VALUING COMMUNITY'S WILLINGNESS TO PAY FOR WETLAND CONSERVATION FUND TOWARD SUSTAINABLE FINANCING MECHANISM: A CASE OF RED RIVER ESTUARY, VIETNAM

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Abstract. Protecting and restoring wetland resources significantly improve the lives of people and contribute to climate change adaptation in Vietnam. With a long coastline, coastal wetland resources in Vietnam are very rich but are under serious pressure from development activities. This paper assesses the perception of households about wetland values and their willingness to pay for conserving wetlands by communities at Tien Hai Natural Reserve in the Red River estuary. The study used Contingent Valuation Method (CVM) for willingness to pay estimation. We implemented a survey of 450 households in the buffer zone of the reserve area. Research results showed that local villagers were highly aware of the importance of wetlands, especially the values of wetlands in livelihood supporting and future generation bequest. Community payment for wetland conservation was estimated at 280.1 VND thousand/household/year (1 USD = 24.500 VND) in parametric model and 275.1 VND thousand/household/year in non-parametric model. Bid levels, income, awareness, and education were the main factor affecting positively people probability of payment. The research also raised recommendations to help wetland managers selecting appropriate policies and mechanisms to conserve values of wetlands for communities and society.
Keywords: *attitude, conservation, contingent valuation method, sustainable finance, willingness to pay*

Introduction

Wetlands are a vital resource for human survival and development (IUCN, 2015. Barral et al., 2020, Dinh 2021, Hernandez et al., 2022). They comprise some of the most productive ecosystems worldwide and provide ecosystem services (ES) that provide numerous benefits to socio-economic systems (Macura and Rodriguez, 2011; Depondt and Green, 2016, Xu et al., 2020, Montico et al., 2023). Wetlands not only provide domestic water, food, medicine, fisheries, tourist attractions, but also contain many ecological values (Mamo 2015, Thi and Tran, 2021, Duc et al., 2022). However, the trend of disappearing and degrading wetlands is becoming increasingly serious. Wetlands are disappearing three times faster than forests, and more than 35% of wetlands have been degraded or disappeared since 1970 (Islam and Tai, 2017, Dinh 2021, Yoo et al., 2023). Because most of the ecological values of wetlands are difficult to directly observe and cannot be traded in markets, they are easily 'hidden' or underestimated in the resource use decisions of stakeholders (Engel and Stefanie, 2018, Dinh 2021). Therefore, the economic valuation of wetland ES is useful for national and local managers to monitor factors that affect changes in the quantity and value of wetlands in the short and long term, thereby

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selecting appropriate management tools towards sustainable use of this important ecosystem (Lunchs et al., 2015; Harris and Roach, 2018, Yoo et al., 2023).

In Vietnam, wetland occupies an important position in the national ecological structure, has a special function and role in the national development and is a critical sources of livelihood for local communities (Thi and Tran, 2021; Dinh, 2021; Duc et al., 2022). With a total area of nearly 12 million hectares, accounting for 37% of the total natural area, of which there are more than 7.3 million hectares of agricultural cultivation, the wetlands of Vietnam are the object of development of various industries, economic sectors, and regions (Prime Minister, 2016). For years, many wetlands have been inhabited for generations, creating civilization for the nation, especially the "water rice" civilization (Le and Truong, 2019). This is also a place for entertainment tourism, maintaining the ecosystem, creating an operating environment for many economic sectors such as fisheries, forestry, transportation, energy production, tourism, mining, etc. (Central, 2020). Despite their great roles and importance for communities, many wetland systems in Vietnam are being seriously declined for many reasons. More than 250,000 hectares of coastal mangroves have been lost due to urbanization, economic development, tourism, aquaculture and industrial pollution. These causes stem from inefficiencies and management resources, specifically lack of legal regulations, finance, human resources and information on the economic value of wetlands (Ngoc, 2018; MONRE, 2021; Dinh, 2021). To date, there have been very few studies on the economic value of wetlands in Vietnam as well as connecting research results with implications for managing these resources (Le and Nguyen, 2019; MONRE, 2021; Dinh, 2021).

In the Northern Vietnam, the wetland at THNR is of special economic and ecological significance (IUCN, 2015; Trung, 2020). This is a wetland estuary of the Red River flowing into the sea, with high economic and ecological value to the community and Vietnam (Prime Minister, 2016; Thi and Tran, 2021). Currently, this wetland is facing many threats from nature and humans. Many parts of the wetlands are shrinking, degraded, tarnished, unsustainable, and inefficiently exploited (Thi and Tran, 2021). Therefore, this study analyzes the wetlands resources of THNR, Thai Binh, as a basis for proposing solutions for the management, protection, and sustainable development of wetlands in the locality, as well as supplementing scientific data sources on wetlands in the country.

This study uses the Contingent Valuation Method (CVM) to estimate the economic value of wetland conservation and examines determinants affecting the willingness to pay (WTP) for wetland conservation at THNR. The study provides an empirical evidence on the economic value of wetlands in developing countries, specifically Vietnam. At the same time, we also discuss the implications towards sustainable wetland management in Vietnam from the research findings.

