Willingness to Pay for Environmental Conservation: Subsidy Reduction as a Payment Vehicle

(*Kesanggupan Membayar untuk Pemuliharaan Alam Sekitar: Pengurangan Subsidi sebagai Kaedah Bayaran*)

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ABSTRACT

The objective of the study is to test whether the subsidy reduction of daily consumer goods as a payment vehicle can influence individuals' willingness to pay (WTP) for environmental and nature conservation. Specifically, it assessed the impact of price sensitivity on the willingness to conserve wetlands, using the subsidy reduction approach. Malaysia's Setiu Wetland (SW) served as a case study to gauge respondents' preferences to trade-off the benefits of subsidy with conservation of natural resources. The welfare economic concept of WTP was applied to estimate the economic value of SW with the application of choice experiment method. Analysis using the Random Parameter Logit model showed that respondent's WTP for conserving SW, through subsidies reduction, amount to RM120.59 annually. The price sensitivity in the model is high, suggesting that respondents are greatly concerned about the monetary attribute. This further implies that subsidy reduction can be a most consequential and coercive payment for Stated Preference studies. Thorough assessment of the payment structure is crucial for the quality of environmental value research in developing economies when conventional methods may not be ideal. It is recommended that policymakers consider other alternatives as payment vehicles for environmental conservation to ensure broader support for conservation initiatives.

Keywords: Nature resource economics; environmental valuation; stated preference method; willingness to pay; subsidy reduction; random parameters logit.

ABSTRAK

Objektif kajian ini adalah untuk menguji sama ada pengurangan subsidi barangan harian sebagai alat pembayaran boleh mempengaruhi kesanggupan membayar (WTP) rakyat untuk pemuliharaan alam semula jadi. Ia seterusnya mengkaji sensitiviti atribut harga menggunakan pengurangan subsidi untuk memulihara tanah-tanah bencah. Kajian ini menjadikan Tanah Bencah Setiu (SW) sebagai kajian kes untuk mengukur keutamaan responden menukar ganti faedah subsidi dengan pemuliharaan sumber alam semulajadi. Konsep ekonomi kebajikan dengan kesanggupan membayar (WTP) digunakan untuk menganggarkan nilai ekonomi SW dengan aplikasi kaedah Choice Experiment (CE). Analisis model Random Parameter Logit menunjukkan bahawa responden kesanggupan membayar untuk SW menggunakan pengurangan subsidi sebagai kaedah pembayaran adalah RM120.59 setahun. Sensitiviti terhadap harga dalam model ini tinggi, membuktikan bahawa responden sangat prihatin terhadap sifat kewangan, serta bukti bahawa pengurangan subsidi boleh menjadi kaedah pembayaran yang paling memberi kesan dan bersifat daya paksa untuk kajian SP. Penilaian yang teliti terhadap persediaan pembayaran adalah penting untuk kualiti kajian penilaian alam sekitar di negara membangun, di mana kaedah pembayaran umum mungkin bukan pilihan terbaik. Justeru, cadangan bagi pembuat dasar adalah untuk mempertimbangkan kaedah pembayaran alternatif untuk pemuliharaan sumber alam semulajadi yang kurang membebankan orang ramai.

Kata kunci: Ekonomi sumber alam semulajadi; penilaian ekonomi; kaedah 'stated preference'; kesanggupan membayar; pengurangan subsidi; random parameter logit.

INTRODUCTION

The economic evaluation of natural resources is a significant and challenging task for modern environmental economists. Economists appreciate the environment and natural resources because assigning value enables a direct comparison with the economic values of alternative options, which is essential for conducting cost-benefit analyses. Monetary valuation allows economists to undertake environmental accounting, assess natural resource damage, and evaluate benefits (Meginnis et al. 2020). In the study of consumer behaviour, valuation is particularly crucial since it reveals consumers' views on various environmental management goals and reveals their incentives for protecting natural resources. Economic valuation of natural resources is utilised to establish priorities, evaluate opportunity costs, analyse additional benefits of conservation, reinforce justifications for conservation in the public eye, and create novel initiatives to alter priorities (Meginnis et al. 2020). Many countries face numerous challenges in conserving their rich biodiversity and unique ecosystems whilst simultaneously undergoing rapid economic development. Rapid industrialization and agricultural expansion have resulted in the depletion of natural resources, pollution, and the destruction of habitats, which present significant threats to the stability of ecology and biodiversity. Wetlands are facing significant threats as they are experiencing rapid loss and degradation and they are considered one of the most endangered ecosystems globally (Salimi et al. 2021). In order to effectively protect and manage the wetland, it is advantageous for conservation efforts, land-use planning, and policy decisions to incorporate evidence-based ideas derived from scientific research. Therefore, policymakers, resource managers, and conservationists can all benefit from conducting research in the Wetlands.

