VALUING LOCAL RESIDENTS' WILLINGNESS TO PAY FOR THE CONSERVATION OF CAT BA MARRINE NATIONAL PARK, VIETNAM

HANG, N. D.[1] – HUONG, T. T. L.[2*] – DAT, T. T.[3] – TRUONG, D. D.[1] – HUAN, L. H.[1]

[1]Faculty of Environmental, Climate Change and Urban Studies, The National Economics University (NEU), Vietnam

[2]Faculty of Economics, NEU, Vietnam

[3]French Vietnamese Centre for Education Management (CFVG), NEU, Vietnam

[*]Corresponding author
e-mail: lanhuong@neu.edu.vn

Abstract. This article uses the Contingent Valuation Method to estimate the willingness of local residents to pay for the ecosystem conservation program in Cat Ba Marrine National Park, Vietnam. The primary data in the article were collected through direct interviews with 585 households living in the Park's buffer zone. The analysis results show that about 74% of the respondents are willing to pay for the conservation of the Park and average payment level is 97,000 VND/household/month (4 USD) which is close to 0.63% of the average household income. Research also indicates that if the respondents have better ecological value perception, they are more likely to contribute to the conservation program, or if the respondents know that people around them participate in the project, they will be more inclined to participate and contribute. As the payment levels increase, probability of willingness to pay decreases. The study presents a community case study on payment for conservation in marine protected areas in a developing country, Vietnam. It also provides some implications for better management of Cat Ba Marrine National Park including improving social network, better access to management information, more communication and technical support for community to participate in conservation activities.
Keywords: *protected area, community, perception and attitude, households, payment, bids, Contingent Valuation Method, biodiversity conservation, Binary Logit Regression*

Introduction

Protected area (PA) is a special region of land or sea dedicated to the protection and maintenance of biological diversity and natural resources, combined with the protection of cultural resources, and managed by legislation or other effective means (Carson, 2001; Le and Nguyen, 2019). In a narrow sense, a nature reserve, also known as a nature reserve and habitat species conservation area, is a natural area established for the purpose of ensuring natural ecological succession. PAs in developing countries are facing serious threats from environmental pollution, livelihood activities, land use conversion, infrastructure construction and tourism development. These threats pose urgent requirements for coordination among state agencies, local authorities, civil society organizations and people for sustainable management of protected areas (Le and Truong, 2019; Mohammadi et al., 2019).

In Vietnam, national parks (NP) and PAs play an important role in biodiversity conservation and community livelihood development. In 2020, the Government issued Decision 742/QD-TTg approving the planning of the system of marine protected areas in Vietnam to 2020 with a list of 16 marine protected areas. Up to now, Vietnam has

established and put into operation a network of 10 out of 16 MPAs, including: Cat Ba, Bach Long Vy, Con Co, Cu Lao Cham, Ly Son, Nha Trang Bay, and Nui Chua. Hon Cau, Con Dao, Phu Quoc. Six marine protected areas have completed detailed planning and are completing documents for planning approval: Hon Me, Hai Van-Son Cha, Phu Quy, Nam Yet, Co To, and Dao Tran (Dat et al., 2018).

According to the General Department of Seas and Islands (2020), this system of marine protected areas occupies an area of about 0.24% of Vietnam's sea area. The marine protected areas own nearly 70,000 hectares of coral reefs, 20,000 hectares of seagrass beds and a part of mangroves; most of the breeding grounds, spawning grounds and habitats of economic aquatic species; nearly 100 endemic and endangered species. All 16 marine protected areas of Vietnam are concentrated in the coastal regions; the furthest is Nam Yet marine protected area in Truong Sa Island district, Khanh Hoa province.

Currently, the threat to Vietnam's marine biodiversity is increasing along with population growth and expansion of economic and marine activities. Destructive fishing methods, unreasonable development of economy and industries, etc., combined with poor human awareness have reduced marine biodiversity. Preliminary assessment shows that in the past 50 years, Vietnam has lost up to 80% of its mangrove area. Depending on the period, this area has recovered poorly, and mangroves are always threatened to continue to shrink. Coral reefs have been reduced in both quality and coverage. Particularly in the North Sea, the area of coral reefs has decreased from 25% to 30%. About 85% of coral reefs that survive are of poor or bad quality. Among the 10 major seagrass concentration areas such as Tam Giang and Phu Quoc, some areas have also been significantly reduced (Le and Nguyen, 2019; Cat Ba MNP, 2021).

This study uses the Contingent Valuation Method (CVM) to estimate people's willingness to pay (WTP) for Cat Ba Marine National Park (CBMNP) conservation project in Vietnam. Robert (1963) first used the CVM method in the early 1960s to estimate the benefits of outdoor recreation in the Maine forest. Then, Ridker (1971) applied the CVM method to air pollution problems. Since 1970, many economists have widely applied this method to measure the benefits of environmental goods such as recreation, hunting, water quality, and reduced risk of accidental death by nuclear power plants and hazardous waste dumps (Carson, 2001; Wattage, 2002; Kramer et al., 2003). In Vietnam, several previous studies use the CVM method to estimate the value of forests directly through contributing to a conservation project or indirectly through the conservation of rare animals. Tong and Tran (2010) assessed the community's awareness of the Red-crowned Crane conservation using the CVM method. The study surveyed 410 households in Can Tho city. The average WTP is estimated at 12,222 VND/household for the Red-crowned Crane conservation (although donating money to endangered animals is relatively new in Vietnam). Paschke et al. (2016), Khai and Yabe (2014), Kaida and Dang (2014), Thuy et al. (2013) also used the CVM method to assess urban people's WTP for biodiversity conservation in wetlands in Vietnamese NPs and MPA.