Methodology and Data

Valuation method and model development

Methods for estimating the economic value of ecosystems vary, depending on the nature of the ecological services. There are three main valuation techniques including real market estimation, reveal preference and state preference models (Ilija and Mayer, 2008; Cao, 2020).

To evaluate the conservation values of wetlands, CVM is the most commonly applied technique (Gessa and Vivas, 2016). It allows assessing non-market aspects of resources

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by constructing a hypothetical market using an interview questionnaire. CVM creates a management scenario allowing respondents to state their WTP to obtain a change in environmental quality (López, 2016, Cao et al., 2020).

CVM is built on the foundation of applied Random Utility Theory (RUM) founded by Hanemann (1994). This theory aims to model individuals' choices among distinct sets of alternatives. It is assumed that individuals' preferences among available alternatives can be established by a utility function. People choose the alternative to get the highest benefit. The utility of an alternative depends on the properties of that alternative and the properties that the alternative does not conform to. Observed attributes are represented as utility functions with explanatory variables. The unobserved component is random variables. Since utility is a random variable, one cannot use the model to predict with certainty an individual's choice. Instead, the random utility model gives the probability that alternative is selected (Hanemann, 1994; Marsh and Mkwara, 2010; Gessa and Vivas, 2016).

In the basic model of CVM, the indirect benefit function of the jth individual is expressed by the equation:

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

With i = 1 is the environmental status after improvement, i = 0 was the current status. The factors influencing the benefits of person j, including y_j,, that was the income of the person j, z_j was m-dimensional vector of socioeconomic features of person j, and ε_{ij} were unobservable factors. The function $u_{ij} = u_i(y_j, z_j, \varepsilon_{ij})$ represents the change in benefits from the current status to an improved status of environmental good quality [44].

Specifically, when environmental good quality increases from q^0 to q^1 status, person utility increase from $u_0(y_j, z_j, \varepsilon_{0j})$ to $u_1(y_j - t_j, z_j, \varepsilon_{1j})$.

Person j would have an "accept" answer with a payoff tj in case the benefits of improvements minus costs were greater than the initial benefit:

$$u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_0(y_j, z_j, \varepsilon_{0j}) \quad \text{(Eq.2)}$$

However, the researcher will not be able to observe the random part of the choice but can only predict the probability of acceptance or not. For the jth individual, this probability is:

$$\Pr(yes_j) = \Pr(u_1(y_j - t_J, z_J, \varepsilon_{1J}) > u_0(y_j, z_j, \varepsilon_{0j}) \quad \text{(Eq.3)}$$

From there, benefit equation could be written:

$$u_i(y_i, z_j, \varepsilon_{ij}) = v_i(y_j, z_j) + \varepsilon_{1j} \quad \text{(Eq.4)}$$

$v_i(y_j, z_j) = v_j(y_j, z_{j,} q_{ij,})$ with the integration of environmental dimension. Then:

$$\Pr(yes_j) = \Pr(v_1(y_j - t_j, z_J) + \varepsilon_{1j} > v_0(y_j, z_J) + \varepsilon_{0j} \quad \text{(Eq.5)}$$

$$\Pr(yes_j) = 1 - F_\varepsilon[-(y_j - t_j, z_j) - (v_0(y_j, z_j))] \quad \text{(Eq.6)}$$

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With normal distribution of F(x) = 1- F(-x) then:

$$\Pr(\varepsilon_j < \alpha z_j - \beta t_j) = \Pr\left(\theta < \frac{\alpha z_j}{\sigma} - \frac{\beta}{\sigma} t_j\right) \quad \text{(Eq.7)}$$

or

$$\Pr(yes_j) = [1 + \exp\left(-\left(\frac{\alpha z_j}{\sigma_L} - \frac{\beta t_J}{\sigma_L}\right)\right)]^{-1} \quad \text{(Eq.8)}$$

Experimentally, to estimate WTP in the parametric model, the binary regression model can be used with maximum likelihood estimation. The likelihood function becomes:

$$\begin{aligned} lnL(\alpha, \beta | y, z, t) &= \sum_{j=1}^{T} I_J \ln\left[\left(1 + e^{-\left(\frac{\alpha x_J}{\sigma} - \frac{\beta t_J}{\sigma}\right)}\right)^{-1}\right] \\ &+ \left(1 - I_j\right) \ln\left[1 - \left(1 + e^{-\left(\frac{\alpha x_J}{\sigma} - \frac{\beta t_J}{\sigma}\right)}\right)^{-1}\right] \end{aligned} \quad \text{(Eq.9)}$$

The parametric component {∝/σ,β/σ} could be estimated through a logistic model, then WTP is [44, 45]:

$$E_{\varepsilon}\left[WTP_j\right] = M_j\left[1 - \exp\left(-\frac{\alpha}{\beta} z_j + \frac{1}{2}\frac{\sigma^2}{\beta^2}\right)\right] \quad \text{(Eq.10)}$$

