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Tourists' preferences and willingness to pay for protecting a World Heritage site from coastal erosion in Vietnam

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Abstract
Literature shows that tourists can make significant financial contributions towards efforts of erosion prevention, but very few studies are done in the context of developing countries, especially to protect World Heritage sites. This paper provides the first estimates of willingness to pay (WTP) for differing coastal erosion measures by domestic and foreign tourists visiting Hoi An, an UNESCO World Heritage site located in Vietnam. Using a discrete choice experiment, our study presents several new and important findings. Tourists support visible protection structures and trees on beaches even though these hard measures can affect the natural aesthetics. There exists preference heterogeneity among tourists. Most importantly, our analysis shows that WTP of each tourist is USD $13.45, nearly seven times greater than WTP by local residents estimated in previous literature for a similar erosion protection program.

Keywords Tourists' valuation · Choice experiment · Coastal erosion · World Heritage site

JEL Classification Q26 · Q51 · Q54

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1 Introduction

Coastal erosion has caused significant damage to properties, businesses, and negatively affected the livelihood of billions of people globally (de Schipper et al., 2021). Negative impacts of costal erosion are likely to be more severe in those areas where World Heritage (WH) sites are located. This is because WH sites are often the main attraction drawing domestic and international tourists (Thinh et al., 2019), and many of these sites are situated in the low-lying coastal zone (Vousdoukas et al., 2022). The damage of these WH sites could cause significant impacts on the entire tourism sector of the region as well as the countries. Due to climate change, coastal erosion is expected to accelerate requiring more effective prevention measures (Islam et al., 2022; Vousdoukas et al., 2020). Effective erosion prevention measures, however, require substantial capital investment which typically exceeds the budget of local and central governments, especially in developing countries.

The literature shows that tourists are willing to pay significant amounts for prevention programs (Landry et al., 2020). Financial contributions of tourists can play a crucial part in implementing effective coastal erosion prevention programs in those areas dominated by tourism activities. Existing empirical literature on Willingness to Pay (WTP) for coastal erosion prevention measures has focused on areas in European and American countries. However, empirical estimates for the WTP of tourists for coastal erosion prevention in developing countries in Asia such as Vietnam are very limited, especially with respect to WH sites. This paper aims to fill in this gap by conducting a discrete choice experiment (DCE) to estimate the WTP of domestic and international tourists visiting Hoi An, a UNESCO World Heritage site in Vietnam for differing measures of coastal erosion prevention.

Vietnam has 3260 km of coastline, but most of the country's coastal provinces are facing increasing erosion due to climate change (GFDRR, 2015). In particular, Hoi An City, a UNESCO World Heritage site, has experienced rapid erosion—an average of 12 m per year (Viet et al., 2015). Coastal erosion is estimated to cause a tourism revenue loss for Hoi An of about USD $29 million in 2040 (Thinh et al., 2019). As an essential economic activity of Hoi An, tourism accounts for around 60% of the city's total income derived from the 3.2 million tourists visiting the city in 2017.[1] Hence, Hoi An City is in an urgent need of immediate and effective measures to prevent further erosion.

Addressing the problem of coastal erosion requires large upfront and an ongoing source of funding. However, in this respect, Hoi An City has been facing ongoing financial shortfalls (UN-Habitat, 2014). For example, the annual cost of building and maintaining the erosion prevention infrastructure which employs groynes to protect 60 m of beach width, has been estimated around USD $76 million (Fila et al., 2016), but the city can only mobilise USD $46.2 million to build needed beach embankments. While city residents are willing to contribute to this funding (Nguyen et al., 2021), the literature suggests that tourists can also make a significant contribution (Schuhmann et al., 2019; Singh et al., 2021; Wang et al., 2017). Empirical evidence for the WTP for coastal erosion prevention by tourists in Vietnam, however, has been lacking. Thus, this estimate of WTP can be a crucial contribution to policy planning which incorporates such an initiative.

As tourism is the main economic activities of Hoi An, there are also concerns about the impacts of protection structures on the tourists' experience. In fact, Hoi An's authorities have been considering several options for erosion prevention measures which can be

[1] The official portal of Quang Nam Province, https://quangnam.gov.vn/webcenter/portal/ubnd_en/pages_list-news/detail?dDocName=PORTAL115058.

classified into two main groups: hard protection constructions of groynes and stair revetments and soft prevention measure such as sandbags. These measures have differing impacts on tourists' experiences; hence the authorities require further empirical information on the preferences of tourists regarding these erosion prevention measures.

Our research aims to provide empirical evidence to address two important questions: how much are tourists willing to pay for coastal erosion prevention measures and what are the differences in their WTP for differing erosion prevention measures? To achieve these aims, we conducted a DCE based on a survey of 200 tourists to capture direct and indirect use values of the beach and to reveal the level of preference heterogeneity across three latent subgroups of tourists in the sample. Our empirical results provide several important policy implications. First, there exists a significant preference of tourists with respect to having trees on the beach, either with or without restaurants. Second, one notable empirical finding which contrasts with other studies, is that tourists support visible protection structures even though these hard measures typically have negative impacts on the natural aesthetics of the beach. Most importantly, our results show that the WTP estimated in this study is much higher for tourists than for local residents—as reported in the literature. Remarkably, tourists coming to Hoi An could contribute up to USD $43.04 million per year for further measures to prevent coastal erosion. This contribution is sufficient to fill the budget shortfall that local authorities face in implementing their planned prevention programs.

The paper is organized as follows. The literature review is presented in Sect. 2. Section 3 introduces the case study. Materials and methodology are described in Sect. 4. Estimation results are presented in Sect. 5, and Sect. 6 provides a discussion of the findings and concludes.

