Vietnam Journal of Earth Sciences, 44(2), 239-256, https://doi.org/10.15625/2615-9783/16969

Vietnam Academy of Science and Technology
Vietnam Journal of Earth Sciences
http://www.vjs.ac.vn/index.php/jse

User willingness to pay for natural resource conservation at Bach Long Vy Island, Vietnam

Chien Thi Hoang[1*], Mitchell Kirby[2], Lan Dinh Tran[1]

[1]*Institute of Marine Environment and Resources, VAST, Hai Phong, 180000, Vietnam*
[2]*Southern Cross University, Lismore campus, Military road, East Lismore, New South Wales, 2480, Australia*

Received 30 September 2021; Received in revised form 22 November 2021; Accepted 04 March 2022

ABSTRACT

Tourism development plays a crucial role in creating employment, boosting the revenue of the economy, supporting to improve the living standard. While tourism provides many opportunities to improve the well-being of local communities, the expansion of tourism needs to be effectively managed to avoid the degradation of natural capital. Assessing resource awareness and use behavior is an effective way to determine the public's commitment to natural resource conservation and restoration in protected areas. The research was performed in Bach Long Vy Island (BLVI) in Hai Phong city, Viet Nam which is the first National Marine protected area designated by the Vietnamese Government. The aim of this study was to estimate tourists' Willingness to pay (WTP) for natural resource conservation at BLVI through using Contingent valuation method (CVM) with the single-bounded dichotomous choice technique and the random utility model. We estimate the average visitor WTP is VND 153 370 per year (approx. US$6.58), while the aggregate WTP of tourists for the environmental conservation is VND 7.67 million per year (approx. US$32 900) (currency conversions taken as the average rate in September 2020; US$1 to VND 23280). The calculated results show that income and gender factors have significant effects visitors WTP whereas age and education have opposite effects. The outcomes of this research demonstrate the potential tourism value of this island due to the natural amenities and high biodiversity, particularly originating from its marine ecosystems. This result provides valuable scientific information for decision makers and local authorities and should be useful in establishing strategies to prevent the deterioration of ecosystems at BLVI (e.g., an environmental charge or entrance fee), thus contributing to sustainable tourism development.

Keywords: Recreational value, contingent valuation, willingness to pay, subject sustainable tourism development.

1. Introduction

Tourism in protected areas has the potential to contribute substantially to the well-being of local communities. The creation of employment through tourism contributes to increasing income and thus improving living standards for people associated with the destination (Bennett & Dearden 2014; Lopes et al., 2015). This in turn creates less dependency on harvest or depletion based economic activities. This is especially important in regions where natural areas provide resources that support the livelihoods of communities.

*Corresponding author, Email: chienht@imer.vast.vn

Despite the benefits, for many years, the value of tourism in protected areas has been subject to controversy (Pham, 2020); as tourism brings with it a slew of adverse impacts such as pollution, unsustainable resource use, or damage to sensitive areas. Therefore, in the context of preserving the condition of protected areas, it is important to understand visitor behavior. Indeed, visitors have substantial opportunities in improving awareness through partaking in tourism activities that promote the importance and value of biodiversity (Bushell & Bricker 2016). Further, these experiences have been shown to generate pro-environmental conservation attitudes, which may curtail negative aspects of tourism and contribute to the development of sustainable tourism (Apps et al., 2018).

In addition to understand visitor behavior, the literature suggests that economic valuation plays an important role in contributing to sustainable management of natural ecosystems (Costanza et al., 2014; De Groot et al., 2012). A variety of valuation methods have been developed and applied to address specific management issues of natural resources, of which there are three main perspectives on resources, typically marine ecosystems, including economic, socio-cultural, and ecological benefits (Fernandes et al., 1999; Laurila-Pant et al., 2015). Ecological approach concentrates on ecological functioning of the ecosystem, and production possibility frontiers or efficiency frontiers are used to support for this kind of method (De Groot et al., 2002; Felipe-Lucia et al., 2015; King et al., 2015). Social approach is based on how the community attributes the value to each ecosystem service (Felipe-Lucia et al., 2015). Economic approach is utilized to evaluate various provisioning and non-provisioning ecosystem services in terms of its monetary value (Baral et al., 2016). Also, the valuations can utilize the indicator systems (Yee et al., 2014; Yee et al., 2015; Kittinger et al., 2012) or use quantitative techniques for valuation the values of natural ecosystems to improve the efficiency of management (Groot et al., 2012; Jarvis et al., 2017). Indeed, at a macro level, valuing nature provides useful information to decision makers and can assist in attracting investments in natural resource conservation. At a micro level, monetary values of the environment may help individuals recognize the importance of ecosystems through comparison with services provided by socio-economic infrastructure, and thus may contribute to sensible long term resource use (Resende et al., 2017). In the context of tourism, the identification of monetary values may identify a surplus in willingness to pay (WTP) with which may be exploited to compensate the negative aspects of tourism (i.e., through the use of an environmental charge or entrance fee).

2. Regional setting

Bach Long Vy (BLVI) Island is located at the center of Tonkin Gulf in the north of Vietnam and was designated to be an offshore district of Haiphong City by Vietnamese Government in 1992. This is a small island that spans 1.78 square kilometers at high tide and 3.05 square kilometers during low tide. Although BLVI is the farthest island from the coast in the Tonkin Gulf, it is also one of the largest fishing grounds with an important position in national marine economic development, as well as being significant for security and the defense strategy in the Gulf of Tonkin (Fig. 1).

Considered as the first National Marine Protected Area as designated by the government, BLVI has potential for tourism development because of the high biodiversity it possesses. Specifically, marine ecosystems play an important role in contributing to tourism development of this area. The island's marine habitat consists of intertidal and subtidal ecosystems that account for 1090 species (out of a total of 1502 species related

to this island). The intertidal ecosystems consist of sub-ecosystems such as sandy beaches, rocky tidal areas, and mangroves, while the subtidal ecosystems consist of coral reefs and hard-bottom areas (Fig. 1) (Tran et al., 2014). Additionally, other prominent features of BLVI include a sprawling green landscape, a lighthouse and meteorological station, a harbor, temples, and a fresh and clear atmosphere. All these features, terrestrial and marine, attract visitors and contribute to a growing tourism in the region.