About experiment, we used binary logistic regression model to estimate the WTP for wetland conservation. It also analyses factors affecting the locals' affordability of different bidding level (BIDs). The estimated model is:

$$\begin{aligned} Probabily(Yes) &= \beta_0 + \beta_1 BID + \beta_2 GENDER + \beta_3 AGE \\ &+ \beta_4 EDU + \beta_5 MEMBER + \beta_6 INCOME \\ &+ \beta_7 KNOWLEDGE + \varepsilon \end{aligned} \quad \text{(Eq.11)}$$

Some research hypotheses are posed as follows (*Table 1*):

- BID level is inversely proportional to the WTP. The higher BID levels, the lower payout ratio (Macura and Rodriguez, 2011; Kondaji, 2016; Megaze, 2017; Cao et al., 2020).
- The higher the family size, the lower the WTP due to the higher expenditures for family members (Kipkeu and Mwangi, 2014; Mohammadi and Safari, 2016).
- Income also directly affects the level of payment. The higher the income, the higher the WTP for conservation (Susilo, 2017; Susilo and Takahashi, 2017; Pham et al., 2018; Zebardast and Majed, 2020).
- Older people are more aware of the role of wetlands by experiencing and being exposed to them for many years, thus paying higher rates (Zebardast and Majed, 2020).
- Respondents with higher education would have higher awareness and, therefore, pay a higher rate (Mamo, 2015; Mohammadi and Safari, 2016; Megaze et al., 2017).

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- Men are often the breadwinner and go to mangroves to exploit for livelihood, thus being more aware of wetlands' role, leading to higher conservation payments (Mamo, 2015; Zhu and Wei, 2019).
- People with a better knowledge about wetland value would pay more for conservation (Mahanta and Das, 2013; Mamo, 2015; Cao et al., 2020).

Table 1. *Variables in regression parametric model*

Variables	Description	Code
Pr (Yes)	WTP a specific amount of BID to preserve wetland	1= WTP 0=Not WTP
BID	Prices people are WTP (VND/year)	Specific levels
GENDER	Gender	1=Male; 0=Female
AGE	Age	Continuous variable
EDU	Years of schooling	Continuous variable
MEMBER	Number of family members	Continuous variable
INCOME	Household income (million VND/month)	Continuous variable
KNOWLEDGE	Respondents understanding of the value and benefit of wetlands	Continuous variable

Source: Research design (2024)

Data collection

The key of CVM is to develop a hypothetical protection scenario based on current information on the status and development of wetlands in the study area.

With supports of wetland experts and THNR managers, a conservation scenario was set up and showed to respondents. In this scenario, most common characteristics and ecological values of wetland were presented. Respondents then were introduced with threats to THNR (agricultural expansion, tourism, illegal logging, trade). These causes have led to a decline in biodiversity and ecological values in the region and if not properly managed, wetland quality will continue to decline. Hence, it is critical to have the participation of relevant parties, including local communitiess, to preserve wetland in THNR.

In order to determine the optimal BID levels, an open-ended trial survey (pre-test) was conducted before the official survey. This two-stage survey method allows for determining the lowest and highest prices for constructing closed-case scenarios in the official survey. The test results found that lowest BID level selected was 65,000 VND, while the highest level was 2,000,000 VND. However, there are 6 levels of BID that are chosen by 90% of people in the experimental survey and they are used for the official survey (100; 200, 300; 500; 700 and 1,000 thousand VND/year).

The survey is implemented in 5 villages in THNR buffer zone: Nam Thinh, Dong Minh, Dong Long, Dong Hoang, and Nam Phu. According to Statistical Yearbook (2021), those five communes had a total of 16,863 people. Requiring the allowable maximum error level of 5%, the author can calculate the number of samples interviewed as 435 according to formula (Gessa and Vivas, 2016).

$$n = \frac{N}{1 + N \times \varepsilon^2}$$

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Of which, n is the reliable sample size; N is total population, and ε is the allowable error. In this study, the number of interviewed households was 450. The survey sample was selected by stratification technique. On the first stratification, in each commune, the survey team selects two hamlets by a random selection of households from the resident list of each commune. On the second stratification, households in each hamlet were interviewed using the convenience sampling method (into any household in the hamlet without prior information on the household). The field data collection was conducted through household interviews from November to December, 2023 in Thai Binh province.

Biases and coping strategy

According to Kondaji (2016) and Cao et al.(2020), the biggest issue while doing CVM studies is biases. The first limitation, the respondents do not understand the scenario and nature of the problem leading to a specific price, so they will tend to choose a low price. The second limitation is that respondents tend to think more about the direct benefits (and losses) from wetlands. They set their WTP based on the direct potential damage and loss from the wetlands, not on consideration of biodiversity conservation. The third limitation is that the respondents understand the problem, but because the payment is not actual, they are "too generous" to pay higher prices than they actually pay if they are forced to do so.