In general, a few previous studies have used the CVM method to estimate the value of a marine NP conservation project to update more data as a more solid basis for policy formulation. This study was carried out on current MPA conservation to provide and contribute more information about people's current perceptions and preferences for conserving ecosystems. At the same time, this article also contributes to the quoted value of environmental goods valuation in Vietnam by the CVM estimation method.

Study site

CBMNP is located on the archipelago's largest island, 45 km east of Hai Phong, 25 km south of Ha Long, and about 150 kilometers southeast of Hanoi. Cat Ba is the gateway to the city, the center of biodiversity, geology, and natural landscape, and the city's tourist center (*Figure 1*).
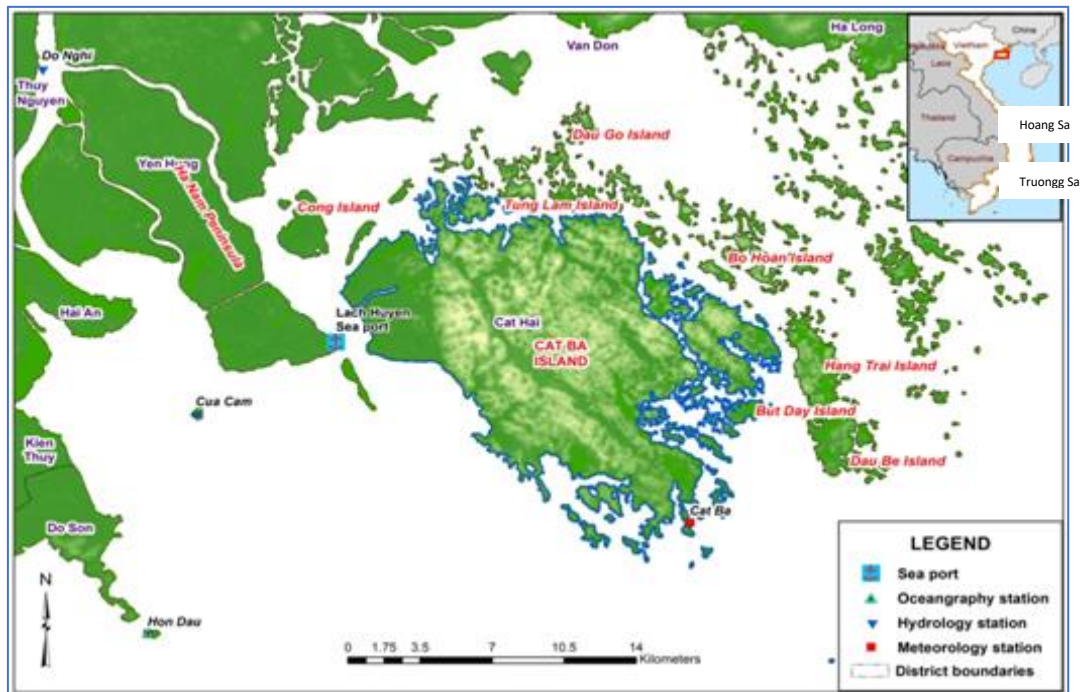

Figure 1. CBMNP in Vietnam

CBMNP is a center of high biodiversity in the world with global value, which the International Union has classified for Conservation of Nature (IUCN) (Dat et al., 2018). Typically, there are over 1,561 species of forest plants, 408 species of woody plants, 661 species of medicinal plants, and 203 species of ornamental plants; Forest fauna has 279 species, with 53 species of mammals, 160 species of birds, 66 species of reptiles; 274 species of insects. In addition, CBMNP also possesses a wealth and diversity of marine species with about 1,313 species with 196 species of marine fish, 538 species of benthic animals, 89 species of zooplankton, 189 species of phytoplankton, over 75 species of seaweed and 193 species of coral. Thus, it can be seen that, although it cannot be quantified in monetary terms, the value of biodiversity is considered an invaluable asset that nature has bestowed on CBMNP. The Park also has many rare endemic species with high conservation values (Cat Ba MNP, 2021).

In addition to biodiversity values, many majestic natural landscapes such as cave systems, famous monuments, historical sites, and unique limestone mountain systems with many distinct shapes creating unique landscapes; these values have become the main source for Hai Phong to develop tourism. With the rare values of biodiversity and the benefits that the National Park has brought, over the years, the Government, Hai Phong City People's Committee, agencies, domestic and international scientists, and

non-government organization (NGOs) have paid attention to the construction and development of the National Park.

Cat Ba is an attractive tourist destination in the North of Vietnam. Statistics of the first 7 months of 2022, the total number of tourists to Cat Ba is estimated at 1,556,756 arrivals, reaching more than 100% of the 2022 plan. In which, international visitors are estimated at 20,588 arrivals; domestic tourists are estimated at 1,536,168 arrivals. Total revenue from accommodation and catering services is estimated at more than 1,405 billion VND (Hai Phong Statistic Office, 2021).

For the first time in the Asia-Pacific region, the biosphere reserve Cat Ba archipelago was built in the National Park as a "Learning Lab" for sustainable development based on approaches to systems thinking, landscape planning, interdisciplinary coordination, and quality economics. This is also a place to implement the ideas of harmoniously combining "preservation for development" and "development for conservation" according to the principles of sustainable development (Dat et al., 2018).

In order to promote activities towards sustainable development, Hai Phong City built the Cat Ba Biosphere Fund to mobilize financial resources for conservation and sustainable development. Besides, the city has developed a sustainable conservation plan for CBMNP until 2030. Accordingly, the goal of protecting, restoring, and developing fauna, flora, and natural landscape resources has been determined within the management scope of CBMNP on a total planning area of 17,362.96 hectares (Cat Ba MNP, 2021).