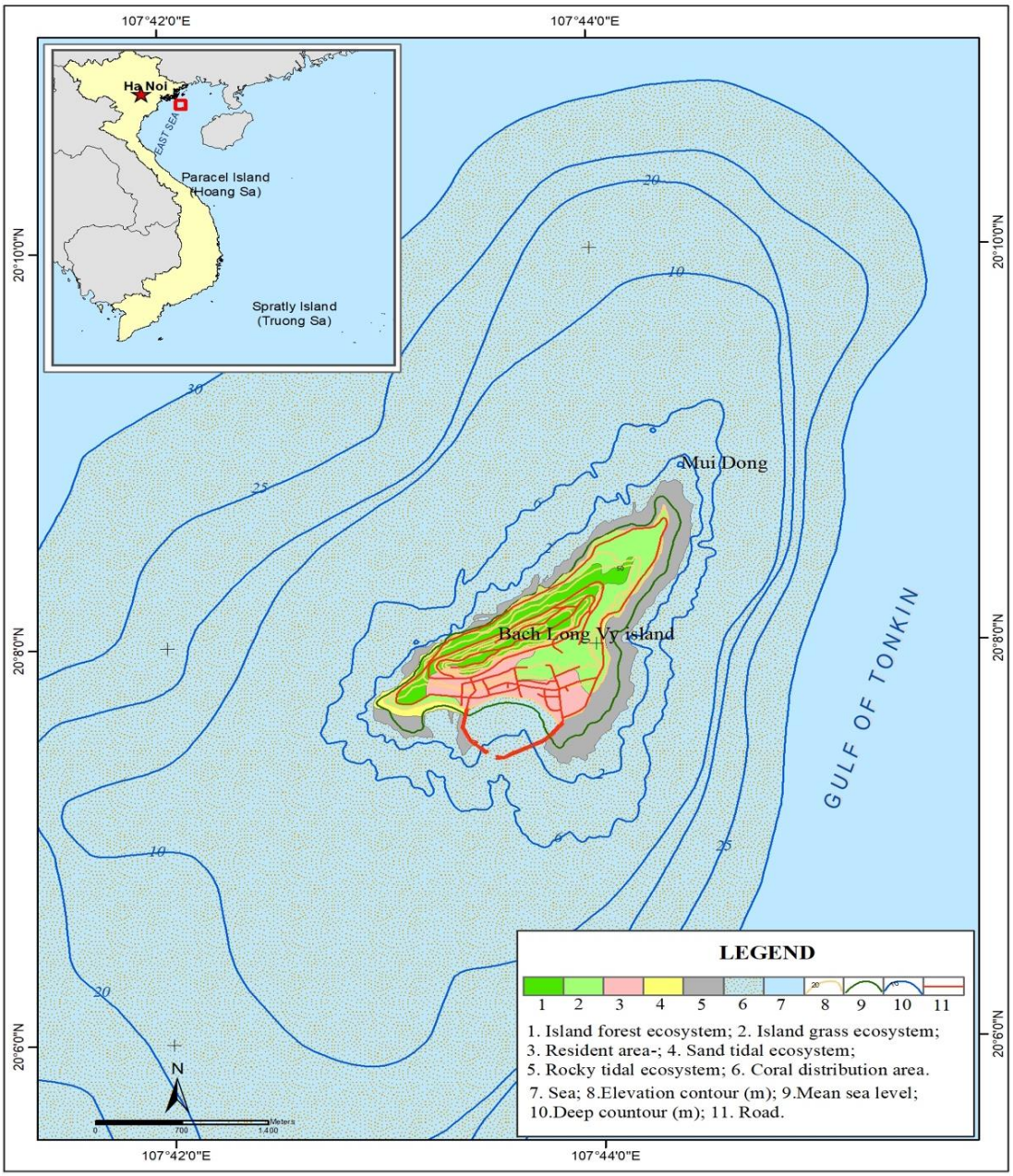


Figure 1. Location and distribution of marine ecosystems on Bach Long Vy Island in Vietnam

Due to the growth of tourism development, several human activities are predicted to put pressures on the BLV environment, for example: port and maritime development, infrastructure construction, fishery development, and urbanization (Tran et al., 2013). Therefore, tourism development needs to be accompanied with environmental protection to ensure sustainable tourism on the island. To achieve this, it is necessary to support policy makers and local authorities by providing scientific information, especially regarding the monetary value of ecosystem services on the island.

Lan et al. (2016), provide the only attempt to value the ecosystem services provided by BLVI (Lan et al., 2016). In their study, a travel cost method (TCM) was applied to determine the consumer surplus of visitors to BLVI and the estimated result was VND 1 074 416 per person per year (approximately US$46). This is a substantial figure demonstrating the potential recreational value of BLVI's natural resources. While we acknowledge the value of this study, we have identified several shortfalls. Firstly, this study did not engage directly with visitor awareness of ecosystem services provided by BLVI - which would be useful information for managing the resources and attribute value to specific ecosystem traits. Further, we believe that the TCM used in the study does not provide an effective signal for policy solutions aimed to curtail the negative aspects of tourism, e.g., an environmental charge or entrance fee.

To fulfil these shortfalls, this study calculates visitors' willingness to pay (WTP) for restoring BLVI natural resources through using a Contingent Valuation Method (CVM). The estimated results of this study will demonstrate the potential tourism value of BLVI natural resources, providing useful insights of this island for decision makers and local authorities to manage and protect natural resources on BLVI, especially for the purpose of sustainable tourism management. Moreover, it may advise a foundation to establish the entrance fee to BLVI which can be used to offset environmental damages and contribute to improved conservation outcomes in perpetuity.

3. Materials and methods

A variety of techniques exist to estimate the monetary value of nature which can be categorized into two broad approaches: stated preference methods which use individuals' statements about their preferences to estimate the change in quality or quantity of environmental good and services (e.g., contingent valuation and choice experiments) and revealed preference methods that calculate monetary values of natural resources based on determination of situations in which people actually do trade-off income or wealth against physical risks (e.g., market prices, hedonic pricing, cost-benefit analysis, replacement cost and travel cost method). Regarding the estimation of tourism and recreational values, TCM has become widely popular and used extensively in the valuation of national parks and other natural assets which attract visitors for recreational purposes (Englin &Mendelsohn 1991; Farr et al., 2011; Heagney et al., 2019; Neher et al., 2013; Smith & Kaoru, 1990). Considering this has been used to estimate the consumer surplus of visitors based on the number of trips made at different travel costs (Jala & Nandagiri, 2015). Another method also used broadly to evaluate recreational values is CVM and this method is utilized in this research.

3.1. Data collection and survey design

A mixed methods were used to collect qualitative and quantitative data through focus group discussions, and direct face-to-face interviews. The focus group discussions were held between local authorities of BLVI and scientists of Institute of Marine Environment and Resources (IMER). The purpose of these

focus groups was to discuss the current development of the island and plans for a balance between tourism development and environmental protection. Additionally, information was collected through face-to-face interviews between IMER scientists and visitors by using questionnaires (see Appendix A). The advantage of onsite face-to-face interviews is that they provide a more reliable evaluation as well as a return higher response rate than other approaches (Lee & W. Mjelde, 2007). The design of the interview questionnaire was informed by the results of the focus group discussions, and a pre-interview with about 10 visitors.

3.2. Experimental design

The interview questionnaire had two main sections. The first section encompassed questions such as demographic questions or multiple-choice questions to collect demographic information as well as the characteristics of respondents' travel. The second section provided a hypothetical scenario to engage respondents to state their preferences for protecting natural resources. This part firstly provided information on high biodiversity of natural resources, especially marine ecosystems by using pictures of this island and simple words. Moreover, during face-to-face interview process, interviewers briefed about the values of natural resources of BLVI. Therefore, biodiversity information was refined in a way that was easiest for the respondents considering the new scientific concepts required and providing answers easily.