The objective of the study is to test whether the subsidy reduction of daily consumer goods as a payment vehicle can influence people's willingness to pay (WTP) for environmental and nature conservation. It further examines the sensitivity of the price attributes using the subsidy reduction to conserve the Wetlands. This study utilises Malaysia's Setiu Wetland (SW) as the case study since the current government provides subsidies to ease the cost of living in households. The notion of WTP in welfare economics was employed to evaluate the economic value of SW using the choice experiment (CE) method. The data were collected using face-to-face interviews. The Random Parameter Logit model was used to evaluate the preferences of respondents regarding wetlands protection, as well as the influence of payment methods on the decision-making process. The findings showed that respondent's annual WTP of RM120.59 to reduce subsidies for SW conservation. Given that the model's price sensitivity is strong, it is likely that respondents are concern about this financial attribute.

Many research efforts focus on estimating the monetary value of environmental goods and services but fail to appropriately consider the influence of payment method characteristics on individuals' preferences and willingness to make payments (Vossler & Watson 2013; Xie et al. 2022). This study uses CE to provide a scientific approach for comprehending individuals' preferences and WTP for environmental conservation. Moreover, focusing on the design of payment vehicles will enhance the methodological validation of research and enrich the literature on the economic value of the environment, particularly in the application of coercive and consequential payment in Stated Preference study. A recent study by Azlina et al. (2022) evaluated the WTP for renewable energy in Malaysia. Nevertheless, the research employed the contingent valuation approach, which is often susceptible to biases estimation due to issues such as free-riding, and strategic bidding (Frings et al. 2023). A study by Ramli et al. (2023) assessed respondent's WTP for food safety using the CE method. However, the study directly stipulated payment through the purchase of cabbage in the market without focusing on the impact of price changes which could be evaluated through the examination of the payment vehicle.

In this study, we have investigated the efficacy of utilizing subsidy reduction as a payment vehicle for conservation initiatives within the SW. Our findings offer several significant contributions to both the community and industry stakeholders. By identifying the WTP for wetland conservation through an innovative payment vehicle, this research establishes a concrete basis for policymakers and environmental managers to design more effective conservation financing mechanisms. Such mechanisms are crucial for ensuring the sustainable management of SW, which plays a critical role for biodiversity conservation, water purification, and flood mitigation, thereby directly benefiting the well-being of local community and the environment. Moreover, for industry players, particularly those in the consumer goods sector, the study enlightens on the potential for integrating environmental conservation efforts into their business models. By participating in and emphasizing subsidy reduction schemes for conservation funding, businesses can enhance their corporate social responsibility profiles and align more closely with consumer values that prioritize environmental sustainability. This alignment not only fosters a positive public image but can also pave the way for new market opportunities that favour sustainability.

LITERATURE REVIEW

ECONOMIC VALUATION OF NATURAL RESOURCES

Economic value is founded on individual preferences and can be quantified by the amount of something (often money) that is forfeited to gain or prevent a loss from the status quo amount of a good or service (Glenk et al. 2020). This economic value can be assessed through either stated or revealed preference methods to gauge

marginal welfare changes. Such welfare measure is deeply rooted in the utilitarian theory at the foundation of the neoclassical welfare economics. Central to the concept in welfare economic theory is the axiom that individuals desire to maximize their utility. Variations in an individual's utility, resulting from the loss of goods or services are perceived as changes in welfare and are subject to accurate measurement using these methods.

The theory of utility maximization posits that individuals have specific preferences and is rational in making choices when selecting various bundles of goods whether marketed or otherwise. Each person will choose the combination of goods that best meet their preferences to maximize their utility. Since the individual's utility function, as well as preferences for a particular bundle of goods and services, are not known to the analyst, these must thus be inferred from appropriate data using the suitable econometric methods and assumptions. The economic valuation of environmental goods and services pivots on the concept of substitutability. As such individuals are willing to make trade-offs when choosing among preferred bundles of goods and services. The decisions made can thus reveal an individual's preference over the components of a bundle. The maximum amount that people are willing to pay to get a given bundle corresponds to the increase in their level of utility.

The use values of wetlands are closely related to human utilization of their services, which can either be direct or indirect. Direct use values include harvesting fisheries products or collecting mangrove products (crabs, fruits, woods, etc.), while indirect use values are related to the function of the mangrove area as protective buffer from severe floods and in supporting component flora and fauna species relevant to both direct and indirect uses. The use values may also be related to ensuring and maintaining the availability of the goods and services for future uses. Non-use values resulting from enhanced conservation activities relate, for example, to existence values and bequest values linked to improved biodiversity protection, habitat and landscape protection, as well as levels of ecosystem services. Non-use values may also include altruistic values held by the respondents such as existence values related to the knowledge and aspiration that ecosystem services (e.g., resulting from improved biodiversity protection) will continue to exist in the future (Wadström et al. 2023). Bequest values are the desire to maintain or preserve wetland ecosystem services for the benefit of future generations whereas altruistic values are related to individual concerns for the local well-being of others resulting from conserving environmental resources. The potential welfare effects of hypothetical improvements to wetland's ecosystem services incorporating both use and non-use values have not been fully quantified. As consequence, policymakers and conservation managers are confined to limited information on the trade-offs and synergies between various conservation strategies and the payment vehicles that facilitate them. This lack of comprehensive