In order to preserve biodiversity associated with development, CBMNP also raises the community's awareness and responsibility for protecting natural resources and the ecological environment, improving people's lives, and building models for sustainable socio-economic development of the locality. CBMNP effectively implements international cooperation such as coordination with organizations such as the langur conservation project; Center for Conservation of Marine Life and Communities (MCD) to contribute to the sustainable development of natural resources on the island.

CBMNP has a high level of biodiversity, but the conservation rate is low and has not been appropriately cared for and protected (Dat et al., 2018). According to the Institute of Forest Inventory and Planning research results, the leading cause of forest area decline is the conversion of forest land use purposes and over-exploitation of forest products (Dat et al., 2018; Cat Ba MNP, 2021).

Methodology and data

Valuation model

This study uses CVM model to estimate local people's WTP for conserving CBMNP. The basic theory of the CVM method approach was proposed by Hanemann (1998), Haab and McConnell (2002). This method requires answering a self-contained question, namely whether the respondent is WTP a certain amount to get a specific change to their status quo. Assume that the respondent is asked to consider the change from Q^0 to Q^1 (Q^1 refers to the value of the environmental good, and the latter choice may be preferred over the former choice). This is described by the respondent's utility function as follows $V = V\{P, Q, M, Z, \varepsilon\}$, where P is the price of all goods that exist in the market, and M is the income of respondent, Z is the respondent's socio-economic characteristics, and ε is the random unobserved component of the utility function (Hanemann, 1984, 1994; Sudman

et al., 1991). Then if the respondent is asked if they are WTP an amount t for the value of Q^1, their answer is "yes" with the following condition:

$$\Pr(yes) = Pr\{V(P, Q^1, M - t, Z) + \varepsilon_1 > V(P, Q^0, M - 0, Z + \varepsilon_0\}$$
$$= Pr\{V(P, Q^1, M - t, Z) - V(P, Q^0, M - 0, Z + \varepsilon_1 - \varepsilon_0 > 0\} \quad \text{(Eq.1)}$$

In which, ε_0 and ε_1 are the unobservable components of the utility function, have zero expected value, and have a defined distribution. If $\Delta V = V(P, Q^1, M - t, Z) - V(P, Q^0, M - 0, Z)$, and $\gamma = \varepsilon_1 - \varepsilon_0$, *equation (1)* becomes:

$$\Pr(yes) = Pr\{\gamma > -\Delta V) = 1 - F_\gamma(-\Delta V) = F_\gamma(\Delta V)\} \quad \text{(Eq.2)}$$

In which $F_\gamma(\Delta V)$ is the cumulative distribution function (CDF) of the respondent's greatest WTP.

The CVM method estimates the mean and median values of WTP based on the regression model's coefficient of freedom and the Bid variable's coefficient, along with the coefficients of the variables on the respondents' knowledge, attitudes, and other socio-economic characteristics. Probit and Logit models are commonly used to estimate WTP in the CVM method. This article uses the Logit model with the coefficient estimation formula presented as follows:

$$\Pr(yes) = F_\gamma(\Delta V) = \frac{1}{1 + \exp(-\Delta V)} = \frac{1}{1 + exp - (\alpha + \beta_1 BID + \beta_2 X)} \quad \text{(Eq.3)}$$

In which α and β are estimated coefficients, and BID is the contribution to the proposed conservation project in the questionnaire. The Logit model is estimated by the method of maximum likelihood estimation (MLE). R_k represents the kth observation:

$$\Pr(yes) = \Pr(R_k = 1) = \Pr(\gamma_k < \Delta V_k) = F_\gamma(\Delta V_k)$$
$$\Pr(no) = \Pr(R_k = 0) = \Pr(\gamma_k < \Delta V_k) = 1 - F_\gamma(\Delta V_k) \quad \text{(Eq.4)}$$

Therefore, the log-likelihood function is formed as follows:

$$\log L = \sum_{k=1}^{N}\{R_k F_\gamma(\Delta V_k) + (1 - R_k)\ln(1 - F_\gamma(\Delta V_k))\} \quad \text{(Eq.5)}$$

With the assumption that the relationship is linear in the model, the mean and median values of WTP are the same and are calculated by the following formula:

$$Mean\ WTP = Median\ WTP = -\frac{(\hat{\alpha} + \widehat{\beta_2}\hat{X})}{\widehat{\beta_1}} \quad \text{(Eq.6)}$$

Data collection

Primary data was collected by directly interviewing 585 households living in CBMNP buffer zone through a prepared questionnaire using the binary CVM method. The questions aim to assess the respondents' awareness, attitudes, and understanding of the

issue of NP protection and provide a hypothetical scenario for conserving the CBMNP ecosystem. The official survey was carried out in April and May 2022.

The investigation is divided into two main phases. The first phase is a pilot survey (test survey) which is essential in any randomized evaluation study (Bateman et al., 1995; Carson and Czajkowski, 2014; Khong et al., 2019). The purpose of this interview is to refine the questionnaire, make the starting price clearer and more accurate, and also help the interviewer understand the content of the questions. Approximately 55 households were interviewed during this period. The second phase was the post-pilot phase, the questions and rates were modified to match the real situation, and a total of 585 respondents were collected in the final survey (Khuc, 2013; Bhat and Sinha, 2016; Khong, 2020). Households were randomly selected in 5 communes in the CBMNP's buffer zone. First, the list of households was collected, then the households were clustered by communes and in each commune the interviewed households were randomly selected. The study applied the following formula to calculate sample size (Haab and McConnell, 2002).

$$n = \frac{N}{1 + Ne^2} \qquad \text{(Eq.7)}$$

where, n is the sample size, N is the total number of households of the population, e is accepted errors.