In terms of visitor WTP for conservation of the natural resources of this island, it was explored through a single-bounded dichotomous choice approach. This approach was chosen because of its simplicity in collecting data. Further, it is also commonly used in research estimating the WTP for conservation of natural resources; for example, for coral reefs in the Mexican pacific (Robles-Zavala & Reynoso, 2018), in Heiðmork Iceland (Cook et al., 2018), for biodiversity restoration in the North Adriatic Sea in Italy (Tonin, 2019), and also for beach tourism in Qingdao coastal scenic area in China (Liu et al., 2019). This method was employed to allow interviewees only select either "Yes" (Agree to contribute) or "No" (Do not agree to contribute) in choosing bid levels for natural resource protection. In the study of BLVI, interviewees were asked by question "…***would you be willing to pay (bid level) a year to fund this plan?"*** with bid levels comprising 8 price levels (Table 1) and being suggested randomly among respondents. Notably, bid levels were chosen through pre-interview and group discussion.

Table 1. Bid levels for the hypothetical scenario

Bid levels (VND)	Bid levels (US$)
50 000	2.14
100 000	4.29
150 000	6.44
200 000	8.59
500 000	21.47
800 000	34.36
1 000 000	42.95
2 000 000	85.91

*Here, US$1 is equivalent to VND 23280 (Vietcombank, 2020)

Surveys were conducted between IMER researchers and domestic tourists. At the beginning of a survey, interviewers had to introduce about themselves and the purpose of the research project to the respondents. If researchers approached a group or a family, only one member was asked to take part the survey.

3.3. Methods for calculation

This study uses the Contingent Valuation Method (CVM) to calculate visitor WTP for natural resource conservation. This technique belongs to Stated Preference methods which is one of three main types of approaches used to estimate the monetary values of an

environment, including Direct Market, Revealed Preference, and Stated Preference Valuation Techniques (Laurila-Pant et al., 2015). It also has been applied broadly to evaluate the recreational benefit of environmental goods and services. Through surveys by using questionnaires, interviewees are asked how much each would be WTP for protection of relevant natural resources or the amount of compensation each would be WTA to give up these same environmental goods and services (Limaei et al., 2016). This method was originally proposed by Ciriacy-Wantrup in 1947. However, Davis was the first to use the CV method empirically when he estimated the benefits of goose hunting through a survey among the goose-hunters in 1963 (Ciriacy-Wantrup, 1947; Venkatachalam, 2004). In recent decades, CVM has been applied in numerous studies to investigate WTP of resource users for maintaining the recreational value of the environment. For instance, Chen et al. (2013) used the CVM to calculate the potential ticket price for boat fishing and scuba diving on artificial reefs in Taiwan (Chen et al., 2013). CVM was also applied to estimate visitor WTP for services rendered by the facilities available at Pilikula lake in India (Jala & Nandagiri, 2015). In study about the recreation benefits of Natural Springs in Florida, WTP of residents for karst springs restoration were investigated by using CVM (Wu et al., 2018). Also, based on the recreation aspect of two coastal lagoons, one at the Ria de Aveiro (Portugal) and the other in Coorong (Australia), CVM was used to estimate visitor WTP for increasing visit costs (Clara et al., 2018). Additionally, a study about the Qingdao coastal scenic area in China showed the application of CVM in calculating tourist WTP to restore beaches in this area (Liu et al., 2019).

Estimating WTP for protected areas, especially marine protected areas for recreational purposes by using CVM also plays an important role in designing marine conservation strategies as well as in sustainable marine environment development. Therefore, there have been a range of studies conducted for this purpose. Hence, CVM was used to evaluate the WTP of visitors to protect the coral reefs of Folkestone Marine Reserve in Barbados (Kirkbride-Smith et al., 2016). This method was also applied to investigate WTP of tourists and residents for marine conservation in two MPAs in the Zhejiang Province in China (Yu et al., 2018). Moreover, evaluating visitor WTP for entrance costs to Mexican protected areas also demonstrated the indispensable usefulness of CVM in determining the recreation value of an environment (Witt, 2019).

In light of this widespread and favorable use, the CVM is also used to estimate the WTP of visitors for protection of natural resources on BLVI. The basic model for analyzing the dichotomous choice responses is the Random Utility model and the average WTP of respondents can be estimated as below (B.12). For full details of the calculation of the WTP, see Appendix B.

$$Md_{\varepsilon}(WTP_j/\alpha, \beta, z_j) = \alpha z_j/\beta \quad \text{(B.12)}$$

The collected data from surveyed questionnaire were processed by Excel software before using SPSS software to run logistic regression. This is a typical and powerful method in analyzing the influence of independent variables on a binary dependent variable based on the contribution of each independent variable (Stoltzfus, 2011).

Mean WTP is estimated based on the regression between dependent variable being the probability of “Yes” answer for paying for environmental protection and independent variables being demographic elements of visitors. Independent variables would have their own effects on a dependent variable, and they were selected in this research based on literature review as below:

- Age: This is the years of age of respondents. Some studies demonstrated that younger age has a positive effect for the possibility of "Yes" answer (Nord et al., 1998; Carlsson and Johansson-Stenman, 2000). It is expected that younger people will have high willingness to pay for BLVI environmental protection.

- Gender: It is the gender of respondents and the sex differences in the knowledge about environmental issues have been paid attention in many previous studies (Arcury et al., 1987; Kostakis and Sardianou, 2011).

- Education: It is the schooling years of participants. In this study, education is categorized in to three levels, including undergraduate, bachelor, and postgraduate. It is demonstrated that people with higher education experience may raise their own concern about environment protection (Xiao et al., 2013) (De Silva et al., 2014). Meyer (2015) also indicates that education may enhance the pro-environmental behavior, leading to higher willingness to pay for environmental restoration in the context of developing country (Meyer, 2015).

- Income: It is money received from working of respondents. It is expected that the better of economic status interviewees have, the higher willingness to pay for environmental conservation they provide (Veisten et al., 2004; Bulte et al., 2005; Hidano et al., 2005) (Reynisdottir et al., 2008).

Additionally, to guarantee having optimal function in regression, independent variables should not correlate with each other. Therefore, correlate analysis in SPSS software was applied to select independent variables and they include Bid, Age, Gender, Education, and Income (Table 2).

Table 2. Model variables and input coding

Variables	Description	Values (coding)
Pr (Yes)	Probability of a responding willingness to pay for natural resource protection	Yes (1), No (0)
Bid	Bid levels (million VND/year)	0.05; 0.1; 0.15; 0.2; 0.5; 0.8; 1; 2
Age	Age of respondents	Discrete numeric variable
Gender	Gender of respondents	Male (1), Female (0)
Edu	The education level	Undergraduate (0), Bachelor (1), Postgraduate (2)
Income	Income of respondents (million VND/year)*	Discrete numeric variables

*Here, US$1 is equivalent to VND 23280 (Vietcombank, 2020)

The regression equation can be written as follow: $Pr\ (Yes) = \alpha_o + \alpha_1 * Age + \alpha_2 * Gender + \alpha_3 * Edu + \alpha_4 * Income + \beta * Bid + \varepsilon$

4. Results

4.1. Socio demographic characteristics of the surveyed sample

4.1.1. Gender

Results from surveying returned 50 fully completed questionnaires. Most respondents were male (78%). The average age of the visitors was 38.74, notably all respondents were of working age with the eldest being 61 years old and the youngest 20 years old.

