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AN ECONOMIC VALUATION OF REDANG ISLAND: TOWARDS SUSTAINABLE TOURISM IN SMALL ISLANDS

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Abstract: In Malaysia, the demand for island-based recreation is increasing rapidly, especially among foreign tourists. This study attempts to capture the non-market value of services provided by the ecosystem as a basis for arguing that island and beach resources in Malaysia are undervalued. Consequently, they are not considered seriously in decisions affecting resource use and allocation. This study estimates the economic value of Redang Island, using an environmental valuation technique - the Travel Cost Method (TCM). The recreational service flows of Redang Island, a popular destination located in the state of Terengganu, were estimated through the consumer surplus generated by the visitors during May and June, 2010. Annual consumer surplus per individual was estimated as USD747 (RM2,286) while annual total benefit was USD57.89 mil (RM177.24 mil). The relatively high value of recreation suggests that the recreational functions of beaches ought to be seriously considered in decisions affecting the allocation and use of such resources. Valuation of natural resources would therefore lead to better resource-management decisions in Malaysia.

KEYWORDS: Economic valuation, Travel Cost Method, Consumer surplus, Annual net benefit
JEL Classification: Q26, Q51

Introduction

Worldwide, non-market valuation of natural resources, ecosystems and the environment is becoming important in efforts towards achieving sustainable development. A move away from sustainable development would be detrimental to a nation but the impact would be greater for the ecology-based communities. In Malaysia, the economic well-being of the coastal communities to a large extent depends on income from sea resources. However, in recent years, beach recreation and tourism is becoming an important source of income to the local communities. Considering the increasing volume of tourists visiting the beaches in Malaysia, it is crucial to understand the factors that influence coastal recreational activities as they would subsequently affect the environment. The east coast region of Peninsular Malaysia has approximately 800 to 900 kilometres of ocean coastline. However, increased coastal population, rapid urbanisation, oil and gas production, tourism development, and other economic activities have created numerous environmental and ecological problems in the coastal zone of Malaysia. Beach erosion, resource depletion, environmental degradation, and destruction of natural habitats have drawn significant attention of environmentalists (Cicin-Sain & Knecht, 1998). Severe coastal erosion caused by a variety of natural and man-made processes has been a subject of major national concern. Currently, most states in Malaysia implement their respective integrated coastal-zone management plans. The most recent initiative is the pilot projects undertaken in Sabah, Sarawak and Pulau Pinang to formulate integrated coastal-zone management plans at the State level (Cicin-Sain & Knecht, 1998).

The increasing demand for beach recreation would gradually lead to environmental destruction in the form of pollution, damage to coral reefs as well as causing congestion problems at islands. For example, Redang Island has been declared a Malaysia Coral Reef Conservation Project, and several management plans have been proposed.

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While the costs of such projects are substantial, there is a dearth of scientific research on the value of beach resources. Freeman (1993) notes (i) the lack of studies which provide estimates of the value of access to beach resources and (ii) a paucity of information on how values change with site quality. In light of the global climate change and sea-level rise, the changes in values appear fundamental in devising an optimal long-run policy for the environment. How much money should be spent on preserving beaches depends upon their value as recreational resources, what people are willing to pay to preserve beaches for future generations, as well as any non-use values related to ecosystem integrity or habitat preservation. However, it is difficult to justify the use of scarce public resources in protecting beaches without some knowledge of the value that such resources provide. Therefore valuation of natural resources becomes important.

Over the years, research into valuation of non-market goods such as ecotourism has developed into two categories; revealed preference methods and stated preference methods. The first branch, the revealed preference method, infers the value of non-market goods by studying actual or revealed behaviour on a closely-related market (Jamal, 2000). The most popular revealed preference methods are the Hedonic Pricing Method and the Travel Cost Method (TCM). In the second category of valuation method, stated preference method includes approaches such as Contingent Valuation Method (CVM) and Choice Experiment (CE).

The travel cost method (TCM) is used to estimate economic use values related to ecosystems or recreational sites using consumption behaviour in related markets. Among the earliest studies in estimating the economic values of recreational sites (Knapman & Stanley, 1991; Knapman & Stoeckl, 1995; Beal, 1995) focussing on Australia's National Parks. Recent studies on travel cost method are Whitten and Bennet (2002), Carr and Mendelsohn (2003), Rolfe and Prayaga (2007) and Fleming and Cook (2008). The studies mentioned above estimated the recreational-use values of different recreational sites such as duck hunting in the upper south east of South Austaralia, Great Barrier Reef in Queensland, recreational fishing in north Queensland and Lake Mackenzie on Fraser Island.

