

Visitors' Awareness and Willingness-to-Pay towards Coastal Sustainability in Cherating, Pahang

Nik Nor Rahimah Nik Ab Rahim^{1*} and Azmir Nurhakim Azaharuddin¹

¹Department of Environment, Faculty of Forestry and Environment, Universiti Putra Malaysia 43400 Serdang, Malaysia

Abstract. Coastal severe erosion has been detected on the beaches of Cherating, causing disruption to the coastal ecosystem and diminishing the aesthetic appeal that attracts visitors. To prevent further harm to the coast, it is necessary to enhance sustainable coastal management practices. However, the implementation of such measures can be expensive. To ensure the success of improved sustainable coastal management, it is important to secure public funding, possibly through one-time donations, to cover the capital costs of the improvement project. Therefore, obtaining the acceptance of visitors regarding the enhanced sustainable coastal management in Cherating Beach is crucial. This study aimed to assess visitor acceptance based on three objectives: (i) determining the visitors' level of awareness regarding the issue of coastal erosion at Cherating Beach, (ii) estimating the extent of visitors' willingness-to-pay towards the improvement of sustainable coastal management in Cherating Beach, and (iii) identifying the key factors influencing visitors' willingness-to-pay towards the improvement of sustainable coastal management in Cherating Beach. A sample of 385 visitors in Cherating was surveyed using an open-ended contingent valuation method questionnaire using convenience sampling. The analysis included descriptive analysis, estimation of visitors' willingness-to-pay and binary logistic regression. The main findings revealed that the majority of visitors had a high level of awareness regarding coastal erosion in Cherating Beach. In terms of willingness-to-pay, visitors indicated a willingness-to-pay RM 13.15 per person as a one-time donation for implementing sustainable coastal management. The findings also demonstrated that visitors with higher education levels were more likely to donate towards improving sustainable coastal management. Overall, the visitors' feedback was positive, suggesting that providing this acceptance information to the Kuantan City Council and the Department of Irrigation and Drainage, Pahang, could be beneficial in implementing strategies for sustainable coastal management in Cherating Beach.

1 Introduction

Coastal areas are trendy globally and have significant social, economic, and cultural importance. They are densely populated, with three times the global average population density [1]. About 2.5 billion people, 40% of the world's population, now reside within 100 kilometres of the coast, exerting additional pressure on coastal ecosystems [2]. Coastal areas offer numerous direct and indirect benefits, including recreation, income resources, and marine flora and fauna habitat preservation.

The term "coastal development" refers to human-induced changes in the landscape around coastal areas [2]. Coastal areas, such as beaches, have economic, aesthetic, recreational, residential, and cultural value [3], increasing human activities in tourism, agriculture, industry, fisheries, business, and mining sectors. However, beaches are dynamic landforms influenced by waves, wind, currents, and sand supply, which can also result in beach hazards. Coastal hazards are a global concern due to population pressures, retreating coastlines, and rising sea levels [4].

Being a nation with a significant coastal presence, Malaysia is exposed to various oceanic hazards such as coastal erosion and the rise in sea levels [4]. Coastal erosion refers to the long-term sediment loss in coastal zones due to changes in hydrodynamic patterns. Climate change poses a significant concern for coastal and urban areas in Malaysia, making them more susceptible to coastal erosion with potential impacts on the population and the environment [5]. To ensure long-term viability and safety for humans and the environment, conserving and protecting coastal areas is crucial. Sustainable coastal management aims to protect human life and the environment, promote social and cultural well-being, ensure safety from coastal hazards, and reduce environmental impact [6]. It requires an integrated and adaptive approach that balances competing uses and values of coastal resources while ensuring ecological, economic, and social resilience. Effective coastal development planning should consider the natural processes and involve community needs, internal

* Corresponding: rahimah_rahim@upm.edu.my

marine functionality, overall area development planning, minimising environmental impact, on-site natural conditions, and a clear planning horizon aligned with climate change mitigation.

Pahang is located on Peninsular Malaysia's east coast, with beautiful coastlines and important economic hubs like Kuantan and Pekan. It is a popular tourist area and experiences coastal erosion. Coastal erosion is a serious issue affecting various beaches in Pahang, including Cherating, Balok, Kempadang, Sepat, Teluk Chempedak, Tanjung Batu in Pekan, and Tanjung Gemok and Kampung Mukut in Rompin [7]. This erosion is caused by human activities and natural factors, including sea level rise, which alters tidal flows and elevations and increases erosion [8]. The consequences of coastal erosion are felt by society, the economy, and the environment [9]. Societal impacts include the loss of property, infrastructure, disruption of daily lives, and reduced recreational areas. Economic effects involve the loss of tourism revenue and setbacks to other coastal industries. Environmental repercussions include losing plant and animal habitats and contributing to beach and dune erosion. The detrimental effects of coastal erosion can be devastating, ranging from property damage to significant harm to vital ecosystems.