4.1.2. Education level

In terms of the education level of the visitors, there were undergraduates, bachelor and postgraduate graduates. Tourists with undergraduate degrees accounted for the highest proportion, with 42%, following by people with bachelor degrees and postgraduate degrees with 40% and 18% respectively.

4.1.3. Income

The income of respondents ranged from VND 2 to 20 million/month (approximately US$86 to 860). Specifically, the percentages of participants who had monthly incomes of under VND 5 million (approximately US$215) and from VND 5 to 10 million (approximately US$215 to 430) were the same with both calculated at 38%. Only 24% of respondents had a monthly income ranging from VND 10 to 20 million (approximately US$430 to 860) (Fig. 2). Generally, the average income of respondents was over VND 9 million/month (approximately US$387).

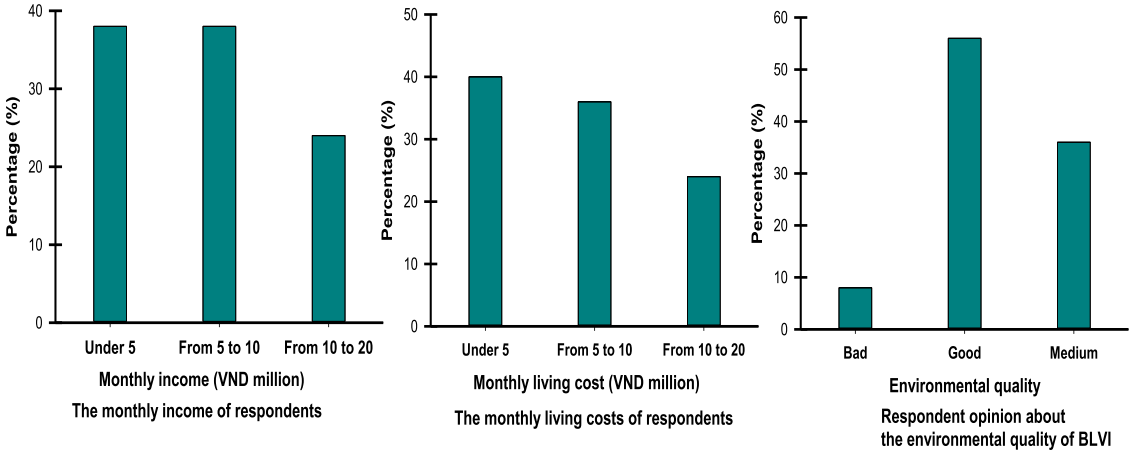


Figure 2. Socio demographic characteristics of the surveyed sample

4.1.4. Living expenses

The average living expenses of tourists per month was also investigated, varying from VND 2.5 to 20 million (approximately US$107 to 860), in which respondents with the living costs of under VND 5 million (approximately US$215) accounted for the highest proportion at 40%. In contrast, visitors with living expenses ranging from VND 10 to 20 million (about US$430 to 860) had the smallest percentage with 24% (see Fig. 2). Therefore, the mean living costs of this sample was over VND 8 million/month (approximately US$344).

4.1.5. Environmental awareness

The awareness of visitors about the environmental quality of the study area was also considered. This factor had a strong correlation with the probability of responding 'Yes' for environmental protection. Respondents were asked about the environmental quality of the study area with three levels of assessment, i.e. Bad, Medium and Good. More specifically, 56% of respondents held opinions that the environment existed at a 'Good' level, whereas only 8% of considered the environment of the study area at a 'Bad' level (Fig. 2). Most interviewees agreed that the environment of BLVI was still pristine.

Moreover, the collected information showed that tourism activities on BLVI comprise sightseeing, discovering about local culture and especially investigating the biodiversity of the natural resources. Almost all respondents greatly appreciated the environmental quality of the study area although urbanization has started to occur in recent years.

4.2. Determinants of the WTP

A summary of the responses to the CVM, respondents more often said "Yes" to paying

for conservation than "No". As expected, a trend was observed were as bid levels increased, the proportion of "Yes" reponses decreased (Table 3).

Table 3. Bid levels and probabilities of a yes reponse for the hypothetical scenario

Bid levels (VND)	Number of respondents	WTP		Proportion of "Yes" answer
		Yes	No	
50 000	11	10	1	0.909
100 000	10	8	2	0.8
150 000	5	2	3	0.4
200 000	4	2	2	0.5
500 000	4	2	2	0.5
800 000	5	3	2	0.6
1 000 000	6	2	4	0.33
2 000 000	5	1	4	0.2
Total	50	30	20	

The statistic results show that model parameters were able to account for 49.3% of the variation of dependent variable (R^2 = 0.493). Model estimates reveal Income to have largest statistically significant positive effect on WTP for natural resource conservation (Table 4). Being a male was shown to have significant negative effect on WTP.

Based on function B.12, the mean individual WTP to visit BLVI is 153 370 VND per year (approximately US$6.58 per year). According to survey data, the total number of visitors per year to BLVI is approximately 5000. Therefore, the total WTP of tourists annually for natural resource conservation on this island would be approximately VND 7.67 million, corresponding to US$32 900 per year.

Table 4. Determinants of the WTP function

Variables	B	S.E.	P-value	Mean
Age	.055	.043	.204	38.74
Gender	-1.986	1.105	.072	.78
Edu	.223	.571	.695	.76
Income	2.2533E-7	.000	.044	9380000
Bid	.00001	.000	.162	345000
Constant	.606	1.794	.736	
R-square	0.493			

5. Discussions

5.1. Demographics and willingness to pay

The results of this study reveal that the mean WTP per visitor is approximately US$6.58. We find this figure to be comparably lower than estimates from studies across the world shown in the literature for WTP for conservation. For example, this result is quite low compared to studies done in Barbados (from US$18.33 to US$17.58), in Nanji Islands (US$34.3) and Putuo Islands (US$27.4) in China, and in Mexico (from US$15.70 to US$25.83) (Kirkbride-Smith et al., 2016; Witt 2019; Yu et al., 2018) (Table 5).

We reason that our lower value for WTP, is function of visitor demographics, more so than the islands attributes. Several factors lead us towards this assumption. The first is that the income of respondent visitors was relatively low (the highest being US$860). Thus, our result may indicate that conservation of natural resources and environment may not be an immediate priority of people due to socio-economic considerations. People may consider spending

income on food or education rather than environmental protection (Ahmed et al., 2007). Consequently, environmental protection may be of less concern to visitors to BLVI. The second factor, there was not any international visitors recorded in the study - which as they come from different economic circumstances (often better off) may rationalize affordability and therefore WTP differently.