To reduce the first and second limitations, the study applied face-to-face interviews, not calling, emailing, or handing out survey forms. Most of the interview process focused on exchanging and explaining carefully about THNR's biodiversity and the threats to this area's biodiversity. The potential scenarios for wetlands degradation and conservation projects are clearly stated, with specific purposes, contents, and operation methods. These techniques help interviewees understand the issue and concern about biodiversity conservation, allowing researchers to assess the BIDs that people are WTP. The third limitation was also addressed by emphasizing "real/virtual pay" and allowing interviewees to think hard and re-choice after considering other practical issues (Zebardast and Majed, 2020).

In addition, we use dichotomous CVM technique for reducing starting point biases. According to this binary model, people are asked whether they agree or disagree to pay a given Bid level. Before being answered, they will consider the expected income and benefits, then give an answer (Susilo and Takahashi, 2017). Such a way of asking is easy to understand and answer for local people. We used the 'cheap talk' technique to eliminate this type of bias as well as misleading information in research.

Since then, in the process of estimating WTP, the study has run 3 parametric models including (i) the overall model (Model A), (ii) the model including observations using cheap talk and (iii) The model does not use cheap talk.

Results

Study site overview

THNR is located at the mouth of the Red River flowing into the sea, in Thai Binh province, Northern Vietnam. This is one of the vital core areas of the Red River Delta Biosphere Reserve - a world biosphere reserve (*Figure 1*) (Thi and Tran, 2021).

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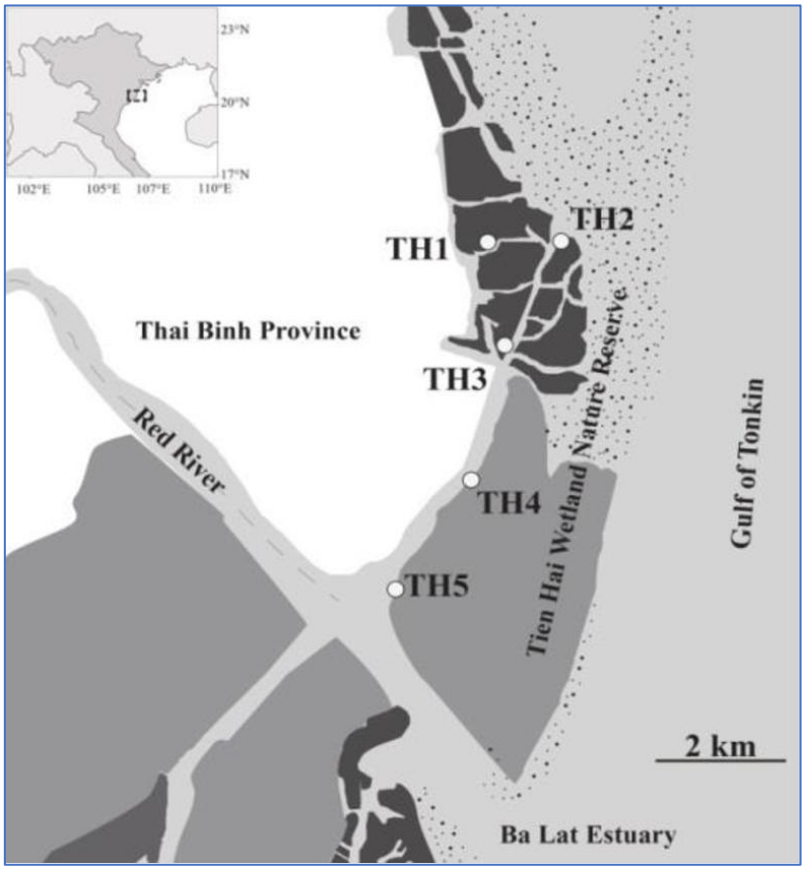

Figure 1. *Study area- THNR location in Vietnam. Source: Research results (2024)*

THNR has two large sand dunes: Con Vanh, with an area of 2,000 hectares, and Con Thu, with an area of 50 hectares (Thai Binh Provincial People's Committee, 2020). Con Thu includes tidal sandy beaches. Con Vanh is located separately from the mainland through a deep-water strait; on the shore are mangrove forests, most of which have been surrounded by aquaculture lagoons. In addition, there is a large area of aquaculture lagoons on the north bank of the Red River. The local communities carry out several economic activities such as aquaculture, cattle rising, fishing, and gathering and catching mollusks (Nhuong and Tran, 2021).

The current status of wetlands is distributed along alluvial flats on both sides of the river upstream. Wetlands are concentrated mainly outside the dyke and in the non-dyke area. The total area of wetlands in THNR is 34.9 ha, of which 27.6 ha in the North of Tien Hai and 7.3 ha in the South of Tien Hai. The area concentrated along the outer dyke is 20.6 ha (59%), and in areas without dike is 14.3 ha (accounting for 41%) (Thai Binh Provincial Committee, 2020; Nhuong and Tran, 2021).

Areas of well-developed wetlands are now rehabilitated plantations with typical mangrove tree nests outside the dyke. Wetlands, through the process of adaptation, have differentiated and distributed regionally to form sub-regions with different species characteristics.