Implementing sustainable coastal management is crucial for mitigating coastal erosion. However, effective protection, preservation, and conservation measures can be costly. Securing public funding is essential to ensure the success of sustainable coastal management. Therefore, assessing public acceptance to contribute financially is important, as they use coastal management services that rely on public investment. When defining public acceptance to contribute towards sustainable coastal management monetarily, it relates to their awareness of the focused issue, in this case, on coastal erosion. Many studies on willingness-to-pay (WTP) towards environmental services and goods have shown a significant positive relation between awareness and WTP [9, 10]. Therefore, this study aims to determine the public's awareness regarding the issue of coastal erosion at Cherating Beach, to estimate willingness-to-pay for improved sustainable coastal management at Cherating Beach and to identify the key factors influencing visitors' willingness-to-pay towards the improvement of sustainable coastal management in Cherating Beach.

2 Methodology

Environmental economists utilise non-market valuation techniques to assess the financial value of ecosystem goods and services that are not traded in the market [9]. These techniques are effective in understanding the value people place on such goods and services that lack a market price. Two commonly used methods in non-market valuation are Revealed Preference and Stated Preference [10]. This study used the Stated Preference method since it allows changes to non-market goods without affecting demand. It involves surveying respondents' willingness-to-pay (WTP) for a change [11]. Since disagreement about the best way to phrase the question for WTP led to the development of different methods for its use, among the methods used under Stated Preference are Contingent Valuation (CV) and Choice Modelling (CM) [12].

CV is the most used stated preference method for environmental assessment. It involves a survey-based approach using hypothetical questionnaires where respondents state their maximum willingness-to-pay (WTP) or minimum willingness to accept (WTA) for non-use values [13]. CV is practical and valuable for determining respondents' preferences through direct surveys. Variations in CV surveys include dichotomous choices, payment cards, auction bids, and open-ended questions to elicit WTP for described amenities, goods, or services [14].

The present study employed an open-ended contingent valuation method to assess individuals' willingness-to-pay for enhancing sustainable coastal management in Cherating Beach. To gather data on WTP and respondents' awareness and socio-demographic background, a questionnaire survey was conducted among visitors of Cherating Beach using convenient sampling. A total of 385 respondents were approached based on the estimated sample size calculated with Cochran's formula for an infinite population. Only individuals above 18 years old were included as respondents in the study, with approximately 13 participants being approached each day over the course of one month for data collection purposes.

The survey questionnaire was divided into sections to collect respondents' socio-demographic background, awareness on coastal erosion and open-ended CV questions to allow them to specify their maximum WTP as a donation. The WTP elicitation design involved two key questions. First, respondents were asked to indicate whether they would pay in dichotomous answers, either YES or NO. Subsequently, they were asked an open-ended question to specify the maximum amount they would be willing to contribute. The payment vehicle of their WTP is a one-off donation, a non-recurring contribution of money made for sustainable coastal management.

The data collected was analysed using the Statistical Package of Social Sciences Statistic (SPSS) 25 software. A comprehensive understanding of the population was gained through statistical analysis. Measures such as means, medians, percentiles, standard deviations, and ranges were calculated to determine central tendency and dispersion. Descriptive statistics were used to analyse the socio-demographic information and awareness data collected. Binary logistic regression analysis was then conducted on the data. The mean value for visitors' maximum willingness-to-pay was determined by considering the number of respondents and their respective maximum amounts. It is important to note that individual WTP may vary depending on both the number of respondents and their personal financial contributions.

3 Results

3.1 Descriptive Analysis

Table 1 presents a summary of the socio-demographic characteristics of respondents who visited Cherating Beach. The gender distribution shows that 52.8% were female. In terms of age, the majority fell into the 18-25 age group, accounting for 33.7% of participants. As for educational level, half had a Diploma/Degree while only a small percentage (1.3%) possessed a Master/PhD degree. Income-wise, most respondents earned between RM 2001 and RM 3000, followed by those earning less than RM2000. Among the participants, only a small percentage (7.3%) reported earning between RM 3001 and RM 4000. The data on employment status indicated that the majority of respondents were government employees (35.5%), followed by private employees (26.9%) and students (20.2%). A smaller proportion identified as self-employed (8%) or housewives (6.2%). However, there was a notable portion of retired or unemployed individuals at 12%. In terms of marital status, the majority of respondents (57.3%) were married.