The questionnaire consists of 4 main parts. The first part provides opinions and information on the conservation of the CBMNP. Respondents will express their attitudes and perceptions about these ideas by choosing one of five levels on the Likert scale. The second part introduces five questions related to CBMNP such as the CBMNP area, the biodiversity of CBMNP and the threats to CBMNP. The third part is a description of the hypothetical scenario and critical questions. At the end of the questionnaire, the respondent's socio-economic information, including age, education, income, and the number of family members were collected.

The hypothetical scenario is as follows: Assume that the People's Committee of Hai Phong (provincial government) will establish the CBMNP Ecosystem Conservation Fund (CBNPECF) with the contributions of local people residents. The donation will be annual and is the amount added to the monthly water bill. This amount is only used for CBNPECF to:

(1) Make a plan to develop the national park, a system of green trees in the area to increase the cover area and protect the CBMNP from threats such as pollution, degradation;

(2) Promote investment in monitoring systems to create favorable conditions for conservation;

(3) Cooperate with agencies and organizations to conserve biodiversity to improve the general conservation at CBMNP;

(4) Strengthening the management of NPs and conserving biodiversity through programs to protect and restore the NPs' ecosystems and improve the capacity to enforce national laws and regulations on the protection and development of natural resources of the national park;

(5) Implement livelihood projects to gradually improve the lives of people around CBMNP.

This scenario is followed by a WTP question and some brief follow-up questions about the certainty of respondents' answers and why they are willing or unwilling to pay. Five different values of 30,000 VND, 60,000 VND, 90,000 VND, 120,000 VND, and 150,000 VND were selected for the study. Each household was randomly asked whether they would be willing to contribute one of these price values. The CVM question has the following form "Are you WTP … VND per month to the National Park Conservation Fund to preserve the ecosystem of CBMNP annually?" Responding to "yes" or "no" answers, respondents were asked why. In addition, if respondents answered yes, they would be asked a maximum price to pay for the conservation project.

Results and discussions

Socio-economic characteristics of sample

Table 1 shows characteristics of the sample. The rate of male and female is 61% and 39%. The average time of staying in the area of households is 38.1 years. The respondents are all Kinh ethnic. Education in study area is quite low. Respondents with secondary school are account for 76.9% and university level is only 2.7%. The average member of a household is 4.2. The biggest family has seven people and the least has two people. The average income per family is VND 94.6 million/year.

Table 1. Socio-economic characteristics of the respondents

Socio – Economic Variables	Value
Female	39%
Male	61%
Age (years)	42.1
Kinh group	100%
Duration of stay in the village (years)	40.2
Education (years of schooling)	7.1
Number of family members (person)	4.2
Total income of the household per year (million VND)	94.6
Main occupations	
Husbandry and gathering wood	2.3%
Farmers and fishing	91.7%
Service, trader, worker, office	2.9%

Source: data processed from survey (2022)

Most of families in the study area are farmers, doing rice cropping and fishing (91.7%). Other jobs have very low rate. About 4.8% of households do husbandary and gather wood, and about 3.5% households are doing other occupations such as local services, traders, workers, and office.

Community's perception on the importance of conserving the Park

Table 2 indicates results of local people's perception on the importance of conserving the values of CBMNP. Values for conservation include local livelihood maintenance, landscape and tourism value, biodiversity conservation value, disaster protection and value passing to future generations.

Table 2. *Perception on the importance of preserving values of CBMNP (% respondents)*

CBMNP values	Support livelihood	Provide landscape and tourism values	Biodiversity conservation	Disaster protection	Benefits for future generation
Not important	1.2	8.5	6.3	17.1	21.3
Neutral	15.2	35.2	18.4	55.5	12.3
Important	45.9	35.1	53.2	22.7	33.5
Very important	37.7	21.2	22.1	4.7	32.9

Source: data processed from survey (2022)

First, we assessed the community awareness on the roles of CBMNP for their livelihoods. About 37.7% of people say that the Park is very important for local livelihoods, 45.9% of villagers tell the Park is important for livelihood and 15.2% of respondent think CBMNP is fairly important. There is no one thinking that the Park is totally not important to support livelihood. More specifically, incomes from the CBMNP are account for a big share in interviewed households' income structure. About 48% respondent report that the Park bring about 35-50% of their family's total income, 25% people say that income from CBMNP accounts for 25-34% of the whole family income.

Local people have been living in the area for a long time (average 40.2 years per household). Because of that, they appreciated the importance of preserving CBMNP for their future generations. About 32.9% of respondents state that CBMNP conservation is very important for future generations, while 33.57% think it is important. There are 21.3% of people have neutral perception, and only 12.3% say it is not important to conserve the Park for the next generations.

Landscape and tourism values are also appreciated highly by local people for the need of conservation. As 21.2% of people rate preserving these values as important, and 35.1% consider its very important. Recently, CBMNP has become an attractive visit area in the North of Vietnam. This area brings about income to local people. Therefore, they appreciate the importance of conserving this value.

Interestingly, the Park's value on disaster protection is less appreciated by local residents. Only 4.7% considered disaster protection is very important and 22.7% says it is important, while 55.5% states a neutral awareness and 17.1% think it is not important. Probably, this ecological functions is less tangible, so perception of its important role is not highly valued by respondents, although the people partially perceive the existence of this value (*Figure 2*).