THNR's mangrove flora has 39 species of 21 plant families. Rhizophoraceae has the most species (5 species), Poaceae has three species, and Fabaceae has two species, while other families account for less (1 species). There are 16 official plant species, accounting

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for 39.8% of the total number of true mangroves in Vietnam, and 14 plant species participating in wetlands. The flora in the area is diverse in species composition and has all the characteristics of mangrove plants (Thi and Tran, 2021).

Due to the flooded conditions and high salinity, the species composition formula of wetlands is often simple; the dominant phenomenon is apparent with the typical structure of a tree layer. The main species, such as Kandelia, Excoecaria, Rhizophora, and Sonneratia, predominate in the area. At the same time, the composition structure also changes according to the ecological sub-region, facing upstream (or from East to West) and the South-North bank of the estuary (Nhuong and Tran, 2021; Thi and Tran, 2021).

The average salinity is 9.4‰, which is favorable for wetland plants. The substrate is mainly riverside alluvial soil with a low average mud level, with clear differentiation in the East-West direction. The tidal regime is irregular diurnal tide with a low tidal amplitude of 0.3 - 0.6m, creating less favorable conditions for the dispersal of sprouts. The average temperature is 24^0C, and the temperature variation in the area is relatively large. Wetlands at the estuary have the effect of protecting the dyke system of the community, with a total length of 22.54 km of estuary dykes. Every year, floods and storms strongly affect the dyke system without cover, causing significant economic loss to the locality (Thi and Tran, 2021).

Socio- economic characteristics of sample

Table 2 presents socio-economic information of households in the study sample. The survey was conducted with 450 households, in which the proportion of men and women responding was quite similar (46.81 and 53.19%, respectively). In terms of educational level, 48.62% have completed middle school and 14.57% have completed high school. This is also the general level of education level in Vietnam when the number of people who have completed high school dominates the community. Only 10.2% of respondents have a university degree. In terms of income, the number of people with income from 1-6 million VND/month predominates (about 3/4 of the sample), followed by from 6 to 10 million VND/month accounting for 22.65%. The number of people with high income (over 10 million VND/month) accounts for less than 9%. On average, each family in the research sample has 4.1 people, this number is similar to the average of middle-income provinces in Vietnam. Those who stay in the locality are usually middle-aged, children, and young people. often look for work in big cities. In the research sample, nearly 64% are farmers, about 15% do small businesses or participate in agricultural cooperatives. Self-employed workers account for 7.02%.

Local people awareness and attitude on the values of wetland

Table 3 below indicates results of villagers' awareness of the importance of protecting and conservating THNR wetland values. For each wetland value, there were 4 levels of selection (very important to not important). Ecological values eligible for conservation include livelihood support, disaster prevention, biodiversity protection, water treatment and enrichment, and future values. In fact, respondents awared of the importance of wetlands for supporting livelihoods as well as bequet for the future, therefore they did more emphasize the importance of preserving these values.

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Table 2. *Socio economic characteristics of respondents (n=450)*

Percentage (%)	
Gender	
Male	46.81
Female	53.19
Education	
Illiterate	0.88
Elementary school	25.73
Middle School	48.62
High school	14.57
University/college	10.2
Postgraduates	0
Income	
1 – 3 million VND	39.87
3 – 6 million VND	26.74
6 – 10 million VND	22.65
10 – 15 million VND	7.08
15 – 20 million VND	3.46
20 – 30 million VND	0.14
> 30 million VND	0.06
Household size (person)	
Mean	4.1
Greatest value	11
Smallest value	1
Jobs/Works	
Farmers/Freelancers	63.78
Entrepreneur/Self-employed	7.02
People who receive salaries from the state budget	2.89
People who are employed or salaried in enterprises and business households	14.82
Students	1.89
Retired, housewife	9
Unemployed	0.29
Other professions	0.31

Source: Research results (2024)

About the role of livelihood supporting. About 35.6% of respondents thought that wetlands were very important, 42.6% of people thought they were important while 14.2% villagers considered wetlands are some what important. Only 7.6% of villagers believed that wetlands e were not important to their livelihoods. In more detail, income from local wetlands accounts for a large share in the income of surveyed households. Nearly 40% of households said that wetlands provided 50% to 70% of their households' total income. So wetlands really play an important role for local humans.

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Table 3. *Attitude of respondents about protecting wetland values (%)*

	Nam Thinh	Dong Minh	Dong Long	Dong Hoang	Nam Phú	Average
Livelihood support						
Not important	5	10	9	10	4	7.6
Neutral	20	11	8	12	20	14.2
Important	40	45	53	40	45	42.6
Very important	35	34	40	38	31	35.6
Disaster protection						
Not important	5	12	6	15	6	8.8
Neutral	50	30	30	15	25	30
Important	33	42	41	40	43	39.8
Very important	12	16	23	30	26	21.4
Biodiversity conservation						
Not important	15	10	19	20	15	15.8
Neutral	50	41	46	60	57	50.8
Important	30	40	20	13	18	24.2
Very important	5	9	15	7	12	9.6
Water filter and recharge						
Not important	14	23	14	14	11	15.2
Neutral	47	31	38	56	45	47.4
Important	28	34	25	23	29	27.8
Very important	11	12	23	7	14	9.4
Future generation values						
Not important	24	35	31	12	23	25
Neutral	29	15	22	20	29	23
Important	27	37	18	39	27	29.6
Very important	20	13	29	29	21	22.4

Source: Research results (2024)

People have lived in the THNR area for many years (on average, each household has lived more than 40 years in the locality). Because they are attached to wetlands and interact with this resource on a daily basis, they appreciate the role and importance of preserving the resource for the current generation and their descendants. More than 50% of people think that preserving wetlands for future generations is important and very important.

