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USE OF DICHOTOMOUS CHOICE CONTINGENT VALUATION METHOD TO VALUE THE PUTRAJAYA WETLAND PARK

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ABSTRACT

This study presents the application of dichotomous choice contingent valuation method (CVM) to value outdoor-recreational resources in Putrajaya Wetland Park. Both the logit and probit models were used to analyse the primary data obtained through personal interviews. The maximum likelihood estimates of this model showed that income and price are significant variables in determining one's willingness to pay (WTP). This study has shown that visitors to the Putrajaya Wetland Park are willing to pay about RM3.77 for the entrance fee. The estimated revenues that could be derived if the fees were charged can also be calculated according to the WTP framework.

Keywords: *Contingent valuation method; wetland; willingness to pay.*

ABSTRAK

Kajian ini menerangkan penggunaan kaedah penilaian kontingent (CVM) pilihan dikotomous untuk menilai sumber rekreasi luaran di Taman Putrajaya Wetland. Kedua-dua model probit dan logit digunakan untuk menganalisis data primer yang diperoleh daripada temu duga responden. Penganggar kebolehjadian maksimum bagi model menunjukkan pendapatan dan harga merupakan angkubah yang signifikan dalam menentukan kesanggupan membayar (WTP) seseorang. Kajian ini menunjukkan pelawat ke Taman Putrajaya Wetland sanggup untuk membayar lebih kurang RM3.77 untuk yuran masuk. Anggaran hasil yang boleh dijanakan jika yuran yang dikenakan juga boleh dikira mengikut kerangka kesanggupan membayar (WTP).

INTRODUCTION

While many of the economic activities are organised through the private market in which competitive forces determine prices, most of the recreational parks exist as public facilities because of their non-rival consumption and non-exclusion in nature. If there are some fees charged at these facilities, it is insignificant compared to the utility obtained. The existence of public facilities create problems for a price system, as once it is produced, a number of people will automatically benefit regardless of whether or not they pay for it. The designation of parks as public facilities creates free riders and over-usage problems. This could lead to deterioration in its quality. Of particular interest is the concern for a quality environment where the subject of user fees in the management of national parks and protected areas has received increasing attention in the literature (Anas, 1988; Leuschner, Cook, Roggenbuck, & Oderwald, 1987; Lindberg & Huber, 1993; Rosenthal, 1984; Loomis & Peterson, 1984).

The introduction of fee charges for the utilisation of parks should be given special attention, especially in developing countries since government funds are typically in short supply, and enforcement of environmental regulations is lacking or nonexistent. In developing countries such as Malaysia, most of the recreational sites or parks (including marine and national parks) charge a very low or minimum fee (Yacob, Willis & Radam, 2006). Thus, most of the visitors, both local or foreign, incur less in cost and enjoy many of the benefits stemming from resource conservation efforts. Charging of fees could allow the market system to function at a certain degree while absorbing part of the environmental costs.

Considerable research has established the Contingent Valuation Model (CVM) as a sound technique for estimating Willingness To Pay (WTP) values for public policy decisions. Some examples of these studies are by Rendall, Ives, and Eastman (1974), Bishop and Heberlein (1979), Bishop, Heberlein, and Kealy. (1983), Hanemann (1984), Seller, Charas, and Stell (1986), Abala (1987), Cameron and James (1987), Bowker and Stoll (1988), Cameron (1988), McConnel (1990), Bladares and Laarman (1990), Donaldson, Thomas, and Torgerson (1997), Rollins (1997), Ryan (1997), Hayes and Hayes (1999), Carlson and Johansson-Stenman (2000), Shackley and Dixon (2000), and Loomis, Lockwood, and DeLacy (2000), just to name a few.

Most Malaysian cases on environmental valuation have applied the Travel Cost Methods (TCM) to estimate the benefits of nature-based recreation, for instance, Shuib (1991), Willis, Garrod, and Chee (1998),

Jamal and Redzuan (1998). There have been fewer published studies of CVM application. Nik Mustapha (1993), Alias, Shazali, Abas and Afizah (2002), Alias and Ruhana (2003), and Jamal and Shahariah (2003) employed the dichotomous choice and open-ended CVM formats to estimate the benefits of a lake recreation and non-use values of forest resources, respectively.

A study by Nik Mustapha (1993) was carried out at Tasik Perdana recreational area in Kuala Lumpur using the dichotomous choice contingent valuation method incorporating the logit and probit models. The mean WTP ranged from RM84 to RM106 from both models while the median WTP ranged from-RM109 to RM36. Median WTP measures was argued to be more robust than the mean WTP, and he concluded that the median WTP figure for the outdoor recreational resources in Tasik Perdana recreational resources in Tasik Perdana was about RM36.