understanding constrains the development of nuanced and effective conservation policies that can cater to the multifaceted values individuals place on natural resources, particularly in ecologically sensitive and valuable areas such as the SW. Therefore, this study aims to estimate the welfare effects of the alternative options suggested for conserving the SW with a particular focus on subsidy reduction as a payment mechanism. Through this analysis, the study aims to elucidate the complexities of integrating bequest and altruistic values into conservation financing mechanisms, thereby contributing valuable insights into optimising conservation efforts for the benefit of both current and future generations, as well as the local communities.

In the absence of an actual market and given the existence of both use and non-use values, the stated preference (SP) methods are considered more suitable for valuing the nature resource conservation outcomes than any revealed preference method. These methods are crucial for investigating the value of potential improvements. SP methods play an important role in both academic and applied research through evaluating people's preferences and their willingness to pay (WTP) for non-marketed goods, particularly those related to passive benefits such as biodiversity conservation and goods not currently available in the market. They are useful for eliciting public preferences over realistic decision alternatives prior to an actual decision and hence contribute to policy design. Within environmental valuation, they may improve the coverage of cost-benefit analyses of policy measures affecting non-marketed goods. Nevertheless, as SP methods rely on individual's stated choices rather than their actual choices, the methods have faced scepticism for decades (Whittington et al. 2017). The most commonly utilised SP techniques for environmental valuation are the choice experiment (CE) and the contingent valuation (CV) method. A convincing CE set-up should be able to present a credible mechanism to establish consequentiality in the survey approach and thus mitigate biases originating from perceived lack of consequentiality (Vossler et al. 2012; Zawojska et al. 2019). Including a payment vehicle as a monetary attribute in the CE design is crucial in valuing nature resources. Choosing the appropriate payment method is crucial for effectiveness and alignment of incentives in stated preference surveys, particularly in developing countries and emerging economies where traditional payment methods from developed countries may not be suitable (Welling et al. 2022; Zawojska et al. 2019).

PAYMENT VEHICLE FOR CHOICE EXPERIMENT SET-UP

In countries where tax compliance is enforced, and people are accustomed to paying taxes, choosing a payment vehicle such as income tax or property tax will indicate a high degree of coercion. In developed nations, a common tax is utilised to finance public amenities, which enhances

the legitimacy of this payment method in such situations (Lliso et al. 2020). A much less coercive payment vehicle is usually voluntary donations, where free-riding behaviour can be expected. Respondents were given the option to indicate any Willingness to Pay in the given hypothetical market, with the understanding that they may opt out of donating and still receive the good if it were actually implemented. The absence of coercion may inadvertently encourage behaviours such as affirmative responses or strategic bidding, potentially resulting in biassed outcomes. This is particularly applicable to individuals in developed countries, who may not be accustomed to depending on charitable contributions but still benefit from well-established and effective tax structures and governance. Voluntary donations may be more pertinent in countries where such contributions are viewed as a societal norm (Frings et al. 2023; Othman et al. 2004).

Vossler et al. 2012 conducted a comparison of various specifications of actual payment and decision rules alongside stated preference WTP statements. They found that even if the payment vehicle specification in their SP experiment was intentionally unclear, the segment of respondents who harboured some trust in the consequentiality of the survey responded in a way largely consistent with those making actual payments for the same good. Herriges et al. (2010) similarly identified a statistical difference between respondents who perceived a survey to be at least minimally consequential and those who believed there would be no effect on policy. However, unclear payment details in a survey can detract from its perceived importance and effectiveness compared to surveys with explicit payment instructions. Specifying payment methods that influence only some respondents may impact responses, for instance, concerning protest behaviour (Morrison et al. 2000), and may also affect the compatibility of the payment questions. For example, assessing WTP for preventing damages to wetland through increased water payment rates, that are targeted and coercive solely for homeowners as a payment mechanism. Respondents without house ownership were found to exhibit higher WTP, possibly indicating free-riding behaviour. Many studies have juxtaposed voluntary contributions with more forceful alternatives, such as taxes or collectively decided payments, consistently revealing that voluntary payments lead to lower WTP levels compared to coercive ones. (e.g. Emang et al. 2020; Ma et al. 2021; van Eeden et al. 2021). Thus, while voluntary payments may induce strategic exaggeration of WTP and be less coercive (Sonnenschein & Mundaca 2019), they may, in some cases, also impact the perceived significance of the survey (Frings et al. 2023; Othman et al. 2004). For instance, some respondents may consider the risk of free riding (by others as well) if the measure described were to be implemented, thus perceiving