2 Literature review

Coastal management was traditionally considered to be within the responsibility of local residents and authorities. Hence, many studies on coastal resources valuation focused on local residents' WTP for the management of coastal environmental and recreational attributes—which was shown to be substantial (Ardeshiri et al., 2019; Choi et al., 2021; Matthews et al., 2017b; Oliveira & Pinto, 2021). However, in areas where the local population is not numerous or the residents' WTP is low, there is an opportunity to implement alternative funding solutions which can rely on tourists' contributions. Therefore, understanding tourists' preferences and their valuation of tourist sites is of paramount importance for the successful design and implementation of optimal coastal management strategies in areas with high tourism activity (Gil-Alana et al., 2021).

There is a rich literature on tourists' preferences for a variety of coastal attributes. Among these studies, beach dimensions and access are the two influential factors relating to the estimation of tourists' WTP for coastal management programs. Oh et al. (2008), by using a contingent valuation method (CVM), examined tourists' preference for public beach access in South Carolina and found that tourists were willing to pay an extra USD $6.60 per day for additional beach access points and parking—a potential contribution of USD $93 million per year. Parson et al., (2013) emphasized the gain from doubly increasing beach width in Delaware at about USD $2.75 per day. Moreover, Schuhmann et al. (2016) observed from a DCE and examined visitors' perceptions of other environmental and quality attributes such as lodging type and the amount of litter on the beach

in Barbados. The author found that visitors need to be compensated approximately USD $45.00 for each additional unit of beach litter present and approximately USD $56 per additional minute of walking distance to the beach. Schuhmann et al. (2019) examined tourists' WTP for a marine conservation fee through a CVM and found the mean WTP to range from USD $36 to USD $52 per visit. Overall, the literature suggests that there is a positive and significant WTP from tourists for a variety of coastal attributes which could contribute to coastal management funds.

Several studies indicate that tourists generally have higher WTP than residents, suggesting that sourcing funding from tourists for coastal management is a viable and more sustainable strategy, especially in areas with high levels of tourism (Shan & Li, 2020). Dixon et al., (2012), conducting a DCE questionnaire in South Carolina, concluded that tourists had significantly higher WTP for additional public beach access. Christie et al. (2015) uncovered the preferences for marine and coastal ecosystem services in the Grenadine's Marine Protected Area through a DCE and found that tourists had significantly higher WTP than local residents. Christie et al. (2015) estimated that the total WTP of all tourists was between USD $3.63 million—$5.59 million, in comparison with only USD $0.05 million—$1.75 million for residents. This is significant given there were more tourists than local residents in this area.

Another important finding reported in the literature is that preferences vary across differing groups of tourists (Barrio & Loureiro, 2018). Beharry-Borg and Scarpa (2010), by means of a DCE, compared the preferences between snorkelers and non-snorkelers and concluded that it is feasible to consider a differentiated pricing policy for different activities undertaken by beach recreationists. Moreover, Hess and Beharry-Borg (2012) and Schuhmann et al. (2019) found that foreign tourists were generally WTP more than domestic tourists for conservation efforts.

While other studies focus on coastal management for recreational activities, another line of literature focuses on valuation of the coastal management to prevent beach erosion. The literature shows that WTP to protect coastlines against erosion differs across areas. In developed countries, the annual WTP for dune restoration and seawall construction in Mercury Bay in New Zealand are estimated, from means of DCEs, to be around USD $88 and $50, respectively (Matthews et al., 2017a). In a study of developing country, WTP per year per visitor for a coastal erosion protection program in Nam Rin Beach and Cha-am beach in Thailand was USD $24.80 and USD $102.96, respectively (Saengsupavanich, 2019). WTP in Tunisia was found to be 5.09 euros per year per resident and 5.02 euros per tourist per visit (Dribek & Voltaire, 2017).

The valuation of World Heritage sites also received scholarly attention in recent years. For example, Wuepper (2017) points out through a DCE that WH status for a national park in northeast Germany increases WTP to go to the park by EUR 4.73 per person. In this way, tourists can significantly contribute to the funding of heritage site management in the Galapagos Islands of Ecuador (Loyola et al., 2021). Moreover, Jurado-Rivas and Sánchez-Rivero (2019), by conducting a CVM in Caceres, Spain, emphasized that tourists are willing to pay for a more sustainable service in a WH city. In addition, socio-economics characteristics of tourists influence their WTP for protecting a WH site, for example, for the restoration of Sundarbans mangrove forest ecosystems as suggested by Iqbal and Hossain (2023).

In Vietnam, the valuation for coastal management has focused on the preferences of local populations. Local residents of Cat Ba, a northern island in Vietnam, are found to be willing to pay USD $8.64 for mangrove restoration to mitigate storm impacts (Pham et al., 2018). Similarly, households in Thi Nai Lagoon in Quy Nhon, a central coastal province,

are willing to pay USD $6.52 for mangrove restoration (Tuan et al., 2014). Moreover, the level of coastal communities' vulnerability to climate change will affect their perception on adaptation, as suggested in Tho et al., (2014). Borger et al. (2021) have reported that the local residents of Nha Trang, a coastal city, are willing to pay more for limiting plastic pollution than for the improvement of water quality and protection of coral reefs. In addition, Nguyen et al. (2021) have revealed a strong heterogeneity in the preference among different groups of local residents towards a protection of the beach in Hoi An from coastal erosion, which could be explained by residents' experience and knowledge of coastal erosion problem. This paper estimates that a resident, on average, is willing to pay USD $1.70 per year for a coastal erosion management program that increases beach width by an additional 50 m, beach access by additional 25%, provision of restaurants and trees on the beach and the use of groynes as the erosion protection structure.

To sum up, in the growing literature on the WTP for beach management and ecosystem services, there are few studies on tourists' valuation of coastal erosion in the context of developing countries. Our overall contribution, then, is to provide Hoi An City local authorities with empirical evidence to assist them in policy design and implementation of coastal erosion preventative measures. This study also contributes to the literature in terms of revealing tourists' preference in relation to a tourist destination with WH status in developing countries.