Biodiversity conservation values were also highly appreciated for the importance. 24.2% of respondents rated preserving this value as important, and 9.6% considered it very important. The function of disaster protection was percieved important and very important by 39.8% and 21.4% by the respondents, respectively. Tien Hai is an area that suffers from many natural disasters during the year in Northern Vietnam. Mangrove forests in the area play a role in protecting sea dykes and livelihoods, so people are quite aware of this value and highly appreciate its importance. its important.

Notably, the value of water filtration and regulation is not highly appreciated by the community with only 9.4% saying that preserving it is very important. More than 50% of villagers also think that it is not important or neutral to preserve this value of wetlands.

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For attitude of wetland protection, respondents mostly appreciated wetland protection. 45.3% of villagers reported that conservation activities are very important, 37% think wetland protection is important; neutral choice accounted for 15%, only 2.7% said that conservation of wetland is not important (*Figure 2*).

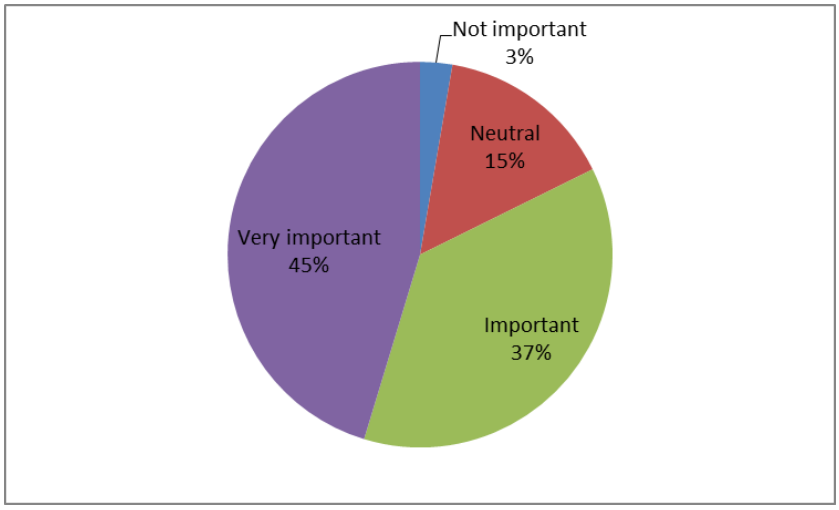

Figure 2. *Community attitude on preserving the values of wetland. Source: Research results (2024)*

Estimation of WTP for wetland conservation with parametric model

After being asked about conservation attitudes and the importance of wetland conservation, people were asked if willing to participate in a wetland conservation program in THNR. The percentage of surveyed subjects agreeing (ready and very ready to participate is 97.7%). Only 2.3% did not agree to participate in the conservation program (*Table 4, Figure 3*).

Table 4. *Community willingness to participate in wetland conservation programs (%)*

	Nam Thinh	Dong Minh	Dong Long	Dong Hoang	Nam Phu	Total
Not engaged	2.4%	1.5%	2.5%	3.80%	2.9%	2.3%
Ready	52.4%	57.5%	57.6%	65.9%	70.2%	61.6%
Very ready	45.2%	41%	39.9%	30.3%	26,9%	36.1%

Source: Research results (2024)

The study also used debriefing questions to identify protest responses. Those are people who are not willing to pay for other reasons. Out of 450 questionnaires, 414 were used to calculate the WTP after excluding "protest bid". Among those who oppose or are unsure about payment, 44.6% of people did not believe the conservation program can be implemented; 2.9% think biodiversity means nothing to them; 7.1% fear that their money is not being used for the proper purpose; 15.7% do not think the project would be effective and sussessful; 4.1% said that conservation shoul be government duties; 9.7% think that they do not benefit from this project and 15.9% are other reasons such as "depend on the decision of paying or not of neighbors".