Estimation of residents' payment for conserving the Park

After answering a series of questions to assess perception and attitude of local people about the conservation of values of CBMNP, the study presented a hypothetical situation: If a management project is going to be implemented for conservation of the Park, how much are residents WTP for the program? *Table 3* shows people's willingness and unwillingnes for the conservation of CBMNP at different prices. The results show that the percentage of respondents WTP for the conservation of the NP ecosystem decreases as the price level increases. Specifically, 94.87% are WTP the price of 30,000 VND; 86.32% of the respondents agree to pay the price of 60,000 VND, and only 50.43% agree to pay the price of 150,000 VND.
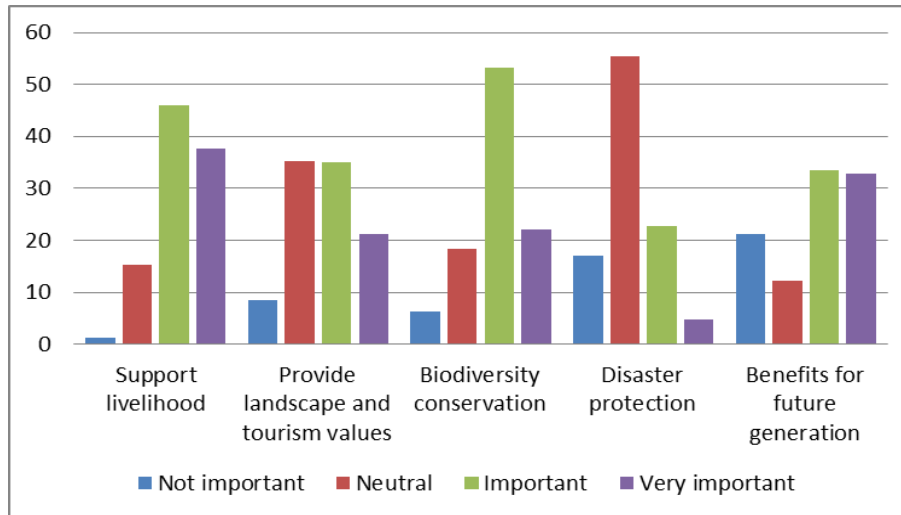
Figure 2. *Perception on the importance of preserving values of CBMNP (% respondents).
Source: data processed from survey (2022)*

Table 3. *WTP and not willing to pay for the conservation project of CBMNP*

Bid	Observations	Willling to pay		Not willling to pay	
		Frequency	**Percentage**	**Frequency**	**Percentage**
30,000	117	111	94.87	6	5.13
60,000	117	101	86.32	16	13.68
90,000	117	87	74.36	30	25.64
120,000	117	73	62.39	44	37.61
150,000	117	59	50.43	58	49.57
Total	585	431	73.68	154	26.32

Source: data processed from survey (2022)

Reasons for WTP for the conservation of the CBMNP's ecosystem are summarized in *Table 4*. The survey results show that 431/585 respondents are WTP, accounting for 73.68% for the ecosystem conservation project of CBMNP. The reason for being WTP for the CBMNP ecosystem conservation project that the respondents were most interested in and chose was "I want to preserve the CBMNP ecosystem because this is the "green lung of the northern Vietnam" with the percentage of 88.4%. Next is the reason "I want to preserve CBMNP for future generations," with 301/431 respondents, accounting for 69.84%. Besides, some other reasons given by the respondents were that after the NP fire and the events of encroachment on the NP and exploitation of CBMNP, this area should be preserved and conserved for the common benefit of the whole community.

Table 5 shows that out of 154 respondents who are not WTP for the contribution given in the questionnaire, only 26 are not WTP anymore, accounting for 16.88%. Besides, up to 128/154 respondents (83.12%) agree to pay a lower amount than the amount given in the questionnaire. Specifically, 21.43% of the respondents agree to pay less than 30,000 VND, the highest is at 30,000 VND - 90,000 VND with 91/154 (accounting for 59.09%) of the respondents agree to pay, and above 90,000 VND have four respondents are WTP, accounting for 2.6%.

Table 4. *Reasons for WTP for the conservation of the CBMNP project*

Reasons	Frequency	Percentage
I want to preserve the ecosystem of CBMNP because this is the green lung of Vietnam's Gulf of Tonkin region.	381	88.40
I want to preserve CBMNP for future generations	301	69.84
I want to contribute because I care about the people whose life depends on products and services from CBMNP	176	40.84
I want to contribute because products and services from CBMNP could meet the needs of facilities and income for residents	202	46.87
I have never been to CBMNP, but I am willing to contribute so that I have a chance to visit in the future	187	43.39
I contribute because plants and animals in CBMNP have the right to survive and develop in both the present and future	218	50.58
This is my duty of conscience to preserve CBMNP	190	44.08
Others	26	6.03

Source: data processed from survey (2022)

Table 5. *Reasons for not willling to pay for the conservation of the CBMNP*

Reasons	Frequency	Percentage
I cannot afford to pay and contribute	89	57.79
I think it is not essential to conserve the ecosystem in CBMNP	19	12.34
I do not believe my contribution will solve the problem	70	45.45
I think the conservation will be done without my contribution	55	35.71
I do not trust my donation to be used for conservation at CBMNP	68	44.16
I get no benefits from this donation	31	20.13
Others	8	5.19

Source: data processed from survey (2022)

Table 6 shows that the respondents are unWTP for the CBMNP ecosystem conservation project, with the highest percentage of 57.79%, 89/154 respondents saying that they cannot afford to pay an amount added to the water bill for the conservation of the CBMNP. They felt the amount in the questionnaire was too high compared with their financial capability. Most respondents said that their family had many expenses, and their income was barely enough to cover the family's daily needs. The second reason is "I do not believe that my contribution will solve the problem" (45.45%); most respondents believe that contributing to this fund cannot solve the growing degradation problem of the CBMNP. Next, 44.16% chose the reason "I do not trust my donation will be used for CBMNP conservation". Besides, eight respondents are giving other reasons for being not willing to pay. Even though they can afford to pay, they feel that this amount is not suitable to contribute, and their monthly water bill is too much, so they do not agree to pay more.