3 Tourism and coastal erosion in Hoi An

Hoi An is located on the coastline of the central region of Vietnam. It has a population of around 150,000. This ancient town is considered as "an exceptionally well-preserved example of a traditional Asian trading port" and has been a UNESCO WH site since 1999.[2] The city has preserved its original form and heritage, including wooden architecture and the integration of indigenous and foreign cultures (Bui et al., 2020). Cua Dai Beach, which is part of Hoi An, is considered one of the most beautiful beaches in Vietnam. Since being listed as a WH site, the number of tourists visiting Hoi An has increased significantly—from 160,000 visitors in 1999 to nearly 3.2 million visitors in 2017. Tourism accounts for about 60% of the city's total municipal revenue.

In recent years, serious erosion has damaged several parts of the coastline in Hoi An, especially Cua Dai Beach, to the extent that sand is no longer present in some areas and buildings adjacent to its shores are susceptible to destruction. Viet et al. (2015) find that Cua Dai beach is under severe erosion, particularly around the Thu Bon River mouth, where the shoreline has retreated by between 200 and 500 m from 2004 to 2014. Several research projects have been conducted to identify the mechanisms leading to coastal erosion in Hoi An (Fila et al., 2016; Viet et al., 2015). According to these studies, natural variation, environmental changes such as sea level rise, increased storm frequency and anthropogenic causes such as sand mining and dam construction, are leading causes of increased erosion.

Coastal erosion has two notable economic impacts. Firstly, it causes significant damage to properties and assets including hotels, resorts, and restaurants. Secondly, there is the danger that coastal erosion can lead to severe degradation or complete destruction of attractive landmarks. This would cause a severe negative impact on the sustainability of the

[2] https://whc.unesco.org/en/list/948.

local tourism sector which is the main economic sector for local people. It is estimated that total tourism revenue losses due to coastal erosion in 2020 was USD $14 million and is projected to increase to USD $29 million by 2040 (Thinh et al., 2019).

To minimize the risk of erosion of Cua Dai Beach, Hoi An's authorities have implemented a variety of erosion management techniques including groynes, stair revetments, concrete revetments (which are considered as hard protection measures), and sandbags (considered as a soft protection measure) at various parts of the coastline. The local government plans to expand these programs but is faced with tight budget constraints. Mobilising financial contributions from domestic and international tourists has been proposed although debate on the choices of coastal erosion prevention techniques continues at the local governmental level. There are concerns that financial contributions by tourists are not sustainable as payments imposed on tourists could have a negative impact on the level of tourist arrivals. In addition, 'hard' measures could have negative impacts on the experience and satisfaction of tourists. To assist the policy debate, there is clearly a need for empirical evidence on tourists' preferences and valuation.

4 Methodologies

The choice experiment method is used to account for tourists' preference relating to the coastal erosion protection programs. The choice experiment is a non-market valuation method that has become increasingly popular over the past decade for the valuation of public goods and environmental policies. First developed by Louviere and Hensher (1983), this method has been getting increasing popularity in the literature on economic valuation of coastal management. Some studies have highlighted the advantages of DCE compared with other valuation methods. In particular, DCE allows for the inference of more information from respondents, which enables researchers to lower the frequency of ethical protesting, to value objects and evaluate changes in multiple characteristics, and to form a deeper understanding of the trade-offs between different attributes of a good or a policy (Hoyos, 2010; Hanley et al., 2002; Holmes et al., 2017).

4.1 Designs of discrete choice experiment

4.1.1 Attributes

The development of attributes was based on literature of beach management valuation (Huang et al., 2007; Landry et al., 2020; Oliveira & Pinto, 2021) and the situation of the beach in the past. Our study focuses on both non-consumptive direct use values and indirect use values of a coastal protection policy that includes regulations, i.e., defence methods and cultural services i.e., beach recreation. This leads to the selection of five attributes: (1) protection structures; (2) average beach width; (3) public access; (4) recreational offers and facilities; and (5) payment vehicle. These attributes were evaluated in literature on coastal management program, see, among others, protection structures in Oliveira and Pinto (2021) and Landry et al. (2020); beach width in Huang et al. (2007); public access in Oh et al. (2008); recreational offers and facilities in Borger et al. (2021). The selection of attributes and their level was pre-tested in the pilot survey, which results in the reduction of levels to reduce the complexity of the choice task and enhance the participations of respondents. Detailed descriptions and levels for the attributes are presented in Table 1.

Table 1 Description of the attributes and levels for a coastal erosion program

Names	Descriptions	Levels
Protection structures	Type of protection structures applied to protect the coastline from erosion	No structure, sandbags, stair revetment, concrete revetment, groynes
Beach width (in meters)	The average width of the beach which can be increased by beach nourishment	0, 25, 50, 75, 100, or 150
Public access (%)	Percentage of the beach that gives free access to all visitors	0, 25, 50, 75, or 100
Recreational offers and facilities	Type of recreational offers and facilities that are available in the beach	Nothing, trees, restaurants, restaurants and trees
Payment vehicles	Tourist tax per visit per tourist to Hoi An for coastal erosion management	USD $0, $2, $4, $6, $8, $10, or $15

For the protection structurers, the paper considers both soft measures (restoring the beach using sand by soft visible intervention by using sandbags) and hard measures (constructing hard engineering structures including stair revetment, concrete revetment and groynes).[3] Both hard and soft constructions were generally valued in previous studies, but this paper further assesses four specific types of structures. The recreational offers and facilities attribute provides popular facilities available in different beach parts in Hoi An, including trees and restaurants.

4.1.2 Split sample

Beaches in Hoi An have varying characteristics among different parts, therefore, with a view to capture the actual situation of the beach (Johnston et al., 2017), we divided the beach into four coastal segments based on erosion rates (see Fig. 1). The use of split sample is commonly conducted to value the spatial preference heterogeneity of the object (e.g., Spencer-Cotton et al., 2018) or in the case that the valued object is not homogenous across space (e.g., Marzetti et al., 2016). Description of each coastal segment is presented in Table 2.

