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Assessing the Preference Heterogeneity in Marine Ecotourism Attributes by Using Choice Experiment

MOHD RUSLI YACOB[a*] AND AHMAD SHUIB[b]

[a] *Department of Hospitality and Recreation*
Faculty of Economics and Management, Universiti Putra Malaysia
43400 UPM Serdang, Selangor, Malaysia
[b] *Department of Economics, Faculty of Economics and Business*
Universiti Malaysia Sarawak
Kota Samarahan, Sarawak, Malaysia

ABSTRACT

This paper aims to assist marine parks managers or policy makers in operating and managing of ecotourism resources in accordance with the concept of sustainable ecotourism development, by providing results of a valuation study on the marine parks. A choice experiment is employed to estimate the values of changes in marine ecotourism resources. The attributes investigated were ecological management (EM), recreational activity congestion (RAC), provision employment to local people (ELP) and conservation charge (CC). The general, specific and interactions of conditional logit (CL) and mixed logit (MLM) models are estimated to account for heterogeneity in the preferences of the visitors from the various management options of marine ecotourism attributes. The findings reveal that there is considerable preference heterogeneity among visitors. Findings of this study can assist marine parks manager in design ecotourism management policies for sustainable marine ecotourism development in marine parks with possible implications for other marine parks in Malaysia.

Keywords: Choice experiment, marine park, conditional logit, mixed logit, interactions, ecotourism

* Corresponding author: Tel: 03-89467709, Email: mroy@econ.upm.edu.my.
Any remaining errors or omissions rest solely with the author(s) of this paper.

INTRODUCTION

The idea for the establishment of Marine Parks in Malaysia first arose in the 1980s, after it was realized that the marine fisheries resources had experienced a decline. In order to enhance these resources, the protection of coral reef areas was deemed essential. These areas provide habitat, breeding and feeding opportunities to various commercial fish species. In view of this situation the first marine park, Pulau Payar Marine Park, was established in 1983. At the moment there are 40 islands, and the surrounding marine waters have been designated as marine parks under the Fisheries Act 1985. These islands are grouped into five centres, which are located off the coast at Kedah, Terengganu, Pahang, Johor and Labuan.

The primary goal of the establishment of marine parks is to provide an area for the protection and conservation of marine resources and habitats, and to function as a management tool, aiding the drive towards sustainability in the fishing industry. Marine parks are able to contribute to these objectives through the conservation of critical habitats and biodiversity, the prevention of over-fishing, the maintenance of habitat continuity, and the maintenance of essential ecological processes. The benefits of their establishment are felt not only by direct users such as fishermen, but also by a wide range of users who experience increased opportunities as a result. These include nature lovers, tourism operators, researchers and scientists. The marine parks also provide platforms for the sustainable development of the tourism and ecotourism industries.

Apart from the objectives related to the conservation of biodiversity, the establishment of marine parks tends naturally to have a positive effect on the enjoyment and appreciation of natural resources by the public. Marine parks encourage the development of tourism and ecotourism. These benefits can be observed in the contribution to income at national or state level due to the arrival of tourists, the generation of direct and indirect employment, and an increase in social and cultural development. Marine parks are often suitable as recreational areas or picnic sites as a result of their inherent beauty. The coral reefs, fish, mangroves, coastal vegetation, beautiful beaches and clear blue waters, together with the peaceful and harmonious condition of the islands, combine to offer an area for human enjoyment. This combination is the main attraction to tourists, and might be of particular benefit to those who live in urban areas.

Many authorities realize that promoting marine park areas as ecotourism sites can lead to a greater interest in their use as an ecotourism destination. Marine parks can provide excellent marine-based ecotourism opportunities which, by increasing visitor numbers, may increase an area's economic potential. Recently, the number of visitors to marine parks increased significantly on a yearly basis (Table 1). This trend can become a challenge to the authorities, who must cater for the needs of the tourists and at the same time ensure the ecosystem of the marine park is well preserved.