In Malaysia, most of the evaluation studies on ecotourism and recreational resources adopt Contingent Valuation (CVM). The studies on economic value of recreational benefits include those conducted on beach recreation, forest resources, marine parks, and islands. Mohd Rusli *et al*., (2008) and Yeo (1998) used CVM to estimate the WTP for recreational benefits in Pulau Payar Marine Park, and Alias and Shazali (2005) used dichotomous choice CVM to estimate the recreational value in Manukan Island, Sabah. A few studies adopt Choice Modelling (CM). Jamal (2002; 2003) applied CM on Matang Mangrove Forest and household preferences for solid-waste management in Malaysia and Mohd Rusli *et al*., (2006) studied ecotourism attributes in Redang Island Marine Parks.

However, there are also studies that focus on TCM application itself. Among the early study using TCM application is by Mohd Shahwahid et.al (1999) that assesses the economic value of sport-fishing recreation at the Matang Mangrove Forest Reserve. The estimation value of the Matang Mangrove Forest Reserve served as a guideline to the policy-makers in managing the resource in an optimal way such as to retain as a forest reserve or allow for project development. Nik Fuad (2006) used the Travel Cost Method (TCM) to measure recreational service flows of two popular beaches in the state of Terengganu – Pantai Bukit Keluang and Pantai Batu Buruk. The model estimated the economic values of the on-site current use value of recreational services at the selected beaches. In the case of Pantai Bukit Keluang the consumer surplus was valued at MYR77 per trip resulting in the total social welfare estimate of RM 0.92 million while for Pantai Batu Buruk the respective values were RM 168.86 and RM 2.02 million. There are studies on economic valuation which combine both Travel Cost Method (TCM) and Contingent Valuation Method (CVM). A study by Siti Aznor (2009) adopted both TCM and CVM approaches in estimating the economic benefits of marine parks in Malaysia, namely Payar, Redang and Tioman Islands. Two types of TCM was applied in this

study: individual TCM and zonal TCM. Based on the empirical analysis, the application using zonal TCM gave more significant result compared to individual TCM with the average consumer surplus found to be the same, RM1000 for each park.

This paper uses the results of a study which captures the non-market values of services provided by the ecosystem as a basis for arguing that the beach resources in Malaysia are undervalued; consequently they are not considered seriously in decisions affecting resource use and allocation. An environmental valuation technique - the Travel Cost Method (TCM) was used to measure recreational service flows of Redang Island, a popular tourist destination located in the state of Terengganu, Peninsular Malaysia.

Data

An on-site survey on Redang Island was conducted during May and June 2010. A total of 150 questionnaires were distributed. Both domestic and international visitors were approached at random and the number of completed questionnaires was 99. The questions asked include the visitor's travel cost and other factors that determine their visits (such as educational background, age, household size, monthly individual income, gender and marital status).

Table 1 displays the summary of visitors' profile. The majority of the visitors (63.6%) were female. About 51% of the visitors were single. Most of the visitors were between 26 to 35 years old (45.5%), followed by the age group of 18 to 25 years old (32.3%). This indicated that the younger generations have a greater intention of visiting the island. About 60% of the visitors were foreigners while the rest (40.4%) were Malaysians. In terms of educational background, most of the visitors were university educated; 51.5% had bachelor's degree, 21.2% diploma and 8.1% master or doctorate degrees. This study found that most visitors (43.3%) were private employees. In terms of income, 55.5% earned an income between US$1,001 (RM3,100) – US$1,500 (RM4,600) followed by 25.3% earnings of US$501(RM1,555) – US$1000 (RM3,103).

Table 1: Profile of Visitors.

No.	Characteristics	Percentage	n
1	**Gender**		
	Male	36.4	36
	Female	63.6	63
2.	**Marital Status**		
	Single	51.5	51
	Married / Partner	36.4	36
	Other	12.1	12
3.	**Age**		
	18-25	32.3	32
	26-35	45.5	45
	36-45	15.2	15
	46-55	6.1	6
	56-65	1.0	1
	65+	0	0
4.	**Nationality**		
	Malaysian	59.6	59
	International	40.4	40
5.	**Education Level**		
	No Formal Education	-	-
	Primary School	-	-
	Secondary School	19.2	19
	Diploma	21.2	21
	Bachelor's Degree	51.5	51
	Masters /PhD	8.1	8
6.	**Occupation**		
	Civil Servant	14.1	14
	Private employee	43.4	43
	Own business	18.2	18
	Students	13.1	13
	Non-working spouse	4.00	4
	Unemployed	7.1	7
7	**Monthly income**		
	Less than US$ 100	0	0
	US$ 100-200	0	0
	US$ 201-300	0	0
	US$ 301-400	0	0
	US$ 401-500	5.1	5
	US$ 501-1,000	25.3	25
	US$ 1,001-1,500	55.5	55
	US$ 1,501-2,000	10.1	10
	US$ 2001-2,500	4.04	4
	More than US$ 2,500	0	0