Table 7 presents information about descriptive statistics of the variables included in the Logit model. *Table 6* shows results from logit regression model to estimate WTP.

Table 7 presents the results of Logit regression for two models. Specifically, model 1 estimates the willingness-to-pay variable with only one independent variable, which is the amount of contribution that the program offers (Bid); model 2 estimates the willingness-to-pay variable with independent variables, including the respondent's characteristics and other important variables affecting the respondent's ability to pay for the protection of the NP.

Table 6. *Descriptive statistics of variables in the Logit regression model*

Variables	Description	Mean	Standard deviation
Probability	WTP for the conservation project of CBMNP (1= yes, 0= no)	0.579	0.501
Bid	The offered price amount for conservation (1.000 VND)	83	38.467
Knowledge*	Value ranged from 0 to 5	2.674	1.492
PubSer	Dummy variable; 1= public servants, 0 = other jobs	0.5	0.43
Age	Age at the time of being surveyed	42.141	9.231
Edu	Value ranged from 1 to 18 years	7.153	3.12
Gender	Dummy variable; 1=male respondent, 0=female respondent	0.61	0.503
Income	Monthly household income (millionVND)	7.883	5.029
Marriage	Dummy variable; 1 = married; 0 = single	0.719	0.245
FamMem	Total number of family members (person)	4.201	1.296
Waterbill	The average amount paid for water bill per month (1,000 VND)	153.291	115.202
Trend	Dummy variable; 1 = respondents tend to pay following others; 0 = respondents do not tend to pay following others	0.829	0.492

* Respondents will be asked five questions about information and knowledge about CBMNP, 1 point for the answer "I know a lot", 0.5 points for "I know little," and 0 points for "I do not know". Source: data processed from survey (2022)

Table 7. *The logit regression model results in WTP for the conservation project of CBMNP*

Variables	Model 1		Model 2		
	Coefficient	Standard error	Coefficient	Standard error	dy/dx
Bid	-0.0292*	0.0057	-0.0499*	0.0193	-0.0029*
Knowledge			0.6291**	0.2942	0.0482**
PubSer			2.6921**	1.1013	0.3102**
Age			-0.0983**	0.0429	-0.0073**
Edu			0.5031*	0.2011	0.0682*
Gender			0.694	0.402	0.0712
Income			-0.0039	0.0482	-0.0002
Marriage			1.8202**	0.8021	0.2013**
FamMem			-0.392***	0.1936	-0.0492***
Waterbill			-0.0049**	0.0031	-0.0004**
Trend			3.0139*	0.903	0.388*
Block coefficient	2.0193*	0.502	0.3056	3.0291	
Log-likelihood	-91.2042		-49.0294		
Pseudo R^2	0.5913		0.4928		
Percent correct prediction (%)	68.392		84.294		
Mean WTP (95% CI)	98,429 VND (83,580 – 133,390 VND)		96,401 VND (85,201 – 112,492 VND)		

95% CI: The 95% confidence interval was estimated using the Krinsky and Robb method (1986); ***, **, and * at the 1%, 5%, and 10% significance levels, respectively. Source: data processed from survey (2022)

Before performing the regression, the problem of multicollinearity was checked. The results show that the models are not multicollinear because the correlation coefficient

between the independent variables is less than 0.7 (Khai and Yabe, 2014). The coefficients of Pseudo R^2 in models 1 and 2 are 0.5913 and 0.4928, relatively large. However, the Pseudo-R^2 coefficient in this model does not entirely explain the model's fit, so it is necessary to consider the model's explanatory accuracy (percentage of correct prediction of the model). The analysis results show that the percentage of correct prediction of model 1 is 68.392% and model 2 is 84.294%, so it can be assessed that the correct prediction ability of the two models is relatively proper and acceptable.

The coefficients of the Bid variable model 1 and 2 have a negative effect on the WTP. They are statistically significant at 1%, showing that the higher the contribution amount, the lower the percentage of respondents WTP in both models, which should be consistent with the demand curve theory. *Formula 6* is used to estimate the average willingness of locals to contribute to the CBMNP conservation project. The estimated results show that the willingness to contribute to the protection of the NP in model 1 and model 2 is 98,429 VND and 96,401 VND per month, respectively, proves that the project is accepted by the locals as expected if the NP conservation program is established.

Table 7 shows the coefficients of 9 statistically significant variables in model 2. In which variables have a negative relationship with WTP, including level of payment (Bid), age of respondents (Age), number of family members (FamMem), water bill (Waterbill), tendency to pay (Trend), variables that are positively related are respondents' knowledge about CBMNP (Knowledge), public servants (PubSer), respondent's education level (Edu), marital status (Marriage).

Discussions

NPs are recognized as centers of biodiversity conservation in the world and in Vietnam, so they receive special attention and need effective conservation mechanisms, especially financing mechanisms. This study estimates community contribution to conservation of ecological values at an MNP in Vietnam. The study uses the CVM method to estimate the WTP level and the factors affecting the WTP level. Research indicates that 74% of people are willing to sacrifice part of their income to preserve the CBMNP. This result is consistent with many other studies around the world on the community's willingness to pay for MPA conservation (Baral et al., 2008; Larson et al., 2015; Lal et al., 2017). It is important that people pay not only to maintain the benefits of the present generation but also to want the benefits of MPA to be passed on to future generations. Parallel to this research, similar results were found by other studies (Carson et al., 2001; Dat et al., 2018; Pedroso and Kungu, 2019).