Table 1 Descriptive results

Variables	Frequency	Percentage (%)	Mean
Gender			
Male	182	47.2	
Female	204	52.8	
Age			
18 to 25 years old	130	33.7	
26 to 35 years old	78	20.2	
36 to 45 years old	97	25.1	
46 to 55 years old	50	13.0	
56 and above	31	8.0	
Education level			
No formal education	10	2.6	
Primary school	7	1.8	
Secondary school	127	32.9	
Certificate / A-level	44	11.4	
Diploma/Degree	193	50.0	
Master/PhD	5	1.3	
Employment status			
Government employee	137	35.5	
Private employee	104	26.9	
Self-employed	31	8.0	
Student	78	20.2	
Housewife	24	6.2	
Other (Retired & Unemployed)	12	3.1	
Gross monthly income			
Less than RM 2000	87	22.5	
RM 2001 - RM 3000	92	23.8	
RM3001 - RM4000	63	16.3	
RM4001 - RM5000	28	7.3	
More than RM5000	32	8.3	
None	84	21.8	
Willingness-to-pay			
Willing to pay for sustainable coastal management	221	57.3	
Unwilling to pay for sustainable coastal management	164	42.7	
Awareness on coastal erosion			

Landscape changes along Cherating Beach can be caused by the northeast monsoon.	3.99
Landscape changes along Cherating Beach can be caused by human activities.	4.08
The occurrence of coastal erosion can depend on the nature of the waves.	4.18
I am aware that coastal erosion is one of the dangers of the Beach.	4.36
I am aware that coastal erosion can damage the recreational areas along Cherating Beach.	4.33
I am aware that coastal erosion may cause roads around Cherating Beach to be closed.	4.08
I am aware that coastal erosion can cause habitat loss on Cherating Beach.	4.16
I am aware that coastal erosion can threaten the safety of people around.	4.35
I am aware that coastal erosion can affect the scenery of Cherating Beach.	4.39

The participants displayed a high level of awareness regarding the issue of coastal erosion in Cherating Beach. They were provided with nine statements related to coastal erosion and asked to rate their agreement on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). The average ratings for each statement ranged from 3.99 to 4.39, indicating their acknowledgement of the causes and impacts of coastal erosion at Cherating Beach.

In terms of willingness-to-pay for sustainable coastal management, it was found that 57.3% of participants expressed their WTP. Among the respondents, the majority (17.4%) agreed to donate RM10 towards supporting improvements in sustainable coastal management. Approximately 4.4% were willing to contribute the highest amount of RM100 and 2.8% were willing to contribute a minimum amount of RM2. The reasons cited for their WTP included wanting to improve public service and maintenance, fulfil social responsibility obligations, and promote environmental protection practices. These factors are considered interdependent and crucial for ensuring a sustainable future, as highlighted by previous research emphasising the significant role played by social responsibility in enhancing sustainable coastal management efforts within coastal communities.

Among the respondents who were unwilling to pay, their primary reason was their inability to afford the payment due to various financial commitments. This matches the discussion in [16], where financial constraints and affordability are important factors to consider when promoting a willingness-to-pay for sustainable coastal management. More than 10% of the respondents also believe that the authorities, including government agencies and non-profit organisations, are responsible for protecting and preserving coastal areas and managing and maintaining coastal infrastructure.

3.2 Binary Logit Model

Binary logistic regression analyses the relationship between a binary outcome variable and one or more predictor variables. It helps identify factors associated with the outcome and predict new cases. It is a simple and interpretable model, widely understood and implemented by researchers and practitioners. Logistic regression can determine important variables for prediction and handle multiple predictors, including categorical and continuous variables. It does not require the same assumptions as other regression methods, such as normality and constant variance.

Table 2 Coding of the variables

Variables		Coding
Dependent Variable	Willingness-to-pay	Yes = 1
		No = 0
Independent Variables	Gender	Male = 1 Female = 0
	Age	>35 Years old = 1
		<35 Years old = 0

Education Level	Higher education = 1 Lower education = 0
Gross Monthly Income	Higher income = 1 Lowest income = 0
Employment status	Employed = 1 Unemployed = 0
Marital Status	Married = 1 Single = 0

The variables in the model were coded as shown in Table 2. Categorical variables were used for both dependent and independent variables. The dependent variable was coded as 1 for YES and 0 for NO. Similarly, independent variables were coded as categorical variables for comparison. For instance, male gender was assigned a code of 1 and females were coded as 0, respectively, to compare the differences in WTP between the genders.