Estimation and results

The travel-cost model is a demand-based model used in estimating the value of a recreation site or sites. Single-site models are useful when

researchers are interested in estimating the total use or access value of a site. The appeal of coastal beaches is made apparent when one considers that households are willing to travel far to spend time at the beaches. The time and money that households expend in travelling to beaches essentially reflect the value placed on these resources. The travel-cost model makes use of this basic idea, applying the basics of demand theory to recreational resources; distance from the resource provides (presumably) exogenous variation in price that allows for the demand relationship to be identified. Such models can be used to estimate the value of a beach day, as well as to value changes in exogenous factors that affect the recreational experience, such as site quality and congestion. Results are most commonly presented in different forms such as annual consumer surplus per person, consumer surplus per person per visit and total benefits of recreational values.

This study employs the Individual Travel Cost Method (ITCM). The demand curve relates an individual's annual visits to the costs of those visits, as follows:

$$Vi = f(Pi, Xi) \quad (1)$$

where Vi = number of visits made per year, Pi = visit cost faced by individual i; total cost is the sum of expenditure made on fuel, opportunity cost of time for travelling and for visits on site; Xi = all other factors determining individual i 's visits (income, age and other socio-economic characteristics).

Several different procedures can be used for estimating the trip generation function. Bateman (1993) highlighted that the most common type of functional forms for the trip generation function are linear, quadratic, log-log, semi-log dependent and semi-log independent. Whitten and Bennett (2002) estimated three different functional forms to test relationship between visit rate (dependent variable) and travel cost (independent variable). However, there is no unanimity in literature on the best functional form to be employed. Most researchers employ several functions forms in order to see how sensitive this choice is to the final estimate of consumer surplus (Mohd Shahwahid *et al.,* 1999). This study estimated 12 models using linear and semi-log functional forms. The best overall model was found to be linear functional compared to semi-log functional forms.

The TCM Demand can be shown by:

Linear form

$$V_i = \beta_\circ + \beta_1 AGAIN_i + \beta_2 AGE_i + \beta_3 HHS_i + \beta_4 INCOME_i + \beta_5 DG_i + \beta_6 DMS_i + \beta_7 DEDU_i + \beta_8 DOSITE_i + \beta_9 CTRAV_i + \varepsilon_i \quad (2)$$

Semi-log form

$$ln V_i = \beta_\circ + \beta_1 AGAIN_i + \beta_2 AGE_i + \beta_3 HHS_i + \beta_4 INCOME_i + \beta_5 DG_i + \beta_6 DMS_i + \beta_7 DEDU_i + \beta_8 DOSITE_i + \beta_9 CTRAV_i + \varepsilon_i \quad (3)$$

V_i = no. of visits of individual
$AGAIN_i$ = dummy variable with 1 if individual will visit RI again in the future
AGE_i = age of individual
HHS_i = household size of individual
$INCOME_i$ = income of individual
DG_i = dummy gender with 1 if individual is male
DMS_i = dummy married status with 1 if individual is married
$DEDU_i$ = dummy education with 1 if individual
$DOSITE_i$ = dummy other site with 1 if individual visits other site that RI
$CTRAV_i$ = travelling costs of individual
$\beta_\circ$ = intercept/constant
β_i = regression coefficients
ε_i = error term

The best model is represented by the linear regression equation based on the following criteria:

(1) The theoretical assumptions about the shape of the demand function,

(2) The precision with which the travel-price coefficient is measured (i.e., t statistics) and more general measures such as goodness of fit. (Mohd Shahwahid *et al*., 1999)

Based on Table 2, the travel-cost coefficient is negative and statistically significant. Equation (2) and (3) were then re-estimated by dropping all insignificant independent variables as in Table 2. Table 3 reported the re-estimated TCM demand. The results showed that the best method is the linear-regression equation based on the criteria proposed by Mohd Shahwahid *et al*., (1999). The regression results in Table 3 show that the travel-cost coefficient is significant at 1% significance level. An increase in visit cost faced by an individual will decrease the number of visits of individual per year. While for the socioeconomic variables, all the indicators (constant, again, age,

Table 2: ITCM Estimation.