4.1.3 Design of discrete choice experiment

The design of a DSC complies with the guidelines provided by Johnston et al. (2017). A multinomial format with two alternatives and a current situation is applied to a choice task.[4] Attributes and levels are presented with both text and images, which support the

[3] We assumed that respondents simultaneously consider the visual impact of the coastal protection infrastructures. A substantial welfare loss of beach visitors due to visual impact of Coastal construction was confirmed in previous studies, i.e., Blakemore et al. (2008), Louinord and Obafèmi (2020).

[4] The "cheap talk" was read before introducing the choice set and as follows:
"When you make your choice:
-Carefully consider the implications of each coastal erosion management program by looking at the dimensions' values listed in the associated table.

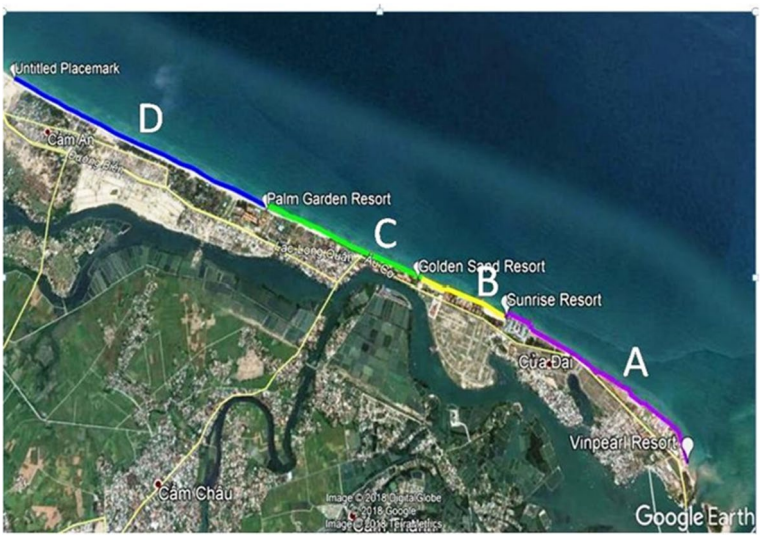

Fig. 1 The division of four coastal segments

understanding of and participation of respondents in a choice task (Balcombe et al., 2015; Louviere et al., 2000) (see Fig. 2 for an example of a choice task). A video introduces the current state of the coastal erosion problem in Hoi An, its causes and impacts, allowing all respondents to have a clearer view of the baseline and how changes of the baseline might benefit them. More dynamic visualization techniques have been found to reduce choice errors and improve respondents' engagement when compared to the use of static images (Matthews et al., 2017b).

To deal with hypothetical bias, a 'self-report certainty' question is mentioned before and after the choice task, respectively, as suggested by Johnston et al. (2017) and Ready et al. (2010). Protest answers are recognized through follow-up questions about their reasons of selecting the status quo and their stance towards paying a tax to reduce coastal erosion in Hoi An.

The questionnaire consists of four parts. The first part deals with information relating to tourists' visit to Hoi An. The second part is the choice experiment section. Socioeconomic information is delivered in the third part. The final part addresses tourists' personal economic preferences.

The experimental design followed the D-efficient design (Clark et al., 2014) and was conducted in Stata. For each beach segment, there are 18 choice sets which are divided into 3 blocks, each of which consists of 6 choice sets. Respondents are randomly assigned to one beach segment and a block.

There is a trade-off between statistical efficiency and design due to the need for reducing unrealistic, implausible, and dominant alternatives (Cherchi & Hensher, 2015; Terawaki et al., 2003). Unrealistic and irrelevant combinations of attributes can be excluded prior

Footnote 4 (continued)

-Remember that each program can have both positive and negative outcomes for you.
What is really important for me is to get your own opinion. There is no good or bad answer, what matter is what YOU prefer".

Table 2 Description of coastal segments

Characteristic	Beach A	Beach B	Beach C	Beach D
Erosion situation	Severely eroded: decrease of about 70 to 190 m of beach width	A decrease of about 60 to 120 m of beach width	A decrease of about 40 m of beach width	Unchanged in the past 13 years
Current protection construction	Concrete Revetments	Nothing	Sandbags	Nothing
Current beach width (meters)	0	25	25	50
Current public access (%)	50	50	50	100
Current recreational facilities	Nothing	Trees	Trees and restaurants	Trees and restaurants

to the experimental design (Cherchi & Hensher, 2015). We have considered these issues, however, in our design, there is no noticeable sign of irrelevant combinations of attribute levels, thus there is no constraint prior the experimental design. Moreover, the statistical report from our pilot survey shows no evidence of the dominance of alternatives.

4.2 Sample description

The survey is implemented with a face-to-face interview. The questionnaire is converted into an interactive application and respondents are asked to make choices using a tablet. Convenient sampling, a non-probability sampling method, is used, in which tourists are interviewed in main tourist attraction sites. 200 respondents completed the questionnaire. The survey was conducted in July 2018. Visitors were intercepted at random at the main tourist attraction sites of Hoi An—including beaches, the riverbank and the Old Town. This type of random sampling has been widely used in previous survey on tourists, for example, Loyola et al. (2021), Marzetti et al. (2016), Oliveira & Pinto (2020).

Table 3 describes the characteristics of the participated tourists. Based on the follow-up questions, one protest answer is detected and then excluded from the sample. The final sample consists of 199 respondents.[5] About 40% and 60% of the sample are domestic visitors and foreign visitors, respectively. This figure shows a relatively similar proportion of domestic to foreign tourists in Hoi An compared to the official figures observed for 2017.[6] They show that roughly 25% of visitors were domestic and 75% foreign. The second and third largest groups of visitors are European (29.5%) and foreign Asian (12%), respectively. Foreign Asian visitors from China, Korea, Japan, and Hong Kong had the highest rate of survey interview refusal than any other visitor groups. The ages of respondents ranged between 16 and 66 years old, with a slightly larger portion of male (56.5%) to female (43.5%) respondents in the sample. 94% of respondents have at least a college or university-level degree. Visitors stay, on average,

[5] An efficient experimental design including D-efficient and S-efficient would allow a small sample size to have statistical power in model estimation (Rose and Bliemer, 2013). In our survey design, D-efficient was implemented.