Table 1 Visitors arrival to Marine Parks in Malaysia

State	Visitor	Year						
		2000	2001	2002	2003	2004	2005	2006
Kedah	Domestic	19,944	38,027	56,259	44,291	36,282	19,607	26,043
	Foreigner	86,836	89,514	77,516	70,393	98,990	74,492	86,605
Terengganu	Domestic	43,390	65,539	56,263	71,654	111,225	98,863	93,546
	Foreigner	9,244	8,041	8,041	7,563	31,251	24,296	41,552
Pahang	Domestic	72,383	127,675	127,675	128,676	184,238	83,857	75,806
	Foreigner	128,206	115,377	100,925	44,111	64,787	98,651	83,573
Johor	Domestic	44,824	27,963	27,235	10,016	24,444	32,440	N/A
	Foreigner	18,402	11,985	11,673	4,368	8,645	12,421	N/A
	Total	423,229	484,121	465,587	381,072	559,862	444,627	463,458

Source: Department of Marine Park, Malaysia

The purpose of this study is to assess the preference heterogeneity among visitors towards ecotourism attributes in marine parks in Malaysia by using environmental economic tools to help develop management policies that enhance ecotourism contribution to sustainable development and conservation in Malaysia. The valuation and assessment of the ecotourism attributes in marine parks in Malaysia is important in order to realize that development fulfils the requirement of the visitor preferences through the concept of ecotourism.

ECOTOURISM IN MARINE PARKS - REDANG ISLAND MARINE PARK

The Redang Island Marine Parks (RIMPs) are located in the north-eastern corner of Peninsular Malaysia. They consist of 11 islands with a fast-growing popularity for tourism and ecotourism. The RIMPs can be further sub-divided into five groups, all of which have been declared as marine parks. These groups are known as The Redang Island Marine Park (RIMP), Perhentian Island Marine Park (PIMP), Lang Tengah Island Marine Park (LTIMP), Kapas Island Marine Park (KIMP) and Tenggol Island Marine Park (TIMP). However, the majority of the research reviewed within this study occurred at RIMP.

The main access to RIMP is via boats, ferries and speedboats that depart from the jetties in Kuala Terengganu and Merang. The journey takes about one hour from Kuala Terengganu and about 30 minutes from the Merang Jetty. Alternatively, there are vessel services available from Kuala Besut Jetty, this ride taking about two hours to complete. The main jetties of Redang Island are at Kuala Redang River and Pinang Island. Land transportation in the island uses roads and pathways.

The marine parks of the east coast of Malaysia, including RIMP, constitute a globally important area of coral and fish biodiversity. The coral reefs at RIMP have

been cited as some of the most beautiful in the world. The area of RIMP contains 149 species of coral from a total of 226 species identified in Malaysia. Most of the species are found around Redang Island. Meanwhile, a total of 209 fish species have been found in the RIMP (Harborne *et al.,* 2000). The island also has landing and nesting areas for turtles, some of which are protected as turtle sanctuaries under the SEATRU project, including those at Cagar Hutan, Pasir Mak Kepit and Pasir Mak Simpan. Birds of the "layang-layang" species are also seen at Tanjung Gua Kawah and Tanjung Batu Tok Kong.

In terms of the ecotourism facilities and services, there are 16 chalets and resorts in RIMP. There are about 900 rooms from a range of categories, including 252 luxury rooms, and a nine-hole golf course on the island, Mohd Rusli *et al.,* (2008). Camping sites are also available for the more adventurous tourists and backpackers at Teluk Kalong. The Department of Fisheries has also established privatized and commercialized chalets at the marine parks centre at Pinang Island. Activities like snorkelling and scuba-diving are also popular attractions for tourists on the island. Thus, RIMP is becoming an increasingly important ecotourism destination in Malaysia. For example, in 1995 this marine park was visited by just 22,725 tourists. However, this number has increased on a yearly basis, and in 2006 it received more than 135,092 tourists (Table 2). This overwhelming increase in visitor numbers now poses a serious challenge to the parks management, who must cater for the needs of the tourists whilst ensuring that economic concerns, environmental awareness, marine ecosystem protection and conservation are maintained.

Table 2 Number of visitors to Redang Island Marine Park

Year	International Visitors	%	Domestic Visitors	%	Total
1990	130	18	577	82	707
1995	4,035	18	18,690	82	22,725
2000	9,244	18	43,390	82	52,634
2005	24,296	20	98,863	80	123,159
2006	41,546	30	93,546	70	135,092

Source: Department of Marine Park, Malaysia

MATERIALS AND METHOD

Choice Experiment Method

Choice Experiment was originally proposed by Louviere and Worthworth (1983) in order to avoid some of the problems and *ad hoc* assumptions associated with rank order or rating scale data. It involves the design of experiments in which choice situations described by a combination of attributes, referred to in the literature as choice or attribute profiles, are presented to individuals in a hypothetical market. In

the CE visitors are asked to choose a single preferred combination of attributes from the alternatives in the set provided. This approach has a format with combinations of attributes that make up specific situations selected from the universe of possible situations. The first study to apply choice experiments to non-market valuation was Adamowicz *et al.,* (1994). Since then there has been an increasing number of studies.