Table 5. WTP estimated in different areas in the world

Locations	Ecosystems	WTP (US$)	References
Barbados	Natural Coral Reef	$18.33	(Kirkbride-Smith, Wheeler &Johnson 2016)
Barbados	Artifical Coral Reef	$17.58	(Kirkbride-Smith, Wheeler &Johnson 2016)
Zhejiang Province, China	Nanji Islands	$34.30	(Yu et al. 2018)
Zhejiang Province, China	Putuo Islands	$27.40	(Yu et al. 2018)
Calakmul, Mexico	Bioshpere reserve	$25.83	(Witt 2019)
Coba, Mexico	Archeological zone	$16.33	(Witt 2019)
Palenque, Mexico	Natural and Cultural Reserve	$19.27	(Witt 2019)
Siam Ka'an, Mexico	Wetlands, forest, coral reef	$16.92	(Witt 2019)
Yum Balam, Mexico	Archeological zone	$15.70	(Witt 2019)
BLVI, Vietnam	Marine island	$6.58	Ours

There are many factors impacting on the WTP of tourists, including demographics, socioeconomic conditions as well as awareness and attitudes towards the environment (Liu et al., 2019). In this study, among the variables influencing tourist WTP, income and gender are shown to have significant effects whereas age and education are not shown to be significant. Regarding income and gender factors, the results of this study are similar with the estimated results of other previous studies. The study about the WTP for marine conservation in Zhejiang province in China showed that income had a positive correlation with WTP, that is respondents with higher incomes, showed a WTP higher amounts (Yu et al., 2018). Additionally, in the study about estimation of the non-use value of beach tourism resources on the Qingdao coastal scenic area of China, Liu et al. (2019) concluded that females demonstrated a higher probability to pay for protection of the environment than the males involved (Liu et al., 2019).

5.2. Comparison between CVM and TCM results

Comparing CVM and TCM results, it is demonstrated that the value of WTP for protection of the environment calculated by CVM is less than consumer surplus values estimated by TCM. The mean WTP of visitors for natural resource conservation of BLVI from CVM model with VND 153 370 per year (approximately US$6.58) is smaller than the consumer surplus value calculated by the TCM model in the previous study of Lan et al. (2016) with VND 1 074 416 person/year (approximately US$46). Many previous studies also illustrate the different results evaluated by these methods and they are summarized in Table 6 below.

The reasons why the TCM results are higher than the CVM results can be explained in relation to the role of methodologies. TCM estimates may include values of respondents with travelling across several possible sites whereas CVM estimates just focus on information of participants within a specific site. Furthermore, application of a TCM method is based on actual tourism in real markets, in contrast, a CVM method is based on hypothetical situations (Jala &Nandagiri 2015; Rolfe & Dyack, 2010). In this study into BLVI, the reason for the smaller result of CVM in comparison with that of TCM is probably due to the different WTP collected between real market and hypothetical circumstance.

Table 6. The calculated results utilized by CVM and TCM

Research	CVM	TCM	References
The recreational value in the Coorong, Australia	The WTP per adult visitor per day was US$116	The consumer surplus per adult visitor per recreation day was US$149	(Rolfe & Dyack, 2010)
The recreational benefits of ecosystem services on and around artificial reefs in Penghu, Taiwan	The potential ticket revenue for boat fishing and scuba diving were US$13 and US$12.7, respectively	The recreational benefit of boat anglers and scuba divers were US$281.9 per trip and US$348.5 per dive, respectively	(Chen et al., 2013)
The recreational value at the Pilikula Lake in India	The average WTP for enhancing extra facilities was Rs.36.75 (approximately US$0.51)	The consumer surplus per individual visit per day was Rs.238 (approximately US$3.33)	(Jala & Nandagiri, 2015)
The recreational values of the Natural Springs in Florida	The WTP of tourists was from US$12 to US$14 per person	The annual consumer surplus was from US$20 to US$43 per person	(Wu et al., 2018)
The recreational value of coastal lagoons on the Ria de Aveiro (Portugal) and the Coorong (Australia)	The WTP were 103€ and 110€ (approximately US$123 and 131) per adult per day for Australian and Portuguese lagoons, respectively	The consumer surplus values were 132€ and 160€ (approximately US$157 and 190) per adult per day for Australian and Portuguese lagoons, respectively	(Clara et al., 2018)

5.3. The difficulties and shortcomings of methodology and BLVI research

The difficulty in conducting CVM studies is the existence of hypothetical bias. This is an unavoidable deviation in any CVM study due to the nature of this method which is to assess individual benefit changes in a hypothetical market (Haab and McConnell, 2002). Besides, hypothetical bias occurs when respondents do not understand the hypothetical scenario clearly to provide WTP value (Diamond and Hausman, 1994). Therefore, there are some solutions to overcome this limitation. Providing clear and simple information for respondents to have more awareness of the program can reduce these biases (Amarnath and Komagal, 2014). Using the binary CVM method also can decline hypothetical bias due to the simplicity of the method in which respondents listen to a script, considering relevant factors and choose the available bid level. In addition, another technique has also been widely applied to decrease bias called "Cheap talk". This technique is based on reminding respondents to think carefully before answering a chosen question of the hypothetical situation (Fisher, 2005).

This study has used the above suggestions and guidelines to minimize hypothetical bias of CVM method. The questionnaire was designed not only after collecting the information from group discussions and pre-interviews but also in a simple way by applying the dichotomous choice approach, resulting in respondents finding it easy to understand the situation as well as answer the questions. Before performing face-to-face interviews, interviewees were briefed about the values of natural resources, especially the marine ecosystems of BLVI, enhancing the awareness of tourists about these resources. Biodiversity information was also refined in a way that was easiest for the respondents including using pictures and simple words. Therefore, the respondents could understand the new scientific concepts required. The data for this study was from visitors who went to BLVI several times a year and each time spent a few days on the island. This suggests that the data from these visitors is reliable for estimating the recreational value of the study area.

This is the first study on assessing tourist behaviors of BLVI natural resource protection and it has some limitations. Firstly, the

number of interviewees was quite small with only 50 visitors. Secondly, based on survey data during survey trips by IMER scientists and the survey results of interviews with local people, this island has not had any foreign tourists yet. The reason to explain these drawbacks could be due to an offshore island. The difficult travel between the mainland and the island has caused the limited number of tourists. Normally, it takes at least from 5 to 9 hours to go to the island and weather condition is also a prerequisite for travelling to BLVI, so there are only 3 or 4 trips to the island per month. Small survey sample size and only domestic tourists may affect the research results. Therefore, further research about this field at BLVI will be necessary.

Nevertheless, this study has provided certain contributions, confirming the potential tourism value of this island. The outstanding outcome of this research is the assessment of visitor behaviors towards the conservation of BLVI's natural resources through their own WTP. This is valuable scientific information to support to sustainable environmental resource management. Through the research study, enhancing the public awareness as well as improving the locals' attention to natural resource protection by applying solutions such as propaganda, education, or community-based resource management will be indispensable.

5.4. Future tourism development on BLVI

According to survey data from local authorities, one of the targets to achieve by 2025 is improving environmental management, marine environmental protection, achieving sustainable tourism development. As a function of its inherent qualities, the future development of this island and with that increased tourism activity at BLVI is inevitable. It is clearly that the tourism development on BLVI is based on the high biodiversity of the marine ecosystems, especially the coral reefs, contributing for establishing potential scuba diving tourism in this area in the future. The calculated result of visitor WTP for environmental protection could be a useful foundation for managers in forming an entrance fee to control the number of visitors to prevent tourism-related marine ecosystem degradation. While the benefits coming from tourism development could be creating employments relating to tourism services, developing the infrastructure, and promoting the local culture to foreigners, adverse effects of tourism activities are also predicted (Tran et al., 2013). As discussed above, at least in the short- term future, it is likely that visitors of the island are likely to be less concerned with the conservation the island reserve than other interests. Therefore, environmental charges may be an appropriate way to offset the negative aspects of visitor behavior. The relatively low value of WTP with approximately US$6.58, however, means that conservation activities will be able to be constrained by this. An additional method to improve conservation fund could have a higher tax for tourism-related services (like tourist accommodations, restaurants, or souvenir shops), further contributing to excluding negative behavior of visitors as well as local communities.