[6] The official portal of Quang Nam Province, https://quangnam.gov.vn/webcenter/portal/ubnd_en/pages_list-news/detail?dDocName=PORTAL115058.

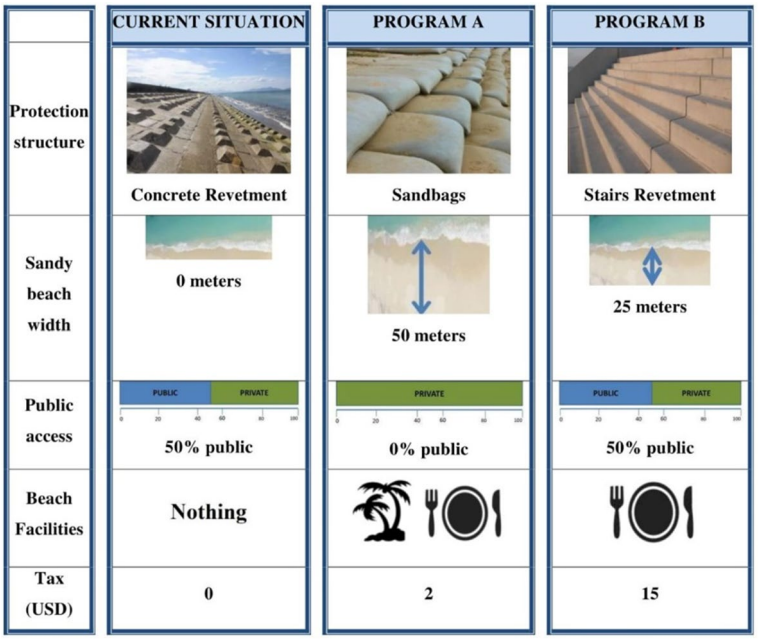

Fig. 2 Example of choice set in the DCE

3.4 days in Hoi An and over two-thirds of them planned to visit beaches. For those who did not plan a beach visit during their stay, the main reasons were lack of time (59.3%) and having alternative points of interests (18.6%). For those who visited the beach, they mainly did so for relaxing and sunbathing (41.8%), enjoying the landscape (23.4%) and swimming (15.6%). Most tourists acknowledged the existence of coastal erosion problems. The allocation of respondents to beach segments is relatively balanced, which varies 45 to 56 respondents for each segment.

4.3 Empirical modelling

4.3.1 Discrete choice modelling

The logit model is one of the most widely used discrete choice models (Train, 2000) and is an integral characteristic of the random utility model (RUM) (McFadden, 1974). A respondent, *i,* faces a choice among *J* alternatives. The respondent obtains a certain level of utility U_{ij} from alternative *j*, with $j=1,\ldots, J$. The respondent chooses the alternative that provides the greatest utility, i.e., chooses alternative *k* if and only if $U_{ik} \geq U_{ij}$, for all $j \neq k$. Utility is decomposed as follows $U_{ij} = V(x_{ij}/\beta_n) + \varepsilon_{ij}$ where $V(x_{ij}/\beta_n)$ is the observed part and ε_{ij} is an unobserved part. The observed part of utility is usually specified to be a linear function where parameters $V_{ij} = \beta_i X_{ij}$ and where X_{ij} denotes a K-vector of observed attributes of alternative *j*. According to McFadden (1974), the ε_{ij} is assumed to be i.i.d and the parameter β_i is homogeneous across respondents -.i.e.,$\beta_i = \beta$. These assumptions form the classic multinomial logit model (MLM):

Table 3 Sample description

	Category	
Nationality	Total	100% (199 respondents)
	Vietnamese	40%
	European	29.6%
	North American	5.5%
	South American	2%
	Australian and New Zealander	8%
	African	2.5%
	Asian, non-Vietnamese	12.1%
Beach segment (number of respondents)		
	Beach A	45
	Beach B	56
	Beach C	45
	Beach D	53
Trip information	Min	1
Duration of visit to Hoi An (days)	Max	5
	Mean	3.4
Plan of visiting beach (%)	Yes	70.9
	No	23.6
	Don't know	5.5
Reason for not going to beach (%)	Don't know there is a beach	3.4
	Don't have time	59.6
	Other interesting things to do in Hoi An	18.7
	More beautiful beaches in Vietnam	8.5
	Other reasons	10.3
Purpose of visiting beach (%)	Swimming	15.8
	Relaxing and Sunbathing	42
	Enjoying landscape	23.5
	Enjoying seafood, restaurant, bars	4.3
	Other purposes	14.4
Acknowledge of coastal erosion problem in Hoi An (%)	Yes	60.8
	No	39.2
Demographic information		
Age	Min	16
	Max	66
	Mean	29.9
Gender (%)	Female	43.7
	Male	56.3
Education (%)	Highschool graduate	5.5
	College or university	74.9
	Post-graduate	19.6

$$U_{ij} = \beta X_{ij} + \varepsilon_{ij} \tag{1}$$

4.3.2 Mixed logit and willingness-to-pay space

A flexible model developed from MNL is the mixed logit model (MXLM) which allows capturing preference heterogeneity. The most popular form is based on random coefficients (Train, 2009). The utility of respondent *i* from choosing alternative *j* can be rewritten as:

$$U_{ij} = \beta_i X_{ij} + \varepsilon_{ij} \tag{2}$$

where β_i is a vector of parameters for respondent *i* and is assumed to follow a continuous density. The unconditional mixed logit probability of respondent *i* choosing alternative *j'* is given by:

$$P_{ij'} = \int \left(\frac{e^{\beta' x_{ij'}}}{\sum_{j=1}^{J} e^{\beta' x_{ij}}} \right) f(\beta|\theta) d\beta \tag{3}$$

where $f(\beta|\theta)$ is a density function and θ are the distribution's parameters. The log likelihood for the model can be expressed as $LL(\theta) = \sum_{i=1}^{I} \ln P_i(\theta)$.