Alias, *et al.* (2002) conducted a study of willingness of local tourists to pay for conservation of tourism sports in the Damai District Sarawak. The study applied the dichotomous choice of Contingent Valuation Method (CVM) to visitors sampled randomly. Results using the logit model indicated a per person median value of RM11.64 WTP for the preservation of Damai.

Alias and Ruhana (2003) apply the dichotomous choice CVM to the outdoor-recreational resources of the Malaysian Agricultural Park, Bukit Cahaya Sri Alam, Selangor. The WTP figure derived from the model showed that visitors are willing to pay higher fees than the present fees charged. Jamal and Shahariah (2003) applied the dichotomous-choice CVM on Paya Indah wetlands in Kuala Langat, Selangor, to estimate the non-marketed benefits of conserving the wetland from the perspective of non-users, in particular among urban households in Selangor. Results indicated that the mean WTP (equivalent surplus), which reflects the non-use values of Paya Indah wetlands, accrued to urban non-user households in Selangor ranging from RM28-RM31 annually. From all the studies mentioned above, it is revealed that the large sum of monetary value that visitors are willing to pay indicates that the magnitude of social benefits that society obtains from conserving nature is highly valued by the general public.

The potential benefits from charging user fees and differently pricing access to national parks are significant. Since charging fees could lead to a more optimal market (Dixon & Sherman, 1991), it could provide the vehicle for capturing benefits of ecotourism which often accrue

primarily to the private sector. It can also reduce visits in areas that suffer from overuse and the accompanying ecological damage.

The monetary value assessment of the total economic value of environmental resource requires the use of special valuation tools. Contingent valuation (CV) is one of the valuation tools suggested in the literature (Mitchell & Carson, 1989). The CV method involves the use of questionnaires to elicit individual willingness to pay (WTP) for the specified environmental quality change. The CV method turns out to be a very important valuation technique since it is often the only technique available for accessing benefits, mainly because CV is the only method capable of shedding light on non-use value (Nunes, 2002). Using Putrajaya Wetland Park as a model, this paper applies CVM to access the net economic values of recreational resource in Putrajaya Wetland.

This paper is organised into five sections. Section one is the introduction, followed by section two which describes the location of the study. Section three explains the methodology and source of data used in the study. Empirical results are presented in section four while the last section offers some discussion and concluding comments with regard to consumers' willingness to pay accessment of the net economic values of recreational resource in Putrajaya Wetland.

LOCATION OF THE STUDY

Putrajaya Wetland Park was constructed in 1997 and was completed in 1999. With a total area of 650 hectares, it is the largest constructed freshwater wetland in the tropics. The park comprises of a series of 24 wetland cells and a large Primary Lake, carved out from rubber and oil palm plantations. This lake features many different habitats where vast areas are homes to numerous rare and unique species of flora and fauna. It provides an extensive area for recreation and education, as well as forms an essential part of ecosystem.

The Wetland serves as a home to unique and rare species of birds, insects, plants, amphibians, reptiles, small mammals, and other invertebrates, including water snails. More than 70 species of wetland plants were planted and 24 species of indigenous fish were introduced into the Wetland. In addition, over 558 wetland plant species that have timber value can be found in this Park.

Putrajaya Wetland Park is also a favorite place for bird watchers especially during the migration period from August to April.

Other than bird watching activities, this Park also organises other activities such as Camp Series, abseiling, wetland monopoly, science demonstration, guided tour, and many more. The Putrajaya Wetland has a few interesting sites such as the Wetland Cells, Flamingo Ponds, Lookout Tower, Nature Interpretation Center (NIC), and Swan Lake.

METHODOLOGY AND SOURCE OF DATA

CVM is widely used all over the world in areas of economics such as in health economics, cultural economics, and transportation safety and economics, as well as in environmental economics. It is a simple, straightforward and flexible method, which has recently been widely used in environmental valuation. In a CV study, there are four types of elicitation techniques used, namely the bidding game (BG), payment card (PC), open ended (OE) and dichotomous choice (DC). The DC is also called the referendum format approach (Mitchell & Carson, 1989). However, DC is the most frequently recommended form for CVM questionnaires (NOAA, 1993).