The CE approach allows trade-offs between goods in the choice set or attribute profile, as well as monetary compensation (Hanley *et al.,* 2001). This implies that the environmental policy makers can examine the number of environmental quality factors that the visitors are willing to trade off for one another. In this study, for example, the marine parks manager or decision makers can examine the numbers of attributes related to ecotourism development in Redang Island Marine Parks that the visitors are willing to trade-off for one another. This information could improve the efficing of management in RIMP.

There are two aspects of CE related to theoretical foundations; theory of value by Lancaster (1966) and random utility theory by Manski (1977). Lancaster's theory specifies the value of a good as a function of the attributes that characterize the good rather that the good *per se*. This theory gives rise to the utility function that is used for the application of CE. Meanwhile, the random utility theory (RUT) helps to derive the best estimator of the unknown true utility function. This theory relates utility directly to the probability of choosing an alternative from a set of alternatives.

Conditional logit is commonly used to estimate the choice modelling exercise. It is one of the simplest variants of discrete choice method. In this study let us say a respondent *n*, faces a choice among *J* alternatives in a choice set. Label the observed attributes, either in qualitative terms (e.g. very good, satisfactory, less congestion) or quantitative terms (e.g. 20%, 1 hours, RM5, RM10) of alternative *i* in the choice set as faced by the respondent, *n* as the vector X*in*. The probability (P_{in}) that respondent *n* chooses alternatives *i* depends on the observed attributes of alternative *i* compared with other alternatives (ie. X*in* relative to all X*jn*; j≠i). In this case, there are three alternatives; management option 1, management option 2 and the *status quo*. The probability can be represented by a parametric function of general form;

$$P_{in} = f (X_{in}, X_{jn}; j \neq i, \beta) \quad (1)$$

Where;

P_{in} = probability of respondent *n* choosing alternative *i*

X_{in} = a vector of observable characteristics of alternative *i* accessible to respondent *n*

X_{jn} = a vector of observable characteristics of alternatives *j* accessible to respondent *n*

In this case, *f* is the function that relates the observed data with the choice probabilities. This function is specified up to some vector of taste parameter β to be estimated. These parameters can be interpreted by estimating the marginal value of each ecotourism attribute in the respondent's choice set. In discrete choice procedure, three characteristics of choice set that should be considered; the alternatives must be *mutually exclusive,* the choice set must be *exhaustive* in that all possible alternatives and the number of alternatives must be *finite,* Train (2003).

Thus, in order to derive of discrete choice model or the specific function of *f* in Equation (1), let us consider the utility obtained by the respondent from each alternative. Take the vector of all attributes of alternative *i* as faced by respondent *n* as Z_{in}. According to Lancaster (1966), the utility that respondent *n* obtains from alternative *i*, denoted U_{in} can be written as follows;

$$U_{in} = U(Z_{in}) \tag{2}$$

U is a function. The respondent chooses the alternative that provides the greatest utility. When the respondent *n* chooses alternative *i*, we can write the behaviour model if and only if $U_{in} > U_{jn}$, ; $j \neq i$. Then we can write; $U(Z_{in}) > U(Z_{jn})$; $j \neq i$. This utility represents the deterministic component since the respondent is already known on their utility.

However, in the choice probability, the element of Z_{in} is divided into two components. The first component is called a systematic component (denote as V) and the second, the random component or error term, denoted as ε_{in} (Train, 2003).

$$U_{in} = V(X_{in}) + \varepsilon_{in} \tag{3}$$

In this case, the ε_{in} is not known and is therefore treated as a random term. The joint probability density of the random vectors, $\varepsilon_n = (\varepsilon_{n1}, \varepsilon_{n2} \ldots \varepsilon_{nj})$ is denoted f (ε_n). With this density, the researcher can make probabilistic statements about the decision-maker's choice. In random utility terms, the probability that respondent *n* chooses alternative *i* is (Train, 2003);

$$\begin{aligned} P_{in} &= \text{Prob}\,(V_{in} + \varepsilon_{in}) > (V_{jn} + \varepsilon_{jn}) \; ; \; j \neq i \\ &= \text{Prob}\,(V_{in} - V_{jn}) > (\varepsilon_{jn} - \varepsilon_{in}) \; ; \; j \neq i \end{aligned} \tag{4}$$