the survey as inconsequential and unlikely to produce results. Moreover, some respondents strategically respond in hypothetical surveys, allowing them to adjust their future decisions and outcomes to their benefit, should they materialise (Nguyen et al. 2021). Studies of recreational goods (Xu & He 2022) have compared various forms of recreation user fees and payments to determine their efficacy. These represent instances of payment vehicles that should encourage importance but only affect present or potential users of the recreational sites. In Burkina Faso, a financial incentive was proposed in a study dealing with the ecosystem services program to control forest (Diendéré & Kaboré 2023). There are few studies that have used a payment method such as the charge on water services in Malaysia (Yacob et al. 2011). In subsistence economies when currency is scarce, it is common to employ working days as a kind of payment in environmental value studies (Cunha-E-Sá et al. 2023; Meginnis et al. 2020). The use of payment through tax systems and mandatory payment otherwise is often less accepted in these societies as compared to developed economies, which can apply these payment vehicles with considerable credibility due to the stability and efficiency of tax systems (Cunha-E-Sá et al. 2023; Ureta et al. 2022). Some recent studies also explore the role of carbon taxes as a payment vehicle (Liu et al. 2021; Qin et al. 2020). Nevertheless, mandatory involvement in carbon pricing is still in its early stages, as the case in Malaysia, with ongoing debates on its impacts. Meanwhile, the use of voluntary payment vehicles in developed economies is susceptible to biases estimation due to free-riding, yeah-saying, and strategic bidding (Frings et al. 2023). However, such payment may be more relevant in countries like Malaysia with a culture and social norm of giving, such as to local public goods and purposes (Brander et al. 2024; Hassan et al. 2019).

Numerous research efforts including those by Azlina et al. (2022), Emang et al. (2020), Ramli et al. (2023), and van Eeden et al. (2021) have focused on estimating the financial value of ecological commodities and amenities. These studies however have often overlooked how the characteristics of payment vehicles have impacted individuals' preferences and readiness to make payments. This oversight is especially evident in the context of wetland conservation in Malaysia, where research on the efficacy of various payment methods remains underexplored (Cunha-E-Sá et al. 2023; Meginnis et al. 2020; Sonnenschein & Mundaca 2019). By incorporating choice experiments, this study offers a scientific approach to elucidate individuals' preferences and their WTP for environmental protection. Moreover, by concentrating on the payment vehicle design, this study aims to further the methodological development in the field of environmental economics, specifically focused on challenges unique to emerging nations.

METHODOLOGY

CASE STUDY

SW is located in the Terengganu state on the eastern coast of Peninsular Malaysia as shown in Figure 1. Their significant biological importance is increasingly threatened by human encroachment, making them a critical area for conservation efforts (Suziana 2017). Yusof and Kamarudin (2020), highlighted the criticality of the SW stressing the area as a hotspot for biodiversity, its provision of vital ecological services that support rural livelihoods, together with its cultural and socio-economic significance to the local community. In 2010, the state population, according to the Statistics Department of Malaysia (DOSM), was 993,061. the Malaysian National Physical Plan designated the SW as an Environmentally Sensitive Area (ESA) Rank 1, thus conceding it a certain level of protection. Approximately 1000 hectares of the wetland area were transformed into aquaculture ponds to enhance the local economy, with the assurance that this conversion would not negatively impact the ecological functions and biodiversity of the wetland. Lola et al., 2016 however challenged the assumption of sustainable management of the SW. They posited that the ecosystem services offered by seaweed were not being maintained in a sustainable manner to continue benefiting the local economy and mitigate threats to ecosystem sustainability.
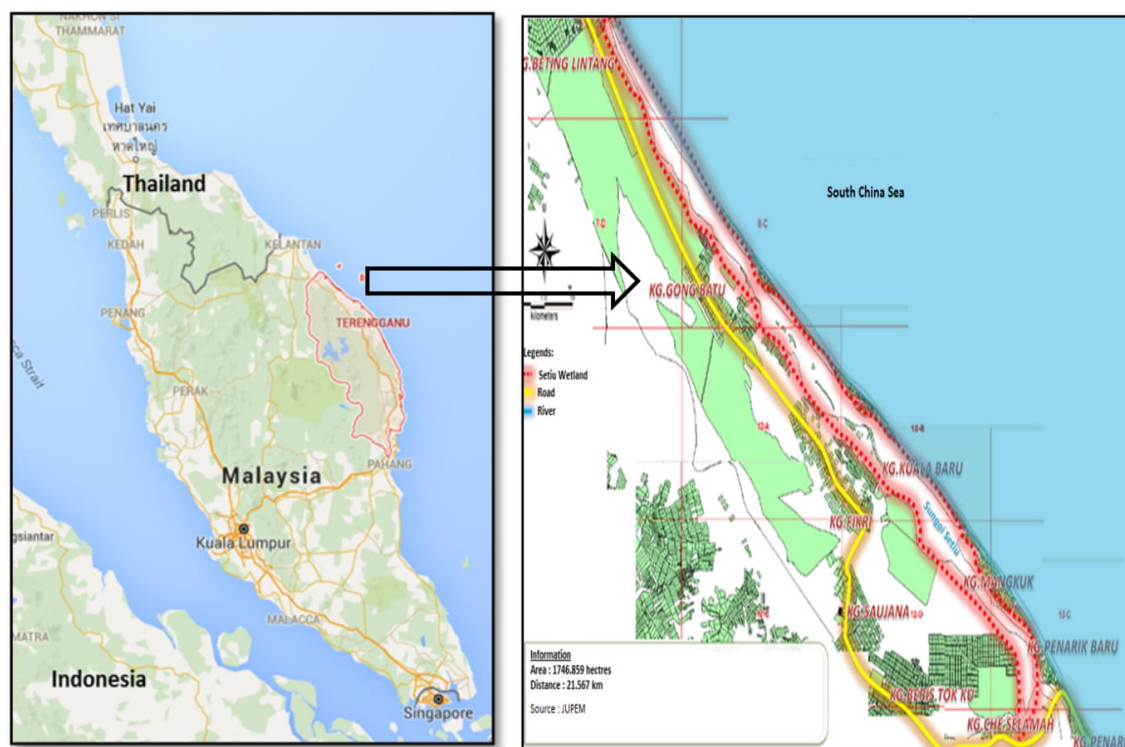