To capture the willingness to pay of respondents, estimation in WTP space is used to avoid the skewed or inflated WTP distribution (Train and Weeks, 2005). The utility function of respondent *i* from choosing alternative *j* in WTP space is then given by:

$$U_{ij} = -\lambda_i p_{ij} + \left(\lambda_i \omega_i\right) x_{ij} + \varepsilon_{ij} \tag{4}$$

where p_{ij} and x_{ij} are the price and non-price attributes, respectively. The λ_i is the utility coefficient for the price, whereas ω_i is the willingness to pay for the attributes.

4.3.3 Latent class model

Preference heterogeneity can be also accounted for by the latent class model (LCM) which uses a discrete distribution over unobservable, endogenous (latent) classes of respondents. Preferences are assumed to be homogeneous within each class but are allowed to differ across classes.i.e., respondents *i* belongs to class *q* with probabilityw_{iq}. Thus:

$$\beta_i = \beta_q \text{ with probability } w_{iq} \text{ for } q = 1, \ldots, Q,$$

The population is thus represented as a finite number of segments or classes. The number of the classes is endogenously determined by the data, while membership of a class depends probabilistically on the respondents' observable socio-economic or attitudinal and behavioural characteristics. Utility of a respondent *i* who belongs to class *q* derives from alternative *j* is written by:

$$U_{ij|q} = \beta_q X_{ij} + \varepsilon_{ij} \tag{5}$$

Heterogeneity implies each class has its own utility parameter vector $\beta_q \neq \beta_k$. The choice probability in this case is given by:

$$P_{ij\prime} = \sum_{q=1}^{Q} w_q \left(\frac{e^{\beta'_q x_{ij\prime}}}{\sum_{j=1}^{J} e^{x_{ij}}} \right) \tag{6}$$

5 Empirical results

5.1 Estimation of MXLMs in WTP space

The models are estimated in R by the gmnl and Apollo package (Hess & Palma, 2019; Sarrias & Daziano, 2017). The MXLMs in WTP space are estimated with 1000 Halton draws. All parameters are assumed to follow a normal distribution. The alternative specific constant (ASC) is included in the estimated model to capture the status quo bias (Scarpa et al., 2005) and is assigned a value 1 for the current situation and 0 otherwise. The continuous variables Tax, Width and Access refer to the tax, width, and access attributes. The facilities and protection structure attributes are dummy coded and are equal to 0 when there is no facility or protection structure. The utility in WTP space is thus expressed by:

$$\begin{aligned} U_{ij} = & -\lambda_i * \text{Tax} + \lambda_i * (\omega_{1i} * \text{ASC} + \omega_{2i} * \text{Width} + \omega_{3i} * \text{Access} \\ & + \omega_{4i} * \text{Protection Sandbags} + \omega_{5i} * \text{Protection Concrete Revetment} \\ & + \omega_{6i} * \text{Protection Stair Revetment} + \omega_{7i} * \text{Protection Groynes} \\ & + \omega_{8i} * \text{Facility Restaurant Tree} + \omega_{9i} * \text{Facility Tree} + \omega_{10i} * \text{Facility Restaurant}) + \varepsilon_{ij} \end{aligned} \tag{7}$$

Table 4 displays the estimation results of the MXLM in WTP space for different groups of tourists (Eq. 7). The positive sign for Width and Access shows that tourists are inclined to prefer a wider and more public beach. However, as expected, tourists are averse to the beach's current situation and an increase of tax which are indicated by the negative sign for ASC and Tax, respectively. Both these variables are statistically significant. These empirical findings are consistent with previous studies on coastal management (Oh et al., 2008). With respect to protection measures, it is surprising to note that tourists support all types of protection structures relative to having no structures. Among all hard and soft measures, concrete revetments are the most preferred measures. With respect to beach facilities, the estimation results show a tourists' preference for having trees on the beach, either with both trees and restaurants or only trees. These preferences differ slightly from Hoi An residents who only favour a beach protected by groynes and having both restaurants and trees—as in the findings of Nguyen et al. (2021).

Columns 3 and 4 present the estimation using data for two groups of domestic and foreign tourists.[7] Consistently, both subgroups of tourists place a higher value on a wider, publicly accessible beach that is protected by all type of structures. Domestic tourists are indifferent to beach with facilities, while foreign tourists prefer a pristine beach with trees, either only trees or both trees and restaurants. Moreover, it is note-worthy that preference of having both restaurant and trees does not observe an additive effect or "part-whole bias"

[7] The parameters of two models are statistically different according to Swait-Louviere test (Swait and Louviere, 1993). The LR statistic is 39.52, which rejects the null hypothesis that parameters of two models are equal.

Table 4 Mixed logit model in WTP space estimation

	All tourists	Domestic tourists	Foreign tourists
Mean of random parameters			
Tax	0.08(0.02)**	0.13(0.03)**	0.08(0.03)**
ASC	− 13.45(3.23)**	− 13.82(3.75)**	− 8.96(3.97)**
Width	0.07(0.02)**	0.03(0.02)*	0.09(0.04)**
Access	0.27(0.06)**	0.09(0.04)**	0.41(0.12)**
Facility: Restaurant	− 0.53(2.49)	− 0.72(2.49)	− 0.66(3.66)
Facility: Restaurant-tree	7.86(2.78)**	4.01(2.44)	9.62(4.61)**
Facility: Tree	9.04(2.95)**	1.54(2.25)	14.76(5.49)**
Protection: Groynes	12.8(3.34)**	11.05(3.31)**	10.95(4.66)**
Protection: Sandbags	7.18(2.93)**	4.61(2.75)*	10.83(4.75)**
Protection: Concrete revetment	13.41(3.49)**	10.89(3.32)**	13.67(4.94)**
Protection: Stair revetment	12.99(3.62)**	13.43(3.75)**	10.21(4.72)**
Standard deviation of random parameters			
Tax	0.03(0.02)	0.04(0.03)	0.05(0.02)**
ASC	23.96(5.47)**	19.17(5.09)**	22.54(7.29)**
Width	0.04(0.04)	0.01(0.04)	0.06(0.06)
Access	0.26(0.07)**	0.15(0.05)**	0.21(0.08)**
Facility: Restaurant	11.55(4.56)**	8.34(3.15)**	10.93(5.74)*
Facility: Restaurant-tree	8.28(3.65)**	7.14(3.04)**	9.47(6.2)
Facility: Tree	9.46(3.96)**	3.96(4.29)	9.41(5.87)
Protection: Groynes	15.41(4.7)**	12.6(4.18)**	18.08(6.50)**
Protection: Sandbags	15.66(4.38)**	9.39(3.85)**	16.26(6.53)**
Protection: Concrete revetment	6.01(6.25)	6.31(4.35)	4.44(7.53)
Protection: Stair revetment	6.41(6.75)	7.00(3.78)*	3.66(8.65)
Observations	1194	480	714
Number of respondents	199	80	119
Log likelihood	− 1097.8	− 425.5	− 648.9