The probability that an individual randomly drawn from the sample population of respondents will choose alternative i equals the probability of the difference between the systematic utility levels of alternative i and j for all alternatives in the choice set. This probability is a cumulative distribution, when the probability that each random term, $\varepsilon_{jn} - \varepsilon_{in}$ is lower than the observed quantity $V_{in} - V_{jn}$. Thus, by using the density $g(\varepsilon_n)$ this cumulative probability can be written as;

$$P_{in} = \int I(\varepsilon_{jn} - \varepsilon_{in}) < (V_{in} - V_{jn})\, g(\varepsilon_n) d\, \varepsilon_n \tag{5}$$

In order to estimate a random utility model, a distribution on error terms must be specified. In this case, in order to develop a conditional logit model, McFadden (1974) and Train (2003) were referred to. By assuming that all of the error terms in the choice set are independently and identically distributed, IID with a Weibull distribution[1], the conditional logit model can be developed. Thus, the probability of respondent *n* choosing alternative *i* can be formed as:

$$P_{in} = \frac{\exp(\mu V_{in})}{\sum_{j}^{J} \exp(\mu V_{jn})} \tag{6}$$

By assuming that V_{in} is linear in parameters, the functional form of the respondent systematic component of the utility function can be expressed as:

$$V_{in} = \beta_1 X_{in} + \beta_2 X_{2in} + \ldots + \beta_k X_{kin} \tag{7}$$

Where Xs are variables in the utility function and the β_s are coefficients to be estimates. If a single vector of coefficients β that applies to all the utility functions associated with all the alternatives is defined and the scale parameter μ=1, (Train, 2003; Swait and Louviere 1993), thus the equation (4.6) can be rewritten as:

$$P_{in} = \frac{\exp(\beta' X_{in})}{\sum_{j}^{J} \exp(\beta' X_{jn})} \tag{8}$$

Where, P_{in} is a Respondent *n* choice probability of alternative i, X_{in} and X_{jn} are the vectors describing the attribute of *i* and *j* and β is a vectors of coefficients. Then, the next step is to estimate the choice probability and to calculate the welfare measure. If one of the attributes is a monetary attribute. Thus, the indirect utility function, in Equation (7) is linear and therefore a ratio of any two coefficients in it provides information about the trade-off or marginal rate of substitution (MRS) between the corresponding variables. The ratio of an attribute's coefficient and the price coefficient represents the marginal implicit price of the attributes. This ratio represents the implied change in the implicit price of the attributes relative to a current situation or *status quo* as in the equation below:

$$\rho_{ik} = \frac{\partial V / \partial X_{i,k}}{\partial V / \partial P_{i,k}} = -1 \frac{\beta_{i,k}}{\beta_{i,k=p}} \tag{9}$$

Choice Experiment Design and Application

Generally, choice experiment study involves five important stages; selecting attributes, determining levels, choosing experimental design, constructing choice

[1] Weibull distribution is also known as the Type I extreme value, Gumbel distribution, double exponential distribution and implies that the error terms are logistically distributed (Freeman, 1993).

sets, and measuring preferences. The first stage in the CE question design was to choose a set of characteristics or attributes related to the policy implemented, which was related to the study site problem. In this case, the good to be valued is the RIMP ecotourism attributes.

The first stage of attribute selection included choosing attributes that were closely related to the study site problem was the main consideration in this study. The second stage was to try to relate the study site problem with the concepts and fundamentals of ecotourism. The concepts and fundamentals of ecotourism are one of the indicators in selecting the attributes. Concepts of ecotourism that are nature-based, ecologically sustainable, environmentally educated, locally beneficial, and generate visitor satisfaction were included during the selection of attributes.

The selected attributes and their levels are reported in Table 3. The first attribute was ecological management. Three levels were chosen: very good, satisfactory, and not satisfied. The ecological management refers to the condition of solid waste disposal, sanitation, and the sewage system in RIMP. Improper ecological management will reduce the water quality and cause negative effects on the fragile coral reef and marine ecosystem in the future.

The second attribute was recreational activities congestion (RAC). Three levels were chosen: less congestion, some congestion, and high congestion. Measurement of congestion in this study referred to the recreational places such as at picnic areas, beach areas, snorkeling areas, and scuba-diving areas. The level of congestion not only affected the experiences and satisfaction among visitors, but also damaged the vulnerable marine resources, especially coral reefs and plants.