FIGURE 1. Map of case study area
Source: Google Maps and the Department of Survey and Mapping Malaysia (JUPEM)

DESIGNING THE SURVEY FOR CHOICE EXPERIMENT

When choosing attributes and their levels, it is essential to establish that these are relevant to the preferences of the target population, are amenable to policy applications, and are quantifiable and observable (Nur Syuhada et al. 2020). The attributes chosen will directly influence respondents' decision-making, as predicted by the underlying utility theory. In this study, the attributes were meticulously chosen through a thorough review of wetland valuation literature and consultation with landscape design professionals, conservationists, local stakeholders, and researchers involved in SW projects. The study selected key attributes such as environmental protection via a buffer zone, biodiversity protection focusing on endangered species, enhanced recreational services, reduction of flood risk, and cost attribute linked to subsidies reduction in daily consumer goods.

This cost attribute delineates financial impact of specific improvement options on households and explains how it will be incurred, with the use of specific payment vehicles. In the Malaysian context, popular payment vehicles used for environmental valuation include water tax services (Nur Syuhada et al. 2020), direct costs (Yong et al. 2023), entrance fees (Emang et al. 2020) and voluntary contributions to government-designated trust funds (Othman et al. 2004). It was found that all Malaysians benefitted from subsidies on daily goods. Thus, their reduction would be universally felt by all respondents, and serves as source of funding for

environmental conservation efforts. Thus, this novel payment vehicle is investigated as a potential compromise for environmental conservation.

Individual household interviews and focus groups were held at the pilot stage to gather information to refine the study. Focus group discussions were conducted with three distinct groups; the residents from the SW area, representatives from the Setiu District Land Office, and members of the WWF Setiu's Office engaged in the planning and development of the SW. Each discussion groups comprised of 5–6 participants above 18 years old, including both genders. The focus group discussions revolved around topics including socioeconomics, wetland conservation issues, specific conservation characteristics in SW, and the proposed conservation mechanism.

A fractional factorial design was used for optimizing the D-efficiency of the choice sets using the Ngene 1.1.1 experimental design software (ChoiceMetrics 2012). Information on the probable direction and magnitude of parameter estimates prior to the design was sourced from the literature, focus groups, and a pilot survey. Twelve choice problems were created, each containing two hypothetical wetland management scenarios and a status quo option. The definitive set of attributes and levels are presented in Table 1, and the choice tasks illustrated in Figure 2.

TABLE 1. The survey includes attributes and levels, with SQ being the current attribute level.

Attributes	Options	Descriptions
Environmental Conditions (Buffer zone)*	High	200 m buffer zone to protect the wetlands.
	Moderate	50 m buffer zone to protect the wetlands.
	Low (SQ)	No buffer zone to protect the wetlands.
Biodiversity	High	Abundant populations of multiple species in the wetlands.
	Medium	A moderate population and species diversity in the wetlands.
	Low (SQ)	There are few wetland species remaining in the area.
Recreational amenities	High	The recreation facilities are well-maintained, offering a variety of recreational activities in the vicinity.
	Medium	The recreation facilities are adequately maintained, and there are several diverse recreational activities available in the vicinity.
	Low (SQ)	The recreational facilities are poorly maintained, and there are few recreational activities available in the neighbourhood.
Flood Control	High (SQ)	Increased likelihood of a hazardous increase in water levels necessitating the evacuation of residents, resulting in significant property damages and losses.
	Medium	There is a moderate risk of storm flood water levels, but no evacuation of residents is necessary. Property damages and losses are expected to be minimal.
	Low	There is a low likelihood of storm flood water reaching high levels, so there is no need to evacuate residents and no significant property damages or losses are expected.
Reducing subsidies for conservation costs annually per household in Malaysian Ringgit (RM)		0, 5, 10, 30, 90, 210, 400

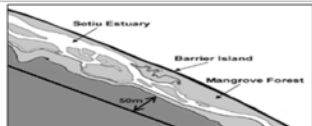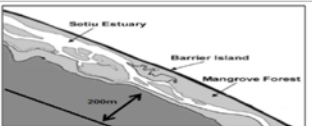*Buffer zone width for wetlands as suggested by Newton (2012).