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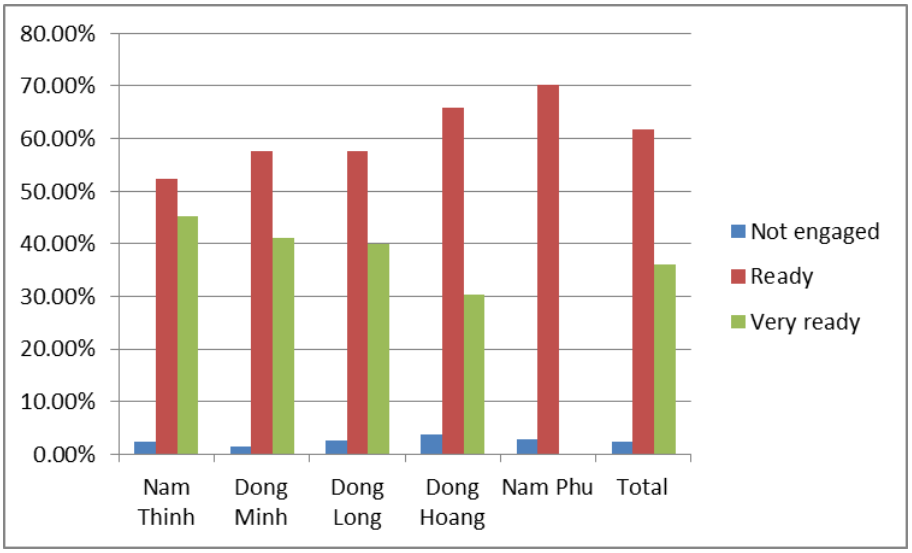

Figure 3. *Community willingness to participate in wetland conservation (%). Source: Research results (2024)*

The results of WTP estimation with binary logistic models are as follows (*Table 5*).

Table 5. *Estimation of parametric models*

Variables/Models	A	B	C
Intercept	11.113 (0.039)**	13.040 (0.0345)**	12.215 (0.041)
BID	-0.048*** (0.006)	-0.036*** (0.007)	-0.041*** (0.009)
SEX	0.187 (0.121)	0.212 (0.371)	0.369 (0.348)
AGE	-0.015 (0.058)	-0.019 (0.071)	-0.023 (0.123)
INCOME	0.010*** (0.000)	0.012*** (0.000)	0.019*** (0.000)
MEMBER	0.013 (0.055)	0.017* (0.037)	-0.007 (0.065)
KNOWLEDGE	0.007** (0.032)	0.010** (0.016)	0.013 (0.055)
EDU	-0.004*** (0.048)	-0.011** (0.08)	0.021** (0.088)
-2 Log likelihood	531.457	234.063	298.217

Source: Research results (2024). Note: In parentheses is p-value. ***: significant at the 1% error level. **: significant at the 5% error level. *

- In all 3 models, coefficient of variable BIDs has negative directions and is significant at 1% error level. Hence, this finding is consistent with theories that when BIDs levels are higher, the probability of acceptance for payment would decrease.
- INCOME variable in 3 models is positive. Thus, in this sample, income of villagers has an impact on the ability WTP for wetland conservation.

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- Variable EDU is significant in all 3 models with an error of 5% and has the expected sign. When people have higher levels of education, they are willing to pay more to conserve resources that are integral to their lives and livelihoods.
- KNOWLEDGE variable is significant at 5% error levels in the model A and B. When people have a better understanding of the role and values of wetlands, they are willing to spend more money on land protection drown.
- MEMBER is only significant at 5% error level in B model. However, this variable had opposite direction than expected. This may be explained by the respondent's psychology, they might think that when more people in their family get benefits from local wetlands, they will donate more for conservation.
- The variables AGE and GENDER are not significant in all 3 models. Thus, age and gender do not have a significant impact on accpetance to pay for wetland conservation in this case study.

As findings, the WTP value in A model (overall with all observations) is VND 280.1 thousand/household/year. The results also showed that there is no significant difference in WTP between model B (with cheap talk technique) and model C (witout cheap talk). Thus, providing cheap talk during interviews does not affect the probability of WTP acceptance (*Table 6*).

Table 6. *Parametric estimation results for WTP*

No	Model	WTP estimated (VND/year)
1	A	280,100
2	B	285,600
3	C	297,500

Source: Research results (2024)

Results of WTP valuation with non-parametric model

In non-parametric WTP estimation, we used the Turnbull estimate to caculate the probability of repondent accepting to pay BIDs falls into the full range of payment levels. This paper uses the proportional change intervals to determine lower bound of WTP by multiplying the proportional difference between the intervals by the upper bound of each interval (*Table 7, Figure 4*).

Table 7. *Distribution of probability of accepting payment with given Bid levels*

No	BIDs (VND)	Probability of answering "Yes"		
		Model A	Model B	Model C
1	100,000	0.81	0.77	0.83
2	200,000	0.65	0.68	0.74
3	300,000	0.54	0.59	0.68
4	500,000	0.43	0.47	0.55
5	700,000	0.39	0.38	0.42
6	1,000,000	0.32	0.31	0.29

Source: Research results (2024)