The third attribute was employment to local p (EMP). Four levels were chosen: no change, decrease 5%, increases 10% and increase 20%. The current level of jobs and involvement in the ecotourism sector, with 10% of the total population, was used as a base to determine the levels of involvement (Department of Fisheries, 1996). Selection of this attribute was based on the concept that ecotourism includes benefits to local people. In fact, increase in employment significantly creates opportunities for the local economy and thus created job opportunities elsewhere for people living within the boundary of the RIMP.

The measurement of the ecotourism value in this study simply used the conservation charge as a monetary attribute. The measurement unit for the conservation charge is in RM (Ringgit Malaysia) per person per visit. The visitor is required to trade-off how much he or she is willing pay as an increase in the management of ecotourism resources in RIMP. Three levels were chosen: RM5, RM7.5 and RM 10. The conservation charge is the current revenue collection system in RIMP and is used to support maintenance, management, enforcement, and operation (Department of Fisheries, 1996). Determination of the level with alternatives of 50% and 100% increases were relevant, and supported by the department of Marine Park officers and some of the ecotourism operators in RIMP.

Table 3 Ecotourism attributes in Redang Island Marine Park

Attribute	Description	Levels	Description
Ecological Management	Refers to solid waste disposal, sanitation and sewage system. Example: waste disposal and untreated sewage dumped directly into the ocean will pollute the beaches.	Not Satisfactory	Open burning for rubbish and waste. Some used septic tank for sewage system but sometime direct dumped into the sea.
		Satisfactory	Used a standard waste disposal system; open burning for waste and rubbish. Some used a septic tank for sewage system.
		Very good	Clean environment and schedule managed, effective waste management, used recycling system and septic tank for sewage system; shipping to mainland.
Recreational activities congestion	Congestion at the certain places and during enjoying recreational activities: picnic places, beach areas, snorkelling areas and scuba diving.	Less	No queue, no encounter by other. Less disturbed from other persons
		Some	Crowding in a few areas, but others overcrowded. Crowded and close with other persons.
		Very	Long queues and very close to other people
Employment to local people	Job opportunities to local people; works with hotels, own business, tourist guides and boatmen	No change	Maintain the current level of jobs and involvement with 10 %.
		Increase 10%	Increase jobs and involvement of local people in ecotourism sectors to 20%.
		Increase 20%	Increase jobs and involvement of local people in ecotourism sectors to 30%.
		Decrease 5%	Decreasing jobs opportunity and involvement in ecotourism sector to 5%.
Conservation charge	The current revenue collection system in RIMP for maintenance, management and operation expenses. The collection will be channel to Marine Park Trust	RM 5	The current conservation charge; RM 5 for adult and RM 2.5 for children; visitors
		RM 7.5	Conservation charge higher than current level; RM 7.5 for adult and RM 5 for children; visitors.
		RM 10	Conservation charge higher than current level; RM 10 for adult and RM 7.5 for children; visitors.

Data Collection

The stated choice experiment survey was conducted in three selected sites in Redang Island Marine Park during May to July 2004. This study also applied the face-to-face interviewed with sample was comprised of 289 respondents includes both foreign and local visitors.

The exercise involves five important stages: selecting attributes, determining levels, choosing experimental design, constructing choice sets, and measuring preferences. The question design was to choose a set of marine ecotourism attributes related to the policy implemented, which was related to the study site problem. The attributes used to describe the alternatives in each choice set should be relevant to the policy making process and must have meaning to the people, Mohd Rusli *et al.,* (2006). Finally, as explained in previous section, there are eight marine ecotourism attributes were selected and used in this study.

This study applied a series of multiple choices. The choice options or management options for marine ecotourism attributes (MPA attributes) differed according to the choice sets. Each choice set had three alternatives or *management options* for marine ecotourism development in RIMP. Management options one and two are the alternatives; meanwhile, management option three is always the same as the '*status quo*' option. The *status quo* option was provided for respondents who do not want a change for the management options described, Table 4.

Table 4 Example of choice experiment question

	Management Option 1	**Management Option 2**
Ecological Management	Satisfactory	Not Satisfactory
Recreational Activities Congestion	Less Congestion	Less Congestion
Employment to local people	No Change	5% Decrease
Conservation Charge	RM 7.5	RM 5
Option	X	
Or would you prefer NO CHANGE with current management practice for PRMPs with Ecological Management, Recreational Activities Congestion, Employment to Local People and Conservation Charge		

RESULTS

Respondents Profiles and Visit Characteristics

The respondents included visitors aged between 18 and over 70 years old with the mean age of the sample being 34.01, and 63.1% were males. The respondent had 45.6% held university degrees, 32.9% with secondary school education, and 18.1% with a professional qualification and the rest had only a primary school. In terms of employment, most of them were in full-time employment (66.1%), while

14.8% were full-time students and 9.1% performed home duties or were full-time housewives. The level of monthly gross household income was regrouped within three levels: high (RM 6001 – RM 9000), medium (RM3001-RM 6000) and low (<RM 3000). Results show that 36.3% fell into the medium income category, followed by 27.5% in the low-income category.