	Alt 1	Alt 2	SQ (CURRENT CONDITION)
Natural Environmental Conditions (Quality)	**Medium:** The wetland protected from 50 m	**High:** The wetland protected from 200 m	**Low:** The wetland habitat has no protection
Biodiversity (Habitat quality)	**High:** Abundant species	**Medium:** Increase numbers of individual and other species are present in the area.	**Low:** Only few individual left.
Recreational services (Quality)	**Medium:** Possible for other facilities and activities.	**High:** Many activities and facilities	**Low:** Limited facilities and activities
Flood Control (Risk)	**Low:** Low risk and safe from flood.	**High:** High risk and frequent flash and heavy flood	**High:** High risk, frequent flash/ heavy flood.
Price (RM) / year of subsidy reduction	**RM 10 /year** Through increased prices on fuel, groceries etc.	**RM 30 /year** Through increased prices on fuel, groceries etc.	**RM 0 /year** Through increased prices on fuel, groceries etc.
I choose :	☐	☐	☐

FIGURE 2. One of the twelve choice task

SAMPLING AND DATA COLLECTION METHOD

The questionnaire survey in villages and towns near the SW areas was conducted through face-to-face interviews. Involving 403 respondents, the face-to-face technique was selected over web-based or postal surveys to circumvent the limitations often posed by uneven internet access, as well as the lack of comprehensive telephone or address directories for mail distribution. Moreover, the technique facilitates a direct exchange that allows for prompt response from respondents to any question or clarification if necessary. The study employed the systematic random sampling procedure concentrating on households located in both rural and urban sectors in selected regions of Terengganu. Although the sampling does not represent the total Malaysian population, or even the broader state of Terengganu it does however offer significant local viewpoints that is sufficiently representative for testing the procedure.

ECONOMETRIC SPECIFICATIONS

The choice experiment method, based in Lancaster's model of consumer choice alongside the theory of characteristics (Lancaster 1966), was first introduced into environmental valuation by Adamowicz et al. (1994). The theory specified that the utility an individual derives from a good is strictly a function of the attributes or characteristics of the good. According to the random utility theory, the random utility model (RUM) delineates that the utility, U that an individual i attaches to an alternative j, in the $n'th$ choice situation can be expressed as follows:

$$U_{ijn} = V_{ijn} + \varepsilon_{ijn} \tag{1}$$

The individual's utility/preferences from alternative j depends on a vector of attributes of the j'th good, S, and the socioeconomic characteristics of the individual, called Z.

$$U_{ijn} = U(S_n, Z_n) \tag{2}$$

The CE method is consistent with the utility maximization and demand theory (Whittington et al. 2017). Thus, individuals are assumed to choose the alternative, j, that yields the maximum utility among all competing alternatives, k in the choice set, n :

$$U_{jn} > U_{kn} \rightarrow V_{jn} + \varepsilon_{jn} > V_{kn} + \varepsilon_{kn} \ \forall k \neq j; j, k \in K \tag{3}$$

Hence, the utility of individual i for selecting j alternative can be written as:

$$U_{ij} = \beta_j x_{ij} + \varepsilon_{ij} \tag{4}$$

Where β_j is the coefficient of attributes, and x_{ij} are the attributes. Therefore, the probability of an individual, i, choosing alternative j over the alternative k can be described as:

$$P_{ij} = \left(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}\right) = (V_{ij} - V_{ik} > \varepsilon_{ij} - \varepsilon_{ik}), \forall k \neq j \tag{5}$$

The observed utility, V_{ijt} is determined by the qualities of a specific option and choice circumstance for an individual, with ε_{ijt} being a stochastic error term that accounts for unobserved effects. The deterministic component of utility is defined as a linear additive function with estimated parameters β of each attribute x'_{ij}. If the error term ε_{ijt} follows a Gumbel-distributed, the probability of respondent i selecting alternative j out of J alternatives in t choice task can be represented as:

$$Pr_{ij} = \prod_{t=1}^{T} \left[\frac{exp(\beta x'_{ij})}{\sum_{j=1}^{J} exp(\beta x'_{ij})} \right] \tag{6}$$