Based on Table 3, the binary logistic model includes gender, age, education level, gross monthly income, employment status, and marital status as independent variables. The coefficients for all the independent variables are positive, indicating their influence on a visitor’s WTP for sustainable coastal management. Specifically, male respondents tend to pay more than females, but this difference is not statistically significant. Similarly, respondents aged 35 or older are more willing to pay than those under 35, but this difference is also not statistically significant. However, education level significantly impacts WTP, with higher education levels leading to a greater WTP. This finding aligns with previous studies by [17] and [18] that found a positive association between education level and WTP for sustainable coastal management. Employed respondents also significantly have greater WTP, aligning with other related studies on WTP for sustainable coastal management. In relation, gross monthly income influence WTP, with higher-income individuals showing a greater inclination to pay. Lastly, single respondents are more inclined to pay compared to married respondents.

Regarding the model fit, the Nagelkerke R Square value is 0.090, indicating that the independent variables explain about 9% of the variation in the dependent variable. The p-value of the Hosmer and Lemeshow test is 0.780, suggesting a good fit of the model as the p-value is higher than the significance level of 0.05 (5%). Overall, the model provides a moderate fit to the data, with the independent variables explaining a small proportion of the variation in the dependent variable.

Table 3 Binary logit model summary

		Coefficient values	Standard Error	Significant level
Variables	Gender	0.007	0.224	0.975
	Age	0.145	0.328	0.659
	Education Level	0.940	0.233	0.000***
	Gross monthly income	0.138	0.291	0.636
	Employment status	0.542	0.276	0.050**
	Marital status	-0.312	0.339	0.357
	Constant	-0.599	0.267	0.025
Summary statistic				
2 Log likelihood		500.189		
Cox & Snell R Square		0.067		
Nagelkerke R Square		0.090		
Hosmer and Lemeshow Test		p = 0.780		

*Significant at 10% level **Significant at 5% level ***Significant at 1% level

3.3 Willingness-to-Pay Estimation

The average maximum amount that visitors are willing to pay for a one-off donation towards improving sustainable coastal management in Cherating Beach is RM13.15 per person. This value was calculated by considering the number of respondents and their individual willingness to contribute financially. It is important to note that this willingness may vary among individuals, resulting in variations in the overall mean value of WTP. As discussed earlier through descriptive analysis, approximately 57.3% of respondents expressed their financial support for enhancing sustainable coastal management at Cherating Beach based on these calculations.

$$\frac{\text{Total amount of WTP (RM)}}{\text{Total respondents}} = \text{Mean Willingness to pay (WTP)}$$

$$\frac{RM5077}{385} = RM13.15$$

4 Conclusion

The findings suggest that visitors to Cherating Beach are highly aware of local coastal erosion issues. Coastal erosion is a significant problem that can have detrimental effects on beaches and the surrounding areas. Raising awareness among visitors is crucial for mitigating these impacts and promoting responsible behaviour to protect these fragile environments. Education programmes, signage, and other communication materials can help inform visitors about the risks and ways to minimise their impact. Encouraging visitors to participate in conservation efforts like beach cleanups and monitoring programmes can further contribute to the preservation of these ecosystems.

The study's findings indicate that visitors with higher levels of education are more inclined to financially contribute towards coastal conservation. This could be attributed to their better comprehension of environmental impacts and the significance of preservation efforts. Moreover, individuals with higher educational backgrounds may have greater disposable income available to support sustainable management initiatives. However, it is important to note that willingness-to-pay is not solely determined by education alone; respondents also cite motivations such as enhancing public services and maintenance, fulfilling social responsibility, and safeguarding the environment. Based on estimations from willingness-to-pay assessment, each visitor expressed a readiness for a one-time donation around RM 13.15. In conclusion, this research accomplished its objectives by emphasising the heightened awareness of coastal erosion among Cherating Beach visitors and their eagerness to contribute towards its mitigation.

This study offers valuable insights that can inform decision-making and planning to enhance coastal management and protect the well-being of visitors and the environment in Cherating Beach. The findings have implications for Kuantan City Council and the Drainage and Irrigation Department in addressing concerns regarding coastal erosion, as well as considering visitor's willingness-to-pay for sustainable coastal management. The positive feedback from the public can assist authorities in implementing sustainable initiatives such as constructing breakwaters, undertaking sand reclamation projects, and conducting educational programmes to raise awareness about coastal erosion.

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