Table 5 Profiles and visit characteristics of respondents

Variable	Definitions and Coding		Freq.	Percent
AGE	Age (in years; mean)	34.01		
GEN	Gender			
	Male		188	63.1
EDU	Education level			
	Primary school		10	3.4
	Secondary School		98	32.9
	Professional Cert./Diploma		54	18.1
	University Degree		136	45.6
EMP	Employment status			
	Full-time employment		197	66.1
	Unemployed		17	5.7
	Home duties		27	9.1
	Full-time student		44	14.8
	Retired		13	4.4
INC	Monthly gross household income			
	Low (Below RM 3000)		82	27.5
	Medium (RM3001 – RM6000)		111	37.3
	High (RM 6001 – RM 9000)		105	35.2
TVST	Visited RIMP before			
	Visit before		129	43.3
	Never visit		169	56.7
NVST	Number of times visited RIMP			
	First time visit		169	56.7
	Second time visit		76	26.2
	Third to Fifth times visit		38	13.1
	More than six times visit		15	5.0
FVST	Will visit RIMP in future			
	Will visit again		255	85.6
	Will not visit again		43	14.4
ENV	Member of marine institution or environmental organization			
	Members		86	28.9
	Non-members		212	71.1
ORI	Place of origin			
	International tourists		43	14.4
	Domestic visitors (Terengganu)		37	12.4
	Domestic visitors (others)		218	73.2

The results of respondent visit characteristics show the majority of respondents (56.7%) were visiting RIMP for the first time, but high percentages (43.3%) of respondents were repeat visitors with 85.6% of respondents stated that they would visit the RIMP again in future. 71.1% of respondents were not involved in any marine institutes or environmental organizations. The international tourists comprised about 14.4% of the total respondents. Meanwhile, 85.6% were domestic visitors; from the state of Terengganu contributed 12.4% of visitors and domestic tourists from other states in Malaysia contributed 73.2%.

Estimation Models

The results in Table 6 contribute to explaining visitors' choices for MPA attributes. In a general conditional logit model (Model 1), a likelihood ratio test of joint significance of the included variables strongly rejects the null hypothesis that the marginal effects (βs) are jointly zero with a likelihood ratio statistic value of 132.76 against 13.276, the critical chi-squared value at 1% level of significance and 4 degrees of freedom. The overall goodness of fit of the model is defined by the model log-likelihood ratio index. With that result as a non-linear model, the level of the explanatory power is rather low with a Pseudo-R^2 value of 0.0577. According to Louviere *et al.,* (2000), in the multinomial logit, MLM/conditional logit CL, a pseudo R^2 between 0.2 and 0.4 is considered indicative of extremely good model fits. This range value is equivalent to 0.7 to 0.9 for linear function in OLS regression application as demonstrated in simulations carried out by Domencich and McFadden (1975).

In Model 1, the variable EM is significant at the 1% level and has a correct expectation sign. The coefficients and standard errors for variable ELP appear low relative to the other coefficients; this is because actual values (20,10,0,-5) have been coded in for these attributes. Overall results show three variables have been of significance: EM, RAC and ELP variables are significant at the 1% level; but have incorrect expectation signs: RAC and CC should have negative signs. The variable RAC is significant at the 5% level but does not have a correct expected sign. However, CC as the monetary variable, is far from significant and does not have a correct expected sign. The results of CC indicate that assumptions of CC being treated as a continuous variable may not be valid. It is possible that CC may be interacting with other attributes or effects, and these interactions may need to be captured to ensure the accurate model specification, such as by including an attributes level model or interaction with socio-economic variables. In this case, all the parameters need to be estimated for individual levels of some attributes.

In facts, Model 1 requires more information to be able to calculate other marginal values. Thus, it makes little sense to find a marginal value for EM in this way because there is no continuous relationship either between the ecological management (EM) and accessibility (AC) attributes used in the experiments. Thus,

to express this in the correct way, a model is estimated where there are coefficients for each level in the discrete attributes. This is achieved by recoding those attributes into dummy codes with separate columns for each level, and repeating the estimation procedure. For example, attribute EM was recoded into three columns, one for each level and dummy codes (1,0) used to indicate if a particular EM level occurred within a scenario.