Variable	Linear	Semi-log
Constant	1.258	0.012
	(1.678)*	(0.331)
AGAIN	0.516	0.103
	(1.835)*	(2.088)**
AGE	-0.035	-0.005
	(-1.985)**	(-1.565)
HHS	0.033	0.003
	(0.493)	(0.213)
INCOME	0.0000514	0.0000746
	(2.640)***	(2.539)**
DG	0.191	0.042
	(0.761)	(0.951)
DMS	-0.635	-0.070
	(-0.904)	(-0.569)
DEDU	-0.632	-0.085
	(-1.919)*	(-1.458)
DOSITE	0.024	0.004
	(0.092)	(0.094)
CTRAV	-0.011	-0.002
	(-2.4267)***	(-32.064)***
F	2.844**	2.251**
R^2	0.265	0.222

Table 3: ITCM Re-Estimation.

Variable	Linear	Semi-log
Constant	0.731	-0.169
	(1.433)	(-2.542)**
AGAIN	0.613	0.116
	(2.286)**	(2.512)**
AGE	-0.034	-
	(-2.262)**	
INCOME	0.000993	0.0000657
	(2.821)***	(2.573)**
DEDU	0.305	-
	(1.264)	
CTRAV	-0.002	-0.0002
	(-2.860)***	(-3.042)***
F	2.844**	2.251**
R^2	0.265	0.222

Table 4: Estimates of Consumers' Surplus per Trip to Redang Island (Linear Model).

LINEAR MODEL

Variables	Beta	Mean	Total
C	0.731		0.731
AGAIN	0.613	1	0.613
AGE	-0.034	30.41	-1.03394
INCOME	0.000993	1621.72	1.610368
DEDU	0.305	1	0.305
CTRAV	-0.002	248.52	-0.49704
V*			1.728388
V*V*	-2.98732	**CS**	**746.8312**
beta2	-0.004		
CS per visit	**522.2596**		

income, dedu and ctrav) are significant except for education. The average difference in number of visits per year between visitors is 0.6. An increase in age will decrease number of visits. For income, an increase in income will increase the number of visits of individual per year.

The consumer surplus was calculated by integrating the demand function with statistical significant travel-cost coefficients with respect to the travel-cost variable and valuing the integrals between the choke travel cost and the mean travel cost (Mohd Shahwahid *et al.,* 1999). The annual consumer surplus with the linear-demand function was calculated using equation (4) and the summary of the results is shown in Table 4. An annual consumer surplus per individual is USD746.8312 (RM2,286.70). This figure was divided by the annual sample average visit, which equals 1.43; resulting in the annual consumer surplus per visit of USD522.2596 (RM1,599.09). In deriving the total benefit from the recreational services of Redang Island, consumer surplus per visit was multiplied by total number of visitors in 2010. Total number of visitors to Redang Island in 2010 was 110,840. Hence, the total benefit obtained from recreational services of Redang Island was estimated as USD57,887,254 (RM177,243,825) a year.

Conclusions and Policy Consideration

Economic valuation is an important aspect in the management and policy-formulation for natural resources, including islands. Economic valuation is an attempt to assign quantitative values to the goods and services provided by environmental resources irrespective of availability of market prices. The economic value is the willingness to pay for the commodity, less the supply cost. The reason for conducting economic valuation is that excessive depletion and conservation of resources is often the failure to account adequately for their non-market environmental values in development decisions. By providing a means for measuring and comparing the various benefits of natural resources, economic valuation can be a powerful tool to aid and improve wise use and management of resources, in this case the islands.

An environmental valuation technique - the Travel Cost Method (TCM) was used to estimate the economic value of recreation on Redang Island, a popular destination located in the state of Terengganu. The recreational service flows of Redang Island were estimated through the consumer surplus generated by the visitors during the months of May and June, 2010. The empirical results are consistent with the economic theory and fulfill all the diagnostic tests. Annual consumer surplus per individual was estimated as USD747 (RM2,286) while annual total benefit was USD57.89 mil (RM177.24 mil). The relatively high value of recreation suggests that the recreational functions of beaches ought to be seriously considered in decisions affecting the allocation and use of such resources. The results obtained from this study can be used in planning a sustainable development of islands. Valuation of natural resources would therefore lead to better resource management decisions in Malaysia.

This study has provided a better picture of island recreation in Malaysia. The establishment of the visitors profile and the identification of important factors that motivate island visitation would certainly help in devising new strategies for a successful evolvement of island recreation in Malaysia. More importantly, planning for nature-based tourism should seriously consider the environmental preservation aspect. The unique features of islands should be carefully managed for the long-term economic survival of island-based tourism. Compared to other natural-based destinations, several measures can be instituted to prevent overcrowding on islands. The policy implications of this study include strategies to attract more nature-oriented visitors and managing natural resources as part of greater ecosystems rather than principally as a recreational resource. The study also indicates a relatively high value of island recreation and suggests that the recreational functions of island resources ought to be given serious consideration in decisions affecting the allocation and use of such resources. Valuation of natural resources, on a much wider scale, would therefore lead to better resource-management decisions in Malaysia.

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