6. Conclusions

In this study, we report the mean visitor WTP for conservation at BLVI is approximately US$6.58. This indicates a reasonable price which could be applied as an environmental charge to compensate the negative impacts of tourism, similar in mechanism to that charged to visitors of the Great Barrier Reef in Australia (Farr et al., 2011). We consider sustainable tourism as an important development opportunity, that may provide improvements to both local and regional livelihoods, and for the conservation of the ecosystems present at BLVI.

Acknowledgements

The authors gratefully acknowledge the project CSCL23.01/22-23 “Cost-benefit analysis and propose financial solutions for sustainable development of Bach Long Vy Marine Protected Area, Hai Phong, Viet Nam” funded by Vietnam Academy of Science and Technology. All authors have had significant contributions to finalize the final manuscript and we are also thankful Professor Caroline Sullivan of School of Environment, Science and Engineering at Southern Cross University, Australia for in-kind support.

References

Ahmed M., Umali G.M., Chong C.K., Rull M.F., Garcia M.C., 2007. Valuing recreational and conservation benefits of coral reefs-The case of Bolinao, Philippines. Ocean & Coastal Management, 50(1), 103-118. https://doi.org/10.1016/j.ocecoaman.2006.08.010.

Amarnath D., Komagal M., 2014. An Economic Analysis of Sago Pollution in Tamil Nadu, India. Journal of International Academic Research for Multidisciplinary, 2(7), 150-170.

Apps K., Dimmock K., Huveneers C., 2018. \Turning wildlife experiences into conservation action: Can white shark cage-dive tourism influence conservation behaviour?. Marine Policy, 88, 108-115. https://doi.org/10.1016/j.marpol.2017.11.024.

Arcury T.A., Scollay S.J., Johnson T.P., 1987. Sex differences in environmental concern and knowledge: The case of acid rain. Sex Roles, 16, 463-472.

Baral S., Basnyat B., Khanal R., Gauli K., 2016. A total economic valuation of wetland ecosystem services: an evidence from Jagadishpur Ramsar site. Nepal. Sci. World J., 1-9. https://doi.org/10.1155/2016/2605609.

Bennett N.J., Dearden P., 2014. Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. Marine Policy, 44, 107-116. https://doi.org/10.1016/j.marpol.2013.08.017.

Bulte E., Gerking S., List J.A., De Zeeuw A., 2005. The effect of varying the causes of environmental problems on stated WTP values: evidence from a field study. Journal of environmental Economics and Management, 49(2), 330-342.

Bushell R., Bricker K., 2016. Tourism in protected areas: Developing meaningful standards. Tourism and Hospitality Research, 17(1), 106-120. https://doi.org/10.1177/1467358416636173.

Carlsson Fredrik, Johansson-Stenman, Olof, 2000. Willingness to pay for improved air quality in Sweden. Appl. Econ., 32(6), 661e669.

Chen J.-L., Chuang C.-T., Jan R.-Q., Liu L.-C., Jan M.-S., 2013. Recreational Benefits of Ecosystem Services on and around Artificial Reefs: A Case Study in Penghu, Taiwan. Ocean & coastal management, 85, 58-64. https://doi.org/10.1016/j.ocecoaman.2013.09.005.

Ciriacy-Wantrup S.V., 1947. Capital returns from soil-conservation practices. Journal of farm economics, 29(4), 1181-1196. https://doi.org/10.2307/1232747.

Clara I., Dyack B., Rolfe J., Newton A., Borg D., Povilanskas R., Brito A.C., 2018. The value of coastal lagoons: Case study of recreation at the Ria de Aveiro, Portugal in comparison to the Coorong, Australia. Journal for Nature Conservation, 43, 190-200. https://doi.org/10.1016/j.jnc.2017.10.012.

Cook D., Eiríksdóttir K., Davíðsdóttir B., Kristófersson D.M., 2018. The contingent valuation study of Heiðmörk, Iceland - Willingness to pay for its preservation. Journal of environmental management, 209, 126-138. https://doi.org/10.1016/j.jenvman.2017.12.045.

Costanza R., De Groot R., Sutton P., Van der Ploeg S., Anderson S.J., Kubiszewski I., Farber S., Turner R.K., 2014. Changes in the global value of ecosystem services. Global environmental change, 26, 152-8. https://doi.org/10.1016/j.gloenvcha.2014.04.002.

De Groot R., Brander L., Van Der Ploeg S., Costanza R., Bernard F., Braat L., Christie M., Crossman N., Ghermandi A., Hein L., 2012. Global estimates of the value of ecosystems and their services in monetary units. Ecosystem Services, 1(1), 50-61, https://doi.org/10.1016/j.ecoser.2012.07.005.

De Groot R.S., Wilson M.A., Boumans R.M., 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecological economics, 41(3), 393-408. https://doi.org/10.1016/S0921-8009(02)00089-7.

De Silva D.G., Pownall R.A., 2014. Going green: does it depend on education, gender or income?. Applied Economics, 46(5), 573-586.

Diamond P.A., Hausman J.A., 1994. Contingent valuation: is some number better than no number?. Journal of Economic Perspectives, 8(4), 45-64.

Englin J., Mendelsohn R., 1991. A hedonic travel cost analysis for valuation of multiple components of site quality: The recreation value of forest management. Journal of Environmental Economics and Management, 21(3), 275-290. https://doi.org/10.1016/0095-0696(91)90031-D.

Farr M., Stoeckl N., Beg R.A., 2011. The efficiency of the environmental management charge in the cairns management area of the Great Barrier Reef Marine Park. Australian Journal of Agricultural and Resource Economics, 55(3), 322-41. Doi: 10.22004/ag.econ.186960.

Felipe-Lucia M.R., Comín F.A., Escalera-Reyes J., 2015. A framework for the social valuation of ecosystem services. AMBIO, 44, 308-318. https://doi.org/10.1007/s13280-014-0555-2.

Fernandes L, Ridgley M., Van't Hof T., 1999. Multiple criteria analysis integrates economic, ecological and social objectives for coral reef managers. Coral Reefs, 18(4), 393-402.

Fisher A.C., 2005. Investment under uncertainty and option value in environmental economics: reply. Resource and Energy Economics, 27(1), 89.

Haab T.C., McConnell K.E., 2002. Valuing environmental and natural resources: the econometrics of non-market valuation. Edward Elgar Publishing.

Heagney E.C., Rose J.M., Ardeshiri A., Kovac M., 2019. The economic value of tourism and recreation across a large protected area network. Land Use Policy, 88, p.104084. https://doi.org/10.1016/j.landusepol.2019.104084.

Hidano N., Kato T., Aritomi M., 2005. Benefits of participating in contingent valuation mail surveys and their effects on respondent behavior: a panel analysis. Ecological Economics, 52(1), 63-80.