Standard errors appear in parenthesis

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

effect. Specifically, preference on this combination is higher than the sum of preference towards two levels taken singularly for domestic tourists, but smaller than that for foreigners. It might reflect that restaurant and trees have been taken by local tourists as complementary relationship, but as substitutes by international group.

The results in Table 4 indicate that tourists are generally willing to pay for the improvement program for the beach i.e., moving away from status quo, at a WTP of USD $13.45. They are, on average, willing to pay more for hard protection structures. Among these, their WTP for concrete revetments, stair revetments, and groynes are estimated to be USD $13.41, USD$12.99, and USD $12.8, respectively. Estimated WTP for soft prevention measure such as sandbag is much smaller (i.e., USD $7.18).

5.2 Latent class estimation

While the unobserved preference heterogeneity is captured from MXLM through a continuous function of the utility parameters, we further accommodate it by conducting subgroup analysis using the LCM. The class membership includes a set of socio-demographic and trip-related variables.[8] "Older" refers to tourists whose age is above the average age of the sample (over 30 years old), "Longer stay" refers to tourists who stay longer than the average duration (more than 2 days), and "Acknowledge" refers to tourists who think that Hoi An is facing problems due to coastal erosion.

The optimal number of classes is based on information criteria statistics and the significance of parameters. Increasing the number of classes will normally lead to the improvements of the log likelihood and AIC. According to Andrews and Currim (2003), the Bozdogan AIC (AIC3) criterion is better than AIC and BIC in choosing the optimal number of classes. Models with three classes have a minimum AIC3 and the highest number of significant parameters, showing that this model is optimal for estimation. In terms of class assignment probability, the model normalizes coefficients of the first class to zero, leading to an outcome in which describing class membership is related to this class (Boxall & Adamowicz, 2002) (Table 5).

The estimation results show statistical evidence of preference heterogeneity of tourists for coastal erosion protection programs. It is interesting to note that while preference for other attributes varies across classes, preference for a beach protected by hard structures including groynes and concrete revetments remains significant over all classes.

Class 1 represents about half of the respondents (53.7%). Members in this class are called as "Unconcerned with facilities" since they are distinct to other groups in being indifferent to any type of facilities on the beach. Moreover, they support a beach protected only by hard structures and not by sandbags. The preference on a decrease of tax in this class is ambiguous since there is a lack of statistical significance of the tax parameter. It might be due to the income effect. i.e., the difference of income among tourists in this class might lead to the variation of utility for paying higher level of tax (Gong et al., 2020). In term of respondent characteristics, class 1 is generally characterized by individuals who stay fewer than 2 days since the parameters of "Longer stay" are positive in all two other classes.

Class 2 makes up 9.0% of respondents and is dominated by domestic visitors who have a long stay in Hoi An but do not have plan to visit the beach and do not recognize the city's issue with coastline erosion. This class is described as "Whatever access" since they are different to an increase percentage of beach access. In addition, they are also in favour of a wider, protected beach by hard structures and averse to a beach with single facility (either only restaurant or tree).

While classes 1 and 2 place a higher value on improvement options than maintaining the current beach situation, members of class 3 prefer the current situation of the beach, since the parameter for ASC is positive for class 3 while negative for the other classes. Moreover, it is noted that foreign tourists who stay in Hoi An for a longer duration than the average, who are aware of the coastal erosion problem, have a higher probability of being in this class membership. As travellers to Hoi An, there is a tendency that tourists will choose to visit the stable and well-liked but not eroded beach segment. The fact that they might not have experience with the beach area under erosion could motivate them to be comfortable with the current situation of the beach, which is aligned with Peng and Oleson (2017) (Table 6).

[8] Other class membership variables were considered; however, they are not significant and lead to a worsen estimation result in terms of criteria statistics. The final model has thus kept the only five variables.

Table 5 Criteria statistics by number of classes

Number of classes	Log likelihood	AIC	AIC3	BIC
1	− 1193.57	2409.14	2420.14	2465.07
2	− 1095.03	2246.07	2274.07	2388.45
3	− 1052.67	2195.34	2240.34	2424.16
4	− 1028.40	2180.79	2242.79	2496.07
5	− 1006.05	2170.10	2249.10	2571.82

6 Conclusions

Hoi An City, a World Heritage site in Vietnam, has experienced increased coastal erosion for many years. The local government has been considering several differing measures to prevent further coastal erosion. However, the local authorities are faced with very tight governmental budget allocations for these erosion prevention programs. Proposals for obtaining financial contributions from both domestic and foreign tourists have been subject to public debate. There are two related questions involved in this policy proposal. First, how much are tourists willing to pay for differing prevention measures? Second, what are their preferences in relation to hard and soft measures of coastal prevention? The present paper provides the answers to these two questions by conducting a DCE through a survey of 199 tourists who visited Hoi An in July 2018.

