables. Results of the likelihood ratio test rejected the null hypothesis that all the latter parameters are equal to zero. This is true for both models involving foreign and domestic tourists. We tested for correlations of the variables in the model and found no statistically significant correlated variables. Although the marginal monetary effect of the variables on WTP cannot be directly measured from the estimated coefficient of an explanatory variable, the sign of the estimated coefficient indicates the direction of the effect. Table 6 shows the signs and significance of the parameters for domestic and foreign tourists.

The bid variable was statistically significant at 1 per cent with a negative coefficient in both models. It implies that a higher bid value reduces the probability of respondents accepting the bid. Education had a strong positive impact on the probability of accepting the bid in both models.

Table 6. Estimated parameters for the determinants of the WTP for mangrove restoration in Rekawa wetland.

Variables	Domestic tourists	Foreign tourists
Constant	2.288 **	4.774 **
	(1.0728)	(1.9693)
Bid	−0.005****	−0.003 ****
	(0.0005)	(0.0002)
Gender (male = 0, female = 1)	−0.399	0.163
	(0.5109)	(0.3281)
Age	−0.035 **	0.006
	(0.0178)	(0.0143)
Education	0.796 **	0.644 *
	(0.4003)	(0.3731)
Occupation (outside labour force = 0, in labour force = 1)	0.169	0.941 **
	(0.4036)	(0.4052)
Concern about climate when selecting a tourist destination	0.079	−0.984
	(0.3482)	(0.6617)
Mangroves help to protect against SLR by accumulating sediments and stabilizing weak shorelines	−0.076	−0.915
	(0.3737)	(0.7462)
Mangroves help to mitigate the CC impacts on sea turtles' terrestrial reproductive phase	−0.351	2.188 ***
	(0.5233)	(0.8381)
Mangroves reduce increased future vulnerability due to urban expansion into low-lying coastal mangrove areas, by ensuring that mangrove ecosystems are restored and protected	0.927 *	−1.3494
	(0.5008)	(1.2997)
Mangroves provide habitats for a variety of terrestrial, estuaries and marine species creating nature-based ecotourism livelihoods	0.404	−0.703
	(0.4826)	(0.9357)
Number of observations	152	213
Log-likelihood	−230.73	−214.20
p-value	0.04	0.01
AIC	483.45	450.40
BIC	516.71	487.37

Note: Standard errors are in parenthesis.
Significant at $p < 0.1$ (*), 0.05 (**), 0.01 (***), and 0.001 (****).

For the domestic tourists, the probability of accepting the bid declined for the elderly. Occupation showed a strong and positive effect on the probability of accepting the bid for foreign tourists. This indicates that foreign respondents who have paid work are more willing to accept the bid, compared to foreign respondents who do not have paid work. In this study, gender did not show any significant impact on the probability of accepting a bid irrespective of the type of tourist (domestic or foreign). Concern about the climatic condition of the touristic sites did not reveal any significant impact on the probability of tourists accepting a bid. However, a belief that mangroves support mitigation of CC impacts on sea turtles' terrestrial reproductive phase, did significantly affect the probability of foreign tourists accepting the bid. Also, findings revealed that domestic tourists with higher trust in the role of mangroves in preventing future vulnerability of urban expansion into low-lying coastal mangrove areas were more willing to accept the bid. The results revealed that domestic and foreign tourists are willing to pay 398 LKR (349 LKR- 461 LKR) and 1710 LKR (1599 LKR-1833 LKR), respectively, for mangrove restoration in Rekawa wetland.

4. Discussion and conclusion

The presented study investigated domestic and foreign tourists' preferences and WTP for mangrove restoration to ensure adaptation to the impacts of CC on ecotourism at Rekawa coastal wetland, using the CVM. We developed two CC scenarios for Rekawa coastal wetland for the short-term (2025) and the long-term (2050). All climatic and climate-induced biophysical variables are changed in a detrimental way in both CC scenarios. We suggested protection and restoration of Rekawa mangroves as an adaptation measure to reduce the CC impacts and asked the tourists about their WTP for the proposed conservation activity. Further, we examined the effect of respondents' socio-demographic characteristics and climate concern, and their WTP for mangrove restoration as an ecotourism adaptation to CC.