Heterogeneity in preferences can be effectively represented by a random parameter logit model (RPL), which also avoids being influenced by the independence of irrelevant alternatives (IIA) assumption (Hensher et al. 2005). The RPL model estimates parameters for each individual in the sample, allowing for more flexibility in capturing variation in preferences. This flexibility is particularly practical when allocating a complex choice scenario and it describes how preferences differ across segments of the population (Bujosa Bestard & Riera Font 2021). Covariates like sociodemographic factors or attitude assessments can also be included to help explain the variation in preferences. This makes it possible for researchers to pinpoint the variables that affect people's decisions and gain a deeper understanding on the aspects that determine how they favour certain environmental attributes. In this study, the RPL model is a benchmark model that assumes a normal distribution for all main effect parameters, except for the fixed price parameter in the sample.

The welfare measure in the form of willingness to pay can be determined by estimating the marginal rate of the substitution between the attributes (Mariel et al. 2021). The WTP for a change in an alternative as measured in a specific non-price attribute can be expressed by:

$$WTP = - \left(\frac{\beta(non\ price\ attribute)}{\beta(price\ attribute)} \right) \tag{7}$$

RESULTS AND DISCUSSION

DEMOGRAPHIC STATISTICS

Table 2 presents statistical data on key demographic traits of 403 participants. The respondents were drawn from urban and rural areas in Terengganu with higher representation from urban areas. This distribution may be attributed to urbanization which attracted individuals to live in urban areas that offer better facilities and quality of life (Mouratidis 2021). Gender distribution in the sampling was equitable with equal proportion of male and female respondents. For education level, respondents were categorised into two groups; those at the school level (at least secondary school) or with higher education credentials (college, university, and above.). All participants had received formal education with 28% at the tertiary level.

Findings from the pilot test in this study revealed that most respondents refrained from disclosing their income. To overcome this, salary ranges were devised to enable respondents to select the option that is most closely aligned with their income bracket, while still respecting their need for privacy. Although this method proved effective, continuous income data would still be more beneficial than range data since these would enhance analytical capabilities while ensuring clearer interpretation. Most respondents (43.8%) earned less than RM 12,000 annually with only 11.4% in the highest income bracket earning above RM36,000 per year. Comparing these income distributions with the income classification in Malaysia, it is evident that most respondents fall in the B40 income class earning less than RM 4849 per month (RM52, 470 per annum) (DOSM 2019).

TABLE 2. Distribution of socio-demographics

Total respondent	%	No.
		403
Residence area		
Urban	72.00	299
Rural	28.00	104
Gender		
Male	49.10	200
Female	50.90	203
Education Level		
School and below	72.00	258
College/University and above	28.00	145
Income (per year)		
< RM12,000	43.80	174
RM12,000– RM24,000	32.10	130
RM24,000– RM36,000	12.70	52
> RM36,000	11.40	47

PARAMETRIC RESULTS

The Random Parameter Logit model estimation using Biogeme version 2.3 (Bierlere 2003) is presented in Table 3. The results were achieved by 1000 Modified Latin Hypercube Sampling (MLHS) iterations, which were deemed adequate for the results to reach stability. It is assumed that the distribution of the random parameters in the model are all normally distributed. In principle however, any distribution could be applied.

The results indicate that most attributes exerted a substantial impact on decision-making, with the exceptions being biodiversity, as well as medium levels of environmental protection and recreational amenities. Notably, there were substantial differences in taste preferences for every attribute among individuals. The positive and large ASC linked to the status quo option suggests that respondents frequently select this option. Including the status quo in estimation helps mitigate potential over estimation of WTP (W Mohamad et al. 2020). Some signs in the model do not align with typical conservation benefit perspectives. For instance, the negative parameters for 'high environment' and 'high recreational' suggest that most respondents prefer lower to medium levels for both environmental conditions and recreational facilities. However, such negative numbers are admissible since there is no definitive theoretical prediction mandating that they should be positive. (Jacobsen et al. 2012). A study by (Humagain & Singleton 2023) found that individuals are inclined to relocate from congested locations to prevent disputes that may diminish the quality of their recreational pursuits, thus potentially explaining the pessimistic perception of elevated recreational quality among participants. Moreover, some respondents may have a negative view of the high levels of the buffer zone due to concerns that the government may potentially acquiring their land for the conservation project, which could be perceived as a cost. The preference for 'low flooding' over 'medium flooding', contradicts expectation and this can be attributed to coastal residents anticipating improved fishing opportunities nearer the shore in the aftermath of monsoon-induced flooding. Significantly reducing the occurrence of flooding could directly lower their income by causing a decrease in their catch or requiring them to travel farther out to sea to maintain previous catch levels.

In summary, across all payment vehicle scenarios, the greatest benefit for respondents would result from reducing the risk of flooding, while high recreational services negatively affect their utility. The significant effect of monetary attribute (Price) suggests that respondents have reacted to the subsidy reduction for conservation purposes thus indicating that this model aligns with economic theory.