Results show that tourists value a wider and more publicly accessible beach that is protected by construction structures. They are most willing to pay for a pristine beach covered by trees. The result also confirms preference heterogeneity between domestic and foreign tourists. Vietnamese tourists support hard protection constructions than soft ones. Foreign tourists' preferences are inclined toward both soft and hard protection structures and value the presence of trees on a beach, either with or without restaurants. These results are robust across the three distinct groups of tourists estimated using the LCM.

While a positive WTP for protective actions is in line with prior literature (e.g., Oliveira & Pinto, 2021), our study differs in its finding that tourists prefer hard protective structures over soft measures. This contrasts with the studies of Landry et al. (2020) who report that soft management alternatives are considered more socially desirable. One possible explanation for this difference is due to the presence of negative externalities that reduce the economic benefits of a proposed strategy (Huang et al., 2007). Soft management alternatives based on sandbags or no protective structure other than nourishment may not be effective at preventing serious erosion as in Hoi An. The implication is supported by the finding from the LCM estimation that all three classes support a beach protected by hard structures. It emphasizes that in places where are significantly damaged by coastal erosion, visitors would vote for hard protection constructions, even though these constructions could impact on the beach aesthetic. Moreover, the three classes in the LCM estimation clearly share similar support for groynes and concrete revetments. Hence, it is reasonable to say that groynes and concrete revetments are viable erosion management strategies that are supported by the majority of Hoi An's tourists.

Tourists show a high level of interest in the presence of trees and are willing to pay a considerable amount, i.e., USD $9.04, to have trees on the beach. These findings provide important implications for Hoi An's beach management authorities. The direction of a beach management strategy should aim to improve beach areas and access, while more importantly focusing on coastal tree plantation programs to ensure the availability of green

Table 6 Latent class model estimation

	Class 1 "Unconcerned with facilities"	Class 2 "Whatever access"	Class 3 "Current beach inclined"
Utility function			
Tax	0.008(0.015)	−0.532(0.228)**	−0.087(0.023)***
ASC	−1.765(0.31)***	−1.91(0.931)**	0.539(0.288)*
Width	0.004(0.001)***	0.01(0.006)*	0.003(0.002)
Access	0.01(0.002)***	−0.004(0.006)	0.027(0.004)***
Facility: Restaurant	0.048(0.202)	−3.346(1.118)***	1.082(0.411)***
Facility: Restaurant-tree	0.115(0.191)	−0.72(0.57)	1.838(0.328)***
Facility: Tree	0.181(0.178)	−1.11(0.524)**	2.123(0.373)***
Protection: Groynes	0.744(0.186)***	1.296(0.73)*	1.194(0.361)***
Protection: Sandbags	0.281(0.206)	−0.732(0.589)	1.535(0.317)***
Protection: Concrete revetment	0.77(0.206)***	1.15(0.662)*	0.974(0.278)***
Protection: Stair revetment	0.461(0.235)**	0.603(0.608)	1.46(0.352)***
Class membership function			
Intercept		1.42(0.296)***	1.126(0.336)***
Beach use		−0.587(0.255)**	−0.313(0.213)
Acknowledge		−0.665(0.236)***	0.532(0.173)***
Longer stay		0.757(0.263)***	0.443(0.247)*
Vietnamese visitor		1.234(0.327)***	−0.977(0.222)***
Older		0.065(0.253)	0.075(0.164)
Shares of class (%)	53.7	9.0	37.3
Log likelihood	−1052.67		
AIC	2195.34		
BIC	2424.16		

Standard errors appear in parenthesis

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

space at all beaches. Because trees are much easier and economical to plant and manage than restaurants, planting more trees may generate significant welfare gains for tourists and thus positively benefit the local economy.

The payment vehicle is also an important aspect of designing an efficient coastal erosion program. Tourist tax is a useful instrument in collecting fund for a beach management program, as also pointed in Christie et al. (2015) for coastal ecosystem service conservation in St Vincent and the Grenadines and in Dribek and Voltaire (2017) for beach erosion protection in Tunisia. Meanwhile, other potential payments could be entrance ticket (e.g., Logar & den Bergh, 2014; Oh et al., 2008) or management fee (e.g., Hess & Beharry-Borg, 2012; Schuhmann et al., 2019). The acceptance on payment vehicles is found to be differed across groups of tourists. For example, the study by Schuhmann et al. (2019) suggests that in the case of Caribbean beaches, domestic visitors are opposed to the payment vehicle of a marine conservation fee whereas foreign visitors are not. Hence, further in-depth studies aimed at evaluating the effectiveness of payment vehicle are needed before its implementation.

Given each tourist is willing to pay USD $13.45 for a beach improvement program, it is estimated that 3.2 million tourists visiting Hoi An in 2017 could have contributed USD $43.04 million per year. This amount is significant in comparison to the total estimated WTP of USD $201,636 by the 98,600 Hoi An residents (Nguyen et al., 2021). In 2019, the City of Hoi An requested the Government fund USD $30 million for an urgent protection program for coastal erosion protection. However, the Government has decided to allocate only USD $13 million for constructing about 1.030 km of revetments (Decree 797/NQ-UBTVQH14). Given the Hoi An coastline is 7.6 km long, it can be expected that a contribution from tourists as projected in this study could meet the budget gap.

This paper provides evidence on the valuation of tourists for coastal erosion management program in Hoi An. However, these programs need to be further analyzed in a cost benefit framework to compare the benefits and the costs of protecting the beach from coastal erosion. Another extension is the comparison of preferences between tourists and local population. Moreover, there are several limitations that are worth noting. First, although our sample is relatively representative for the percentage of domestic and international tourists, the type of their travel means is unclear. Indeed, independent travel accounts for most of our sample. There is a significant number of tourists, especially Asian tourists who visit Hoi An in guided tours; however, it is difficult to approach and interview them due to their strict schedule. Second, an increase in sample size could produce a more reliable result. Third, other recreation activities are not considered in our choice experiment. Our main concern is the coastal erosion protection ability of a beach management program; nonetheless, it is recognized that tourists might have interest with water activities such as diving or sailing which are not studied in our research.

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article. The authors have no relevant financial or non-financial interests to disclose.

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