Research shows that as the level of bids is higher, the probability of willingness to pay decreases. The results also show that older people are willing to pay more for conservation. This result is consistent with the findings by Khai and Yabe (2014), Platania et al. (2018) but inconsistent with the findings by Dat et al. (2018) and Pedroso and Kungu (2019). Gender and household size had also significant effect on WTP. Lai et al. (2017) supported this result, but the inconsistent result was revealed in the findings by Kaida and Dang (2014).

Like the research results of Khai and Yabe (2014), the variable of information and knowledge about CBMNP (Knowledge) has a positive relationship with the WTP, so it is consistent with the model's expectations. This means that the respondents who know more about CBMNP are also more interested and more likely to contribute to the conservation project. The coefficient of the public servants variable (PubSer) is

statistically significant at 5%, showing that when the respondent is a public servant, the WTP for the project will increase by 31.02% if other factors remain unchanged.

Besides, the variable trend to pay (Trend) has a positive relationship with the WTP. The reason for this is that the respondents said that if everyone around them agreed to pay, they would also pay because of the "crowd effect," and some respondents said that if many people around have agreed, the policy or project would be effective, so they are WTP. Thus, when other factors remain unchanged, at a 1% significance level, if respondents know that more and more residents participate in paying for the project, their WTP will increase to 38.8%. Similar to the research results of Tong and Tran (2010), Phan and Tang (2014), the coefficient of the educational level variable (Edu) has a positive impact at the significant level. 10% shows that if the respondents' years of schooling increase, their WTP also increases. The remaining variables in the model that are not statistically significant are the variables (Gender) and income (Income), which shows that the acceptance of contributions to the project does not depend much on the gender and income level of the household (Kaida and Dang, 2014; Lai et al., 2017).

Conclusions

The paper uses the CVM method to estimate the WTP of local residents in CBMNP for the CBMNP conservation project. The survey results show that the percentage of respondents WTP for the NP conservation project is relatively high at about 74%, and the average Bid of WTP for the project is about 97,000 VND/household/month, accounting for about 0.63% of the average household income. This study also finds that the participation trend of people around has a substantial impact on people's WTP for the project. If the respondents know that the more people participate in the conservation project, the more likely they will participate, and their WTP increases by about 39%. Besides, if the respondents are government employees or public servants, their ability to pay for the project increases by about 31%. In addition, the study does not have enough evidence to show the influence of factors such as gender and income on the WTP of urban residents in Hai Phong city.

Through the results of the actual survey, the author makes some recommendations to improve the peformance of CBMNP conservation as follows:

- Local authorities need to regularly update information about CBMNP, including its biodiversity, the current status of CBMNP, and the threats that the National Park is facing in mass media. Therefore, residents improve their understanding of CBMNP, forming a sense of protection of CBMNP among the community.

- The project management board needs to disclose revenue and expenditure, announce the project purpose transparently, and the activities that will be implemented when the project is launched, showing the benefits that people enjoy when the project is implemented. Currently, the results achieved after the project are in place to create confidence for people to contribute to the project because most people do not believe that their contribution will solve the problem and that the amount of their contribution is used for the proper purposes. For example, after the first year, the project management board must report on the progress of each stage of implementation and the results achieved, publicize the conservation fund's finances on the mass media, and encourage people to continue participating in the project implementation.

- Promote propaganda and dissemination about the project of preserving the ecosystem of CBMNP and the values that the national park brings to the community in the present and the future when the project is implemented. Thereby mobilizing and attracting many people's interest, participating in the NP conservation project will create a "crowd effect". When people see many people around them participating, they will tend to participate in the project then the project will have more people involved.

REFERENCES

[1]   Baral, N., Stern, M. J., Bhattarai, R. (2008): Contingent valuation of ecotourism in Annapurna conservation area, Nepal: implications for sustainable park finance and local development. – Ecol. Econ 66: 218-227.

[2]   Bateman, I. J.., Langford, I. H., Turner, R. K., Willis, K. G., Garrod, G. D. (1995): Elicitation and truncation effects in contingent valuation studies. – Ecolol. Econ 12(2): 161-179.

[3]   Bhat, M., Sinha, A. (2016): Williness to pay for preserving national park biodiversity: a case study economy. – Journal of Management 3: 102-107. 10.20448/journal.502/2016.3.2/502.2.102.107.

[4]   Carson, R. T., Flores, N. E., Meade, N. F. (2001): Contingent valuation: controversies and evidence. – Environ. Resour. Econ 19: 173-210. 10.1023/A:1011128332243.

[5]   Carson, R. T., Czajkowski, M. (2014): The discrete choice experiment approach to environmental contingent valuation. – In: Hess, S., Daly, A. (eds.) Handbook of Choice Modeling. Cheltenham: Edward Elgar Publishing.

[6]   Cat Ba Marine National Park (2021): Conservation Plan for 2020-2030 period. – Vietnam.

[7]   Dat, P. T., Kaida, N., Yoshino, K., Huu, N. X., Dieu, B. (2018): WTP for mangrove restoration in the context of climate change in the Cat Ba biosphere reserve, Vietnam. – Ocean Coast Manag 163: 269-277. 10.1016/j.ocecoaman.2018.07.005.

[8]   General Department of Seas and Islands (2020): Marrine protected area systems in Vietnam. – Hanoi, Vietnam.

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

[10]   Hai Phong Statistic Office (2021): Hai Phong statistics yearbook 2021. – Vietnam.