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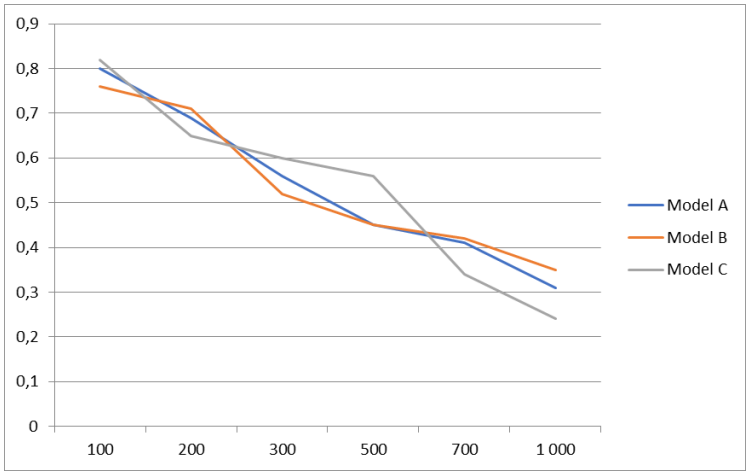

Figure 4. *Non parametric model WTP acceptance probabilities. Source: Research results (2024)*

The results of estimating WTP according to the non-parametric model are presented in table 8; the WTP ranges from 250.1 thousand VND/family/year to 293.6 thousand VND/family/year. In model A (overall), the caculated WTP is 275.1 thousand VND/family/year. The WTPs in non-parametric model are smaller than those in the parametric model, which is theoretically consistent since the non-parametric model gives a lower bound estimate of WTP (*Table 8*).

Table 8. *Estimates of WTP levels from non parametric models*

	Models	WTP estimated (VND/year)
1	A	275.100
2	B	250.100
3	C	293.600

Source: Research results (2024)

Discussions

The research provided insights on the attitudes and perception of local people towards the values and protection of wetlands in THNR. In general, local villagers appreciated the critical roles of wetland for supporting their livelihoods and had a good awareness on wetlands' indirect values such as natural disaster prevention, biodiversity conservation and water resource regulation. This awareness stemed from daily interactions of villagers with wetlands. Hence, they wanted to protect ecological values of wetlands for current and future generations; they also were ready to sacrifice some parts of their income for wetland conservation. This result is consistent with researches of Mahanta and Das (2013), Mamo (2015) and Cao et al. (2020) in developing countries, when people are attached to resources for their livelihood and life, they have a good awareness of the values that wetlands bring. again. The value of preserving for the future is also important. In developing countries, agricultural and rural livelihoods are often passed down through generations, so people value maintaining the quality of resources. wetlands for their descendants. This result is also similar to studies of Macura and Rodriguez (2011), Kondaji (2016), and Dinh (2021). When evaluating and realizing the role of wetlands,

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there is a clear trend that people are willing to participate in conservation activities. These activities may be organized by management agencies or by local associations or civil organizations. These findings are consistent with those in the literature such as Mamo (2015), and Zhu and Wei (2019).

From non-parametric and parametric regression models, the study estimates different levels of expectation of the WTP by local households for wetland conservation at THNR. Non-parametric model results in 275.1 thousand VND/household/year. Parametric regression model results in 280.1 thousand VND/household/year. We see that both estimates give approximately results, showing that the quality of both models is relatively good. Parametric regression model evaluates more accurately since it combines WTP influencing factors. Susilo and Takahashi (2017), and Pham et al. (2018) also showed similar results when showing that WTPs in parametric models are higher than those of non-parametric ones. However, this result is different from the results in the Mohammadi and Safari (2016), and Megaze et al. (2017) studies.

The critical and significant factors affecting WTP probability are bid level, income, education and wetland knowledge. These results might have implications for the design and selection of conservation activities and programs in the region. The WTP is higher when people's incomes are higher, their awareness of wetlands is better, and having more education. This finding is consistent with results of Macura and Rodriguez (2011), Mahanta and Das (2013), Mamo (2015), Cao et al. (2020), and Dinh (2021). In addition, age, gender, and family size do not have a meaningful impact on WTP probability. This result is similar to Pham et al. (2018), and Zebardast and Majed (2020) studies.

Conclusions

Through the CVM, the conservation value of the wetlands of THNR is estimated as well as ít influencing factors. The results show that people in the communes in the buffer zone are well aware of the importance of wetlands in THNR. Bid levels, income, awerness and education are main factors affecting people's probability payment for wetland conservation. Research results will help managers choose appropriate policies and management mechanisms to maintain and conserve wetlands for communitiesa and society.

From the above analysis, the study recommends the following policy implications:

- First, the province should promote propaganda on the role of wetlands in the mass media, especially newspapers, and TV. These are communication channels that have a substantial impact on people's awareness. If communication is effective, people will be more aware of forest protection and restoration.
- Second, localities should organize conservation activities and provide villagers easy access to sources of information for improving credibility of management agencies in ecological protection.
- Third, management agencies should organize training courses on the benefits and values of wetlands ecosystems for local managers and key staff from the forestry and fisheries departments. If managers understand the value of wetlands well, they can be propagated appropriately.
- Fouth, it is feassible to set up a local conservation fund which is self-contributed or managed by local communities to conserve wetlands at THNR.
- Last but not least, we should integrate information on wetlands values and resource protection education into curricula at all school levels.

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Data Availability. The data of this study is freely available for other researchers.

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