Similar to previous studies related to mangrove restoration (Pham et al. 2018; Trung, Nguyen, and Simioni 2020; Tuan et al. 2014), we found that the probability of accepting a bid declined with increasing bid amount. The results showed that education has a significant influence on the probability of respondents accepting the bid, as highly educated people had a higher probability of accepting the bid. A possible explanation is that tourists with a higher level of education have more knowledge about the role of mangroves in coastal protection and mitigation of CC impacts. This finding is in line with most empirical results in recent studies conducted on households in relation to WTP for mangrove restoration (Pham et al. 2018; Susilo, Takahashi, and Yabe 2017). The results of our study demonstrate that education plays a key role in contributing to tourists' preferences for mangrove restoration programmes, irrespective of tourist type. This suggests the importance of increased knowledge of mangrove forests' climate mitigating and adapting effects for buy-in to mangrove forest management efforts, for instance in the school curriculum and general public information.

Our results revealed that occupation of the foreign respondents appears to have a positive and significant impact on the probability of accepting the bid. Foreign respondents belonging to the labour force were likely to pay more compared to those outside the labour force, although the latter is a very small group (24 respondents). This can be explained as a fact of earning capacity which empowers the respondent to contribute towards mangrove conservation programs. Pham et al. (2018) also indicated that occupation was found to be a significant determinant of respondents' WTP for mangrove restoration.

Gunawardena and Rowan (2005) estimated the option and non-use (existence and bequest) values of the Rekawa mangrove ecosystems among households in Rekawa community using the CVM with an open-ended approach. The estimated existence, bequest, and option value of Rekawa mangroves in their study was 2.6 USD/ha/year. Probably this is an underestimate of the total existence value, due to the fact that their study did not include the broader aspects of conservation such as habitat protection for sea turtles and migratory birds and biodiversity conservation as important

non-use values, considering these non-use values were far beyond community boundaries (Gunawardena and Rowan 2005). In our study, we found that foreign tourists who believed that mangroves play a role in mitigating the CC impacts on sea turtles' terrestrial reproductive phase were willing to pay more for mangrove restoration in Rekawa. This may be due to the fact that foreign tourists found the potential of enjoying the *in situ* conservation of sea turtles as this destination is famous among the tourists for turtle watching though this wetland has several other potentials for ecotourism (IUCN and CEA 2006; Salpage, Aanesen, and Amarasinghe 2020).

Although it is illegal to destroy mangroves, these important ecological ecosystems are still being impacted as a result of anthropogenic activities such as urbanisation, illegal construction, shrimp farming, agriculture, and tourism in coastal areas of Sri Lanka where nearly one-fourth of the population is concentrated (Masakorala 2020). Knowledge of such anthropogenic activities might influence domestic tourists to accept the offered bid, due to their belief in preventing increased future vulnerability of urban expansion into low-lying coastal mangrove areas, by ensuring that mangrove ecosystems are restored and protected.

Perera et al. (2005) emphasised the importance of the presence of wide mangrove areas in Rekawa, as no structural damage was observed in the mangroves there after the tsunami in 2004, thereby securing that turtle nesting was not severely affected. They further stated that strict measures should be taken to protect the intact mangrove stands and restore mangrove patches in certain extended areas of Rekawa proposed coastal sanctuary that were severely affected by the Tsunami. Our findings support their suggestions and indicate tourism's WTP for protection and restoration of Rekawa mangroves to reduce the effect of CC on this coastal wetland. Our study further confirmed that over 96 per cent of the foreign tourists have placed option and existence value on the role of mangroves in providing habitats to complete the life cycle of turtles in the coastal terrestrials.