[11]   Hanemann, M. (1984): Welfare evaluations in contingent valuation experiments with discrete responses. – Am. J. Agric. Econ 66: 103-118.

[12]   Hanemann, M. (1994): Valuing the environment through contingent valuation. – J. Econ. Perspect 8: 19-43.

[13]   Hanemann, W. M., Kanninen, B. (1998): The Statistical analysis of discrete-response data. – Working Paper No.798. Department of Agricultural and Resource Economics and Policy, University of California, Berkeley.

[14]   Kaida, N., Dang, N. A. (2014): Economic valuation of the Nha Trang Bay marine protected area: a willingness to pay survey on the conservation. – Progr. J. Environ. Inf. Sci 24: 33-40.

[15]   Khai, H. V., Yabe, M. (2014): Choice modeling: assessing the non-market environmental values of the biodiversity conservation of swamp forest in Vietnam. – Int. J. Energy Environ 5: 1-8. 10.1007/s40095-014-0077-5.

[16]   Khai, H. V., Yabe, M. (2014): The demand of urban residents for biodiversity conservation in U Minh Thuong National Park, Vietnam. – Agric. Food Econ 2(1): 10-20.

[17] Khong, T. D., Loch, A., Young, M. D. (2019): Inferred valuation versus conventional contingent valuation: a salinity intrusion case study. – J. Environ. Manag 243: 95-104. 10.1016/j.jenvman.2019.05.009.

[18] Khong, T. D., Loch, A., Young, M. D. (2020): Perceptions and responses to rising salinity intrusion in the Mekong River Delta: what drives a long-term community-based strategy? – Sci. Total Environ 711: 134759. 10.1016/j.scitotenv.2019.134759.

[19] Khuc, Q. (2013): Household's willingness-to-pay estimation for safe drinking water: A case study in Vietnam. – Env Management 7(5): 23-34.

[20] Kramer, R., Holmes, T., Haefele, M. (2003): Contingent valuation of forest ecosystem protection. – Forest Management 8: 303-320. 10.1007/978-94-017-0219-5_17.

[21] Krinsky, I., Robb, A. (1986): On approximating the statistical properties of elasticities. – Rev. Econ. Stat 68(4): 715-719.

[22] Kyophilavong, P., Inthakesone, B. (2018): Estimating the willingness of urban residents in Khammouane Province to pay for the Hinnamno National Protected Area. – Env Protection 24(3): 17-33.

[23] Lal, P. (2017): Valuing visitor services and access to protected areas: the case of Nyungwe National Park in Rwanda. – Tourism Manag 61: 141-151.

[24] Larson, E. R., Howell, S., Kareiva, P., Armsworth, P. R. (2015): Constraints of philanthropy on determining the distribution of biodiversity conservation funding. – Conserv. Biol 30(1): 206-215.

[25] Le, K. N., Truong, D. K. (2019): Trade credit use by shrimp farmers in Ca Mau province. – Journal of Economics and Development 21(2): 270-284. doi:10.1108/JED-09-2019-0030.

[26] Le, T. N. P., Nguyen, K. H. (2019): Impact of removing industrial tariffs under the European–Vietnam free trade agreement: A computable general equilibrium approach. – Journal of Economics and Development 21(1): 2-17. 10.1108/JED-06-2019-0011.

[27] Mohammadi, L. S., Safari, G., Mohammadi, M. G. (2016): Recreational values of forest park using the contingent valuation method (case study: Saravan Forest Park, north of Iran). – J. For. Sci 62: 452-462.

[28] Paschke, M., Khuc, Q., Alhassan, M., Tran, T., Loomis, J. (2016): Estimating urban households' willingness-to-pay for upland forest restoration in Vietnam. – Forest Management 57(2): 18-29. 10.4236/ojf.2016.63016.

[29] Pedroso, R., Kungu, J. B. (2019): Tourists' willingness to pay for upstream restoration and conservation measures. – J. Sustain. Tourism 27(8): 1107-1124.

[30] Phan, D. K., Tang, T. N. (2014): The willingness of the Mekong Delta people to contribute to the biodiversity conservation program at Bac Lieu bird park. – J. Sci. Dev 208: 17-26.

[31] Platania, M., Rizzo, M. (2018): Willingness to pay for protected areas: a case of Etna Park, Italy. – Ecol. Indicat 93: 201-206.

[32] Ridker, R. G. (1971): Economic costs of air pollution studies. – The US Praeger Publishers, USA.

[33] Robert, K. D. (1963): The value of outdoor recreation: an economic study of the maine woods. – Ph.D. dissertation, Harvard University.

[34] Sudman, S., Mitchell, R., Carson, R. (1991): Using surveys to value public goods: the contingent valuation method. – Contemp. Sociol 20: 243. 10.2307/2072944.

[35] Thanh, N. T., Pham, V., Tenhunen, J. (2013): Linking regional land use and payments for forest hydrological services: A case study of Hoa Binh Reservoir in Vietnam. – Land Use Policy 33: 130-140. 10.1016/j.landusepol.2012.12.015.

[36] Thuy, P., Bennett, K., Vu, T. P., Brunner, J., Dung, N. D. (2013): Payments for forest environmental services in Vietnam: from policy to practice. – CIFOR. 10.17528/cifor/004247.

[37] Tong, Y. D., Tran, T. T. D. (2010): Assessing community awareness on Red-crowned Crane conservation. – Scientific Journal of Can Tho University 16: 32-41.

[38] Wattage, P. (2002): Effective management biodiversity conservation in Sri Lanka coastal wetlands: Literature Review. The UK University of Portsmouth.