Jala, Nandagiri L., 2015. Evaluation of Economic Value of Pilikula Lake Using Travel Cost and Contingent Valuation Methods. Aquatic Procedia, 4, 1315-1321. https://doi.org/10.1016/j.aqpro.2015.02.171.

Jarvis D., Stoeckl N., Liu H.-B., 2017. New methods for valuing, and for identifying spatial variations, in cultural services: a case study of the Great Barrier Reef. Ecosyst. Serv., 24, 58-67.

King E., Cavender-Bares J., Balvanera P., Mwampamba T.H., Polasky S., 2015. Tradeoffs in ecosystem services and varying stakeholder preferences: evaluating conflicts, obstacles, and opportunities. Ecol. Soc., 20, art25.

Kirkbride-Smith A.E., Wheeler P.M., Johnson M.L., 2016. Artificial reefs and marine protected areas: a study in willingness to pay to access Folkestone Marine Reserve, Barbados, West Indies. PeerJ., 4, p. e2175. Doi: 10.7717/peerj.2175.

Kittinger J.N., Finkbeiner E.M., Glazier E.W., Crowder L.B., 2012. Human dimensions of coral reef social-ecological systems. Ecol. Soc., 17(4), 17.

Kostakis I., Sardianou E., 2012. Which factors affect the willingness of tourists to pay for renewable energy?. Renewable Energy, 38(1), 169-72.

Lan T.D., Huyen N.T.M., Thu N.T., 2016. Economic valuation of marine and island typical ecosystems for sustainable development of some frontier islands in Vietnam coastal waters. In Collection of highlighted results from scientific and technological projects under the program KC.09/11-15. Hanoi: Publishing House of Natural Science and Technology, 921-994 (in Vietnamese).

Laurila-Pant M., Lehikoinen A., Uusitalo L., Venesjärvi R., 2015. How to value biodiversity in environmental management?. Ecological Indicators, 55, 1-11.

Lee C.K, W. Mjelde J., 2007. Valuation of ecotourism resources using a contingent valuation method: The case of the Korean DMZ. Ecological Economics, 63(2), 511-520. https://doi.org/10.1016/j.ecolecon.2006.12.011.

Limaei S.M., Safari G., Merceh G.M., 2016. Recreational values of forest park using the contingent valuation method (Case study: Saravan Forest Park, north of Iran). Journal of Forest Science, 62(10), 452-462. https://doi.org/10.17221/4/2016-JFS.

Liu J., Liu N., Zhang Y., Qu Z., Yu J., 2019. Evaluation of the non-use value of beach tourism resources: A case study of Qingdao coastal scenic area, China. Ocean & Coastal Management, 168, 63-71. https://doi.org/10.1016/j.ocecoaman.2018.10.030.

Lopes P.F.M., Pacheco S., Clauzet M., Silvano R.A.M., Begossi A., 2015. Fisheries, tourism, and marine protected areas: Conflicting or synergistic interactions?. Ecosystem Services, 16, 333-340. https://doi.org/10.1016/j.ecoser.2014.12.003.

Meyer A., 2015. Does education increase pro-environmental behavior? Evidence from Europe. Ecological economics, 116, 108-121.

Neher C., Duffield J., Patterson D., 2013. Valuation of national park system visitation: the efficient use of count data models, meta-analysis, and secondary visitor survey data. Environmental Management, 52(3), 683-698. Doi: 10.1007/s00267-013-0080-2.

Nord, Mark, Luloff A.E., Bridger, Jeffrey C., 1998. The association of forest recreation with environmentalism. Environ. Behav., 30(2), 235e246.

Pham T.T.T., 2020. Tourism in marine protected areas: Can it be considered as an alternative livelihood for local communities?. Marine Policy, 115, 103891. https://doi.org/10.1016/j.marpol.2020.103891.

Resende F., Fernandes G., Andrade D., Néder H., 2017. Economic valuation of the ecosystem services provided by a protected area in the Brazilian Cerrado: application of the contingent valuation method. Brazilian Journal of Biology, 77(4), 762-773. https://doi.org/10.1590/1519-6984.21215.

Reynisdottir M., Song H., Agrusa J., 2008. Willingness to pay entrance fees to natural attractions: An Icelandic case study. Tourism Management, 29(6), 1076-1083.

Robles-Zavala E., Reynoso A.G.C., 2018. The recreational value of coral reefs in the Mexican Pacific. Ocean & Coastal Management, 157, 1-8. Doi: 10.1016/j.ocecoaman.2018.02.010.

Rolfe J., Dyack B., 2010. Testing for convergent validity between travel cost and contingent valuation estimates of recreation values in the Coorong, Australia. Australian Journal of Agricultural and Resource Economics, 54(4), 583-899. https://doi.org/10.1111/j.1467-8489.2010.00513.x.

Smith V.K, Kaoru Y., 1990. What have we learned since hotelling's letter?: A meta-analysis. Economics Letters, 32(3), 267-272. https://doi.org/10.1016/0165-1765(90)90110-M.

Stoltzfus J.C., 2011. Logistic regression: a brief primer. Academic Emergency Medicine, 18(10), 1099-1104. Doi: 10.1111/j.1553-2712.2011.01185.

Tonin S., 2019. Estimating the benefits of restoration And preservation scenarios of marine biodiversity: An application of the contingent valuation method. Environmental Science & Policy, 100, 172-182. https://doi.org/10.1016/j.envsci.2019.07.004.

Tran D.T., Nguyen V.Q., Tran D.L., Nguyen T.M.H., 2014. Bach Long Vy national marine protected area: potential and solutions for promoting values. Journal of Marine Science and Technology, 14(3A), 281-291 (in Vietnamese).

Tran D.T., Tran D.L., Nguyen T.M.H., Dinh V.H., 2013. Nature and environment in Bach Long Vi island and sea, Hanoi: Publishing House of Natural Science and Technology, 275 (in Vietnamese). Doi: 10.13140/RG.2.1.4897.5608.

Venkatachalam L ., 2004. The contigent valuation method: a review. Environmental impact assessment review, 24(1), 89-124.

Veisten K., Hoen H.F., Navrud S., Strand J., 2004. Scope insensitivity in contingent valuation of complex environmental amenities. Journal of Environmental Management, 73(4), 317-331.

Witt B., 2019. Tourists' willingness to pay increased entrance fees at Mexican protected areas: A multi-site contingent valuation study. Sustainability, 11(11), 3041. Doi: 10.3390/su11113041.

Wu Q., Bi X., Grogan K.A., Borisova T., 2018. Valuing the recreation benefits of natural springs in Florida. Water, 10(10), 1379. https://doi.org/10.3390/w10101379.

Xiao C., Dunlap R.E., Hong D., 2013. The nature and bases of environmental concern among Chinese citizens. Social Science Quarterly, 94(3), 672-690.

Yee S.H., Carriger J.F., Bradley P., Fisher W.S., Dyson B., 2015. Developing scientific information to support decisions for sustainable coral reef ecosystem services. Ecological Economics, 115, 39-50.

Yee S.H., Dittmar J.A., Oliver L.M., 2014. Comparison of methods for quantifying reef ecosystem services: A case study mapping services for St. Croix, USVI. Ecosystem Services, 8, 1-15.