Model 2 show the results of differences in choice probabilities between those base levels and attributes levels of marine ecotourism attributes. Results in Model 2 show the parameters of the model are generally in accordance with *a priori* expectations. For example, the higher positive coefficient for EM2 and EM3 implies that these are highly favored compared to EM1 as a *status quo* (base). There is also a higher coefficient for RAC1 (very congested) compared to base level, RAC2 (some congestion). Then, in comparison, the negative coefficient for RAC3 (less congested), is less preferred than RAC1 and also RAC2 by respondents. However, neither parameter RAC1 nor RAC3 is significant.

There are a few notable features about this specification of the model, Model 2 as compared to the simple specification, Model 1. Firstly, Model 2 has a higher level of parametric fit compared to Model 2 with improvements in log-likelihood values from 1083.8 to -995.83 and the Pseudo-R^2 values dramatically increase from 0.0599 to 0.1342. This implies that the MPA attributes and levels included in the expanded model explain a much higher proportion of choice than those in the simple generalized model.

In the choice model, there are several possibilities of improving model fit and examining where the sources of the inaccuracies may be occurring. One of the ways is by the inclusion of socio-economic attributes in order to account for heterogeneity of preferences. Thus, Model 3 is done by including respondent profiles and their visit characteristics as attributes in the model such as age, gender, education levels, occupation, income, place of origin, membership of environmental group, number of visits and potential for future visit.

Model 3 shows results of the inclusion of interactions between attributes into the estimation process. Comparison of this result with the general previous models, Model 1 and 2 indicates that variable EM3 becomes insignificant in this model. However, variable ELP20 becomes a strongly significant explanation of choice in this model compared to the previous model. The implications of this are that there are some interaction effects within socio-economic attributes with main attributes. The inclusion of socio-economic variables has generated substantial detail about the links between respondent characteristics and choice for MPA attributes. The negative sign on all age coefficients (ELP20_AGE and ELP10_AGE), indicates that young people were more inclined than older people to support the employment to local people for either a 10% or 20% increase in employment.

Model 4 shows the estimation result of the mixed logit, ML interaction model. There are three main variables with mean coefficients that are significant at the

1% level; EM2, ELP10 and CC. The variable ELP20 is significant at the 5% level only. However, the variable EM3 is not significant at all levels and has a negative sign. The mean for all interaction variables has significance at least at 10% levels and has a correct expectation sign except for EM3_AGE. The pseudo-R^2 value is slightly lower than the CL Model 3. Thus, this model cannot be considerably improved when compared with the interaction CL, model 3. This finding suggests that respondents' taste for attributes will vary across the population. Thus, based on the result above, the interaction ML, the taste parameter estimates confirm and can be considered consistent enough compared to the simple CL models.

Table 6 Models estimates for ecotourism attributes

Variable	CL Model			Mixed Logit Model
	Model 1	**Model 2**	**Model 3**	**Model 4**
EM	0.3026 (6.987)***			
EM2		1.7011 (9.552)***	1.3617 (6.009)**	1.6804 (6.044)***
EM3		1.1075 (7.151)***	-0.0415 (-0.107)	-0.0314 (-0.068)
RAC	0.1362 (2.034)**			
RAC1		0.0435 (0.312)	0.0439 (0.312)	0.0097 (0.059)
RAC3		-0.0149 (-0.093)	0.0173 (0.107)	0.3306 (1.056)
ELP	0.0158 (3.706)***			
ELP20		0.2569 (1.775)*	1.0049 (2.969)***	0.9259 (2.341)**
ELP10		0.4887 (4.796)***	0.9856 (3.019)***	1.1368 (2.917)***
ELPD5		0.1103 (0.666)	0.1177 (0.703)	
CC	0.2000 (0.874)	-0.1023 (-3.735)***	-0.1013 (-3.670)***	-0.1054 (-3.548)***
EM3_AGE			0.0092 (1.461)	0.0089 (1.124)
ELP20_AGE			-0.0135 (-1.664)*	-0.0164 (-1.618)*
ELP10_AGE			-0.0192 (-2.187)**	-0.0228 (-2.175)**

Table 6 (*Continued*)