According to our findings, there is a substantial difference in WTP for mangrove restoration in Rekawa between domestic and foreign tourists. On average, the foreign tourists were willing to pay an entrance fee of more than four times that of the domestic tourists. This is however based on nominal terms, and given the purchasing power corrected values of the two tourist groups' WTP, i.e. expecting a higher purchasing power of 1 USD of Sri Lankans versus most foreign tourists, in real terms the difference in WTP is presumably somewhat smaller. Estimating exact purchasing power parity is however hampered by our sample which includes foreign tourists from 22 countries. Nonetheless, the difference does open the avenue for dual pricing in Rekawa.

Dual pricing is a kind of price discrimination by charging higher prices to foreign tourists than domestic ones (Apollo 2014; Dallen and Boyd 2003). This is a very common practice in Asia, parts of Africa, and Latin America (Dallen and Boyd 2003). The existing literature on dual pricing showcases both pros and cons of this price discrimination strategy. Some scholars have emphasized the importance of implementing dual pricing in tourism. According to Laarman and Gregersen (1996), the domestic population have already paid for creation and management of tourist facilities in their host countries through taxes. Hence, an alternative could be to have a zero price for locals and only charge foreign tourists for access to recreational areas. This kind of differentiation is not uncommon. Samdin (2007) argued that it is appropriate to impose a high entrance fee for foreign tourists as most of them have a higher level of income compared to domestic people and tend to have a higher WTP. If a higher WTP among foreign tourists can be demonstrated, charging a higher entrance fee to recreational areas from foreign tourists can be regarded as a third degree price discrimination aiming at seizing a share of the foreign tourists' consumer surplus.

However, there are some counter arguments that dual pricing in tourism is harmful, as the reputation of a destination can be tarnished by pervasive overcharging of foreign tourists (Chiaravutthi 2019). Currently, no entrance fee is required from anyone to enter Rekawa coastal wetland, but the Turtle Conservation Project office at Rekawa charges 1000 LKR per foreign tourist while no charge is taken from domestic tourists for turtle watching. Based on our study, an admittance price ratio of

1:4 between domestic and foreign tourists can be recommended to Rekawa tourism managers. How this will be perceived by the foreign tourists remains to be assessed.

According to the findings of Salpage, Aanesen, and Amarasinghe (2020), Rekawa coastal wetland is at risk, if adaptation measures are not taken. Their study has highlighted the importance of mangrove protection as an adaptation strategy to minimise the CC impacts at Rekawa. The current study confirms that both domestic and foreign tourists have a preference and are willing to pay for restoration of mangroves at Rekawa coastal wetland. In conclusion, our results support tourist entrance fees for the use of planting mangroves and coastal plants to reduce impacts of CC, patrolling mangrove areas to prevent illegal activities, and promoting nature-based tourism activities such as bird watching in mangroves and boat trips around the Rekawa lagoon surrounded by mangroves.

Notes

1. The carbon captured by oceans and coastal ecosystems is called blue carbon.
2. Complete method of development of CC scenarios can be found in Salpage, Aanesen, and Amarasinghe (2020).
3. 'An alternative formulation of the model for WTP is to think of WTP as a latent variable where the SBDC/DBDC elicits bounds on censored variable (left-/right-/interval-censored). The resulting econometric model is an interval regression model (Wooldridge 2010)'. We are thankful to an anonymous reviewer for pointing out alternative econometric models which can be used to analysis data in a DBDC WTP study.
4. The perceptions included: concern about climate when selecting a tourist destination, mangroves help to protect against SLR by accumulating sediments and stabilising weak shorelines, mangroves mitigate the impacts of CC on sea turtles' terrestrial reproductive phase by providing shade to beaches and preventing coastal erosion, mangroves prevent increased future vulnerability due to urban expansion into low-lying coastal mangrove areas, by ensuring that mangrove ecosystems are restored and protected, and mangroves provide habitats for a variety of terrestrial, estuaries and marine species while creating new livelihood options in mangrove areas such as nature-based ecotourism.

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