Yu B., Cai Y., Jin L., Du B., 2018. Effects on willingness to pay for marine conservation: Evidence from Zhejiang Province, China. Sustainability, 10(7), p.2298. Doi: 10.3390/su10072298.

Appendix A

Questionnaire: The recreational value of the natural resources of Bach Long Vy Island (BLVI)

Hello, my name is…. I come from the Institute of Marine Environment and Resources. I am involved in a research on the value of natural resources of BLVI. Could you please help us by spending your time to answer some questions? Your answers will be kept in secret and used for research purpose only.

I. General information

1. Personal information

Full name: ……

Age: ……

Gender: ☐ Male ☐ Female

Education:…… ……

Occupation:……...

Residential address: ……

Telephone: …….. Email:……..

Income per month: ……...

Living expenses: ……..

2. How do you travel to the island?

……

3. The purpose of this journey:

☐ Sightseeing

☐ Discovering the biodiversity

☐ Local culture

☐ Others: ……

4. How many times have you been to the island?

……

5. How many days are you planning to stay on this island?

……

6. Could you please estimate the travel cost for this trip (VND)?

☐ Two-way ticket price: .....

☐ Accommodation: .....(VND/day)

☐ Food: .....(VND/day)

☐ Souvenir: .....

☐ Others: .....

II. Assessing the recreation value of BLVI

As everyone knows well, BLVI is the Marine protected area with high levels of biodiversity, especially in the marine and coastal ecosystems.

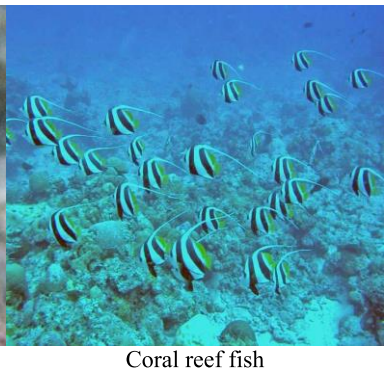
Sea cucumber (*Holothuria vagabunda*)

Abalone (*Haliotis diversicolor*)

Galaxea coral (*Galaxea sp*)

Seaweed (*Sargassum*)

Coral reef fish (*Cephalopholis boenack*)



Coral reef fish (*Heniochus acuminatus*)

Landscapes and man-made features, for example:

Rocky shore

Sandy beach

Temple

6. What do you feel about the environmental quality (eg. natural resources, water quality)?

☐ Good
☐ Medium
☐ Bad

7. Due to the economic development in general as well as tourism development in particular in the future, it is predicted for the island to have the increasing human activities, causing pressure on the environment. ***In your opinion, what are the factors causing negative impacts on the environment (You can select more than 1 option)?***

☐ Port and maritime development (like harbour building or maritime transport)
☐ Infrastructure construction
☐ Overexploitation
☐ Urbanization processes like migration
☐ Agricultural development
☐ Others:……

8. Based on precious values of natural ecosystems and predicted adverse impacts from tourism development, could you please let us know your opinion about natural and environmental protection in BLVI?

☐ Strongly agree
☐ Agree somewhat
☐ Neither agree nor disagree
☐ Disagree somewhat
☐ Strongly disagree

9. Considering your feelings and experiences when visiting Bach Long Vy island; if the local authorities have a plan to establish an environmental conservation fund to protect the natural resources, ***would you be willing to pay (bid level) a year to fund this plan***? (Please keep in mind that this situation is only a hypothetical scenario).

A. Yes, I would
B. No, I would not

Please let us know the reason why do/do not you want to contribute financially (You can select more than one option)?

☐ Our income is not enough money to donate

☐ The biodiversity of this area is meaningless to our family

☐ I am afraid of using our donation for the wrong purpose

☐ Biodiversity conservation is a responsibility of national and local authorities only

☐ Others: ……

Thank you so much for your participation!

Appendix B

According to Habb and McConnell (2002), the indirect utility for respondent j can be written:

$$u_{ij} = u_i(y_j, z_j, \varepsilon_{ij}) \quad \text{(B.1)}$$

Where $i = 0$ is the status quo and $i = 1$ is the condition where the environmental goods and services are supplied. Utility is a function of income y_j, and z_j is a multi-dimensional vector of individual characteristics and attributes of the choice and ε_{ij} is the unobservable component of preferences.

When respondents are willing to pay and say "yes" to pay t_j if the utility with the environmental enhancement program exceeds utility of the status quo:

$$u_{1j} = u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_o(y_j, z_j, \varepsilon_{oj}) \quad \text{(B.2)}$$

However, it is possible to make probability of a "yes" or "no" answer due to unknown random part of preferences. Therefore, respondent *j* can be:

$$\Pr(\text{yes}_j) = \Pr[u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_o(y_j, z_j, \varepsilon_{oj})] \quad \text{(B.3)}$$

$$\text{Or } \Pr(\text{yes}_j) = \Pr[u_1(y_j - t_j, z_j) + \varepsilon_{1j} > u_o(y_j, z_j) + \varepsilon_{oj})] \quad \text{(B.4)}$$

Equation (B.4) give the point of departure for all functions of the random utility, in which the Linear utility function is the simplest and most commonly estimated function (B.1). When utility function is linear, it means that this function is linear in income and covariates:

$$v_{ij}(y_j) = \alpha_i z_j + \beta_i (y_j) \quad \text{(B.5)}$$

where α_i is an m-dimentional vector of parameters

With the status quo utility:

$$v_{oj}(y_j) = \alpha_o z_j + \beta_o (y_j) \quad \text{(B.6)}$$

With the required payment t of the proposed CV scenario:

$$v_{1j}(y_j - t_j) = \alpha_1 z_j + \beta_1 (y_j - t_j) \quad \text{(B.7)}$$

$$\text{(B.7)} - \text{(B.6)} = v_{1j} - v_{oj} = (\alpha_1 - \alpha_o) z_j + \beta_1 (y_j - t_j) - \beta_o y_j \quad \text{(B.8)}$$

Due to the marginal utility of income is constant, $\beta_1 = \beta_o$ and $\alpha_1 - \alpha_o = \alpha$, the utility difference becomes:

$$v_{1j} - v_{oj} = \alpha z_j - \beta t_j \quad \text{(B.9)}$$

Therefore, the probability of responding yes becomes:

$$\Pr(yes_j) = \Pr(\alpha z_j - \beta t_j + \varepsilon_j > 0) \quad \text{(B.10)}$$

where $\varepsilon_j = \varepsilon_{1j} - \varepsilon_{oj}$

From (B.9) and (B.10), WTP can be defined as:

$$WTP_j = \alpha z_j/\beta + \varepsilon_j/\beta \quad \text{(B.11)}$$

With $\varepsilon = 0$, mean WTP is estimated as below:

$$Md_\varepsilon(WTP_j/\alpha, \beta, z_j) = \alpha z_j/\beta \quad \text{(B.12)}$$

List of abbreviations

Abbreviation	Meanings
BLVI	Bach Long Vy Island
WTP	Willingness to pay
WTA	Willingness to accept
CVM	Contingent valuation method
TCM	Travel cost method
IMER	Institute of Marine Environment and Resources