EM2_GEN			0.5357 (2.333)**	0.7966 (1.839)*
EM3_GEN			0.4345 (2.256)**	0.4718 (2.168)**
ELP20_GEN			-0.4303 (-2.196)**	-0.4900 (-2.060)**
EM3_EDU			0.1767 (2.446)**	0.2349 (2.380)**
ELP10_IMED			0.5120 (2.781)***	0.5539 (2.579)***
Summary statistics				
No. of observations	1047	1047	1047	3141
Log Likelihood(L(β))	-1083.86	-995.831	-981.683	-977.748
Log Likelihood(L(0))	-1150.247	-1150.247	-1150.247	-
Pseudo-R^2	0.0577	0.1342	0.1465	0.1499
Adjusted Pseudo-R^2	0.0559	0.1309	0.1399	0.1376
Chi-Squared (30); P=0.00				344.99

Estimation of Willingness to Pay

Table 7 reports the implicit prices, or marginal WTP values for all models of the marine ecotourism attributes, calculated using equation (9) in section 3 and the Wald procedure in NLogit 3.0. For comparisons, estimates were calculated using all four models. In Model 1, the variable CC is not significant thus, the results of CC indicate that assumptions of CC being treated as a continuous variable may not be valid for comparison of the WTP with other models.

In Model 2, EM2 and EM3 have a value of RM16.6 and RM10.8 respectively. RAC1 has a value of RM0.4 but a negative value for RAC3 (RM0.146). However, there are positive values for all ELP variables, ELP10 is a higher value than the other (RM4.7), ELP20 valued at RM2.5 and ELPD5 at a value of RM1.0. Meanwhile, in Model 3, the EM2 value lower than in Model 2, RM13.43 but higher for all values of ELP10 and ELP20 with RM9.72 and RM9.91 respectively.

The marginal values of MPA attributes levels in Model 4, MLM have similar pattern from the Model 3. On average, the value for EM2 is increased from the Model 3 with RM13.43 to RM 15.9. Meanwhile, RAC1 and RAC3 are valued at RM 0.1 and RM 3.1, respectively, thus implying that respondents are willing to pay more for less congestion in recreational activities (RAC3) than very congested recreational activities (RAC1). Meanwhile, ELP20 has valued at RM 8.77, less than ELP10 at a value of RM 10.77. This result has the same pattern in simple CL Model 2, which means that respondents prefer an increase of 10% in employment to local people less than a 20% increase employment to local people (ELP10).

Table 7 Marginal WTP for ecotourism management attributes (RM)

Variable	CL Model			RPL Model
	Model 1	Model 2	Model 3	Model 4
EM	-15.12			
EM2		16.62	13.43	15.93
EM3		10.82	-0.40	-0.29
RAC	-6.80			
RAC1		0.42	0.43	0.09
RAC3		-0.14	0.17	3.13
ELP	-0.79			
ELP20		2.51	9.91	8.77
ELP10		4.77	9.72	10.77
ELPD5		1.07	1.16	

CONCLUSION AND POLICY IMPLICATIONS

The main objective of this study was to present the empirical analysis of the CE in order to assess the preference heterogeneity in marine ecotourism attributes in RIMP. The face to face interviews has been conducted with 298 representative respondents and their socio-economic profiles; age (AGE), gender (GEN), education (EDU), employment (EMP) and income (INC) give the significant results in the estimation of CL and MLM models for interaction variables. Thus, this information is very important and useful to park managers as a guide to improve their management and marketing strategies.

The marine ecotourism attributes investigated includes ecological management (EM), recreational activities congestion (RAC), employment to local people (ELP) and conservation charges (CC). In the first stage of the analysis, Model 1, all the main variables were coded by 1,2,3 except for ELP, CC and EPP. Thus, good estimated results were shown but the monetary attribute was not significant with a wrong expectation sign. Thus, In the second stage of the analysis all the main variables recoded as dummy variables (1,0) and incorporating attributes levels were estimated. Results for Model 2 and 3 were shown to be impressively significant and a drastically improved model fit compared to Model 1.

The CL interaction models (Model 3), with the aim of capturing the heterogeneity preferences among respondents and to improve the model fit. The results shown a Pseudo-R^2 improved (0.13 to 0.14) with all seven interaction variables having significance at least at the 5% level. Meanwhile, Model 4 presented the MLM interactions model results and the interaction model was also estimated with the same number of variables as used in the CL interaction model. Even though the MLM interactions model showed a better result compared to the CL interactions model, on average the results for these models cannot be considerably improved when compared with the interaction model in CL. In addition, the

estimated coefficient of standard deviation showed only RAC3 was significant, out of 15 variables included. In this case, the other possible alternative that could be considered for the future study is by using a Latent Class Model. By using this model the estimation of the heterogeneity in preferences given by segmentation would possibly be a better result.

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