TABLE 3. Random parameter logit model with standard error in brackets

Attributes	Mean		S.D		p-value
High biodiversity	0.20	(0.15)	-1.93***	(0.21)	0.20
Medium biodiversity	0.04	(0.10)	-1.05***	(0.29)	0.72
High environment buffer zone	-0.48***	(0.13)	-1.00***	(0.17)	0.00
Medium environment buffer zone	-0.15	(0.10)	-0.80***	(0.18)	0.11
Low flood risk	0.83***	(0.16)	-2.01***	(0.29)	0.00
Medium flood risk	0.87***	0.12)	1.48***	(0.20)	0.00
High recreational	-0.68***	(0.12)	-1.63***	(0.16)	0.00
Medium recreational	0.01	(0.14)	1.56***	(0.17)	0.97
ASC	0.60***	(0.12)	-	-	0.00
Price	-0.01***	(0.01)			0.00
Log-likelihood	-3759.16				
Pseudo-R2	0.29				
Number of observations	403				

Note: '***', '**', and '*' denote parameters that are statistically different from zero at the 1%, 5%, and 10% significance levels, respectively

PAYMENT VEHICLE EFFECT ON WTP

Table 4 illustrates the welfare measure of conserving SW through the reduction of subsidies on daily consumption goods as a fund mechanism or payment vehicle. It is noted that when mandatory payment vehicles such as subsidy reduction are implemented for environment protection, only a limited number of parameters emerge as significant and positive. This indicates that individuals tend to prefer the status quo over environmental improvement. The results further suggest that when the payment vehicle is perceived as more obligatory and consequential, respondents are less likely to agree ('yeah' saying) and more likely to prefer the status quo (Ahtiainen et al. 2023). In most developing and underdeveloped countries, mandatory payment vehicles are less preferred due to their impact on household spending, relative to payment vehicles that are less coercive such as environmental fees, donation, or tax (Hassan et al. 2017; Zhang et al. 2022). The highest average WTP for conserving the SW, when offset by subsidy reductions on daily necessities, is predominantly for flood risk reduction, whereas the least favoured is high recreational services. Analyses of Random Parameter Logit model indicate that respondent's WTP for SW conservation, using subsidies reduction as a payment vehicle, stands at RM120.59 per year. The price sensitivity in the model is quite high with a very low mean for the monetary attribute at -0.009. The results underscore the respondents' serious concern over the costs, and evidence that subsidy reduction can act as the most consequential and coercive payment vehicle in the context of SP studies.

TABLE 4. The mean WTP from subsidy reduction for SW conservation.

Attributes	WTP (RM)	Confidence Interval
High biodiversity	20.68	(-10.35, 51.70)
Medium biodiversity	3.89	(-19.36, 27.14)
High environment buffer zone	-50.74***	(-74.77, -26.71)
Medium environment buffer zone	-15.82	(-37.13, 5.48)
Low flooding	87.76***	(57.11, 118.42)
Medium flooding	91.98***	(66.52, 117.45)
High recreational	-71.52***	(-99.09, -43.95)
Medium recreational	0.50	(-29.32, 30.32)
ASC	63.08***	(42.78, 83.38)

Note: '***', '**', and '*' denote parameters that are statistically different from zero at the 1%, 5%, and 10% significance levels, respectively. The confidence intervals are obtained using the Krinsky-Robb procedure (Krinsky & Robb 1990)

CONCLUSION AND POLICY IMPLICATION

In the Malaysian case study, the selection of appropriate payment vehicle for stated choice experiments is believed to be consequential especially given the heavy reliance on government subsidies for essential consumer goods such as rice, cooking oil, wheat, and petrol. It is thus assumed that a decrease in these subsidies will impact the majority of the populace. The study revealed that most respondents are likely to refrain from contributing to conservation efforts if these necessitate trade off in their household's income. Alternative payment vehicles for conservation, such as entrance fees, conservation donations, or environmental taxes, could serve as potential options to gain support for conservation initiatives.

To encourage a shift from passive to active engagement in conserving natural resources policymakers should enhance public awareness on the importance of environmental and natural resource conservation. The study reveals a tendency among Malaysians, particularly urban residents, to have passive attitudes towards paying for the conservation of natural resources. The government can utilise media channels or promote public awareness campaigns to disseminate critical information on the ongoing depletion of natural resources in order to promote a scientific and objective understanding among the public. The main limitation of this study is in its contextual specificity to developing and emerging economies which may restrict is applicability in the developed countries where daily consumption of goods is not dependant on government subsidies. One such constraint of the existing data used is their representativeness, which if inadequate could distort the analysis and the derived conclusions. Furthermore, in rural areas such as the SW, residents may exhibit low price sensitivity due mainly to dependence on subsistence living. Additional research, incorporating a variety of payment options to gauge price sensitivity is therefore recommended for greater understanding of public support for environmental conservation.

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