In DC format, a respondent is asked whether he would be willing to pay a stated monetary value. A *yes* answer will be given if the true WTP is in excess of the stated monetary value and *no* for otherwise. The main advantage of this method is that it is like a *take or leave it* approach because the situation it presents is similar to when consumers make a purchase of ordinary goods and services. In fact, this approach will reduce bias in CVM, such as strategic bias, design bias, and interviewer bias as compared to other elicitation approaches (Mitchell & Carson, 1989).

Following recommendations from environmental literature (Arrow, Solow, Portney, Leamer, Radner & Schuman, 1993), the closed-ended (CE) WTP approach to estimate the benefits from the preservation of the Putrajaya Wetland Park was used. Individuals were asked whether they would pay specific additional fees for a given commodity, with possible responses being *yes* and *no*. The bid amount varied across respondents and the only information obtained from each individual is whether his/her maximum WTP is above or below the bid offered.

In a given contingent situation, respondents are required to think and reveal their answers on WTP. Researchers have identified many issues that may result in respondents' stated WTP amounts being different from the amounts that they would actually pay. Respondents may be thinking about the other goods and services when the interviewer asks about their WTP. To avoid this condition, the researcher must

be creative and have a good idea or technique that can simulate the exact situation. Researchers must ensure that respondents understand what CVM actually measures and its purpose. All these will reduce biases in CVM such as strategic bias, design bias and interviewer bias (Mitchell & Carson, 1989).

Logistic regression technique was used to estimate WTP (Hanemann, 1984). Using this approach the probability of saying *yes* to a bid at different level of the independent variable is estimated as:

$$P = (1 + e^{x})^{-1} \quad (1)$$

where x is estimated regression logit equation and P is the probability of accepting the price. Mean WTP is estimated as the area under this probability function. This area shows the proportion of the population who would consume the goods at each price level, and their associated utility. The area under the curve is estimated by integration techniques and can be expressed as;

$$E(WTP) = \int_{L}^{U} (1 + e^{a + bPRICE})^{-1} \, dPRICE \quad (2)$$

where $(1 + e^{a + bPRICE})^{-1}$, is the probability of saying *yes* and U and L are the upper and lower limits of the integration respectively.

Estimating mean WTP within this framework relies on making some assumptions about the upper and lower limits of the integral, i.e. knowing the price amounts at which probability of saying *no* is zero and probability of saying *yes* is one. By applying this to Putrajaya Wetland Park, and assuming that individuals will not pay if they receive a dis-utility from it, negative WTP can be ruled out and zero is used as the lower limit. Bishop and Heberlein (1979) and Seller *et al.* (1986) used the upper range for the integration of their price amounts as the upper limit for the integration. Hanemann (1984) argued that such an approach is able to make an assumption about the probability distribution for the unknown WTP in the sample. He claimed that the upper limit should be infinity and that using the highest offered amount may be a poor approximation to the mean utility estimated when integrating between zero and infinity. In this study, zero was chosen as the lower limit of the integral and maximum value as the upper limit. The confidence interval of WTP was also calculated using the variance-covariance matrix and a technique adopted for dichotomous CVM by Park, Loomis, and Creel (1991).

For the purpose of this study, primary data were collected through interviews by means of questionnaires. The respondents who were randomly selected agreed to participate in the survey. In the case of many family or group members, one person was chosen for the survey. A total of 200 domestic visitors were interviewed. All respondents were 18 years old and above. Information on socio-economic characteristics of respondents obtained included race, origin, age, marital status, education, size of family members, occupation, as well as monthly, and supplementary gross income (Table 1).

Table 1: Socio-Economic Characteristics of Respondents

	Frequency	Percentage
Gender		
Female	96	48.0
Male	104	52.0
Age Distribution		
Less than 20 years old	4	2.0
21-30 years old	134	67.0
31-40 years old	51	25.5
41-50 years old	8	4.0
More than 50 years old	3	1.5
Marital Status		
Single	105	52.5
Married	95	47.5
Race		
Malay	159	79.5
Chinese	25	12.5
Indian	11	5.5
Others	5	2.5
Education Level		
Primary school	2	1.0
Secondary school	38	19.0
College and University	160	80.0
Family Members		
None	22	11.0
1-3 persons	75	37.5
4-6 persons	88	44.0
7-9 persons	10	5.0
More than 9 persons	5	2.5

(*continued*)

Job Category		
Government Sector	102	51.0
Private Sector	71	35.5
Business	13	6.5
Others	14	7.0
Monthly Income Level		
Less than RM1000	49	24.5
RM1001-RM2000	115	57.5
RM2001-RM3000	23	11.5
RM3001-RM4000	8	4.0
More than RM4000	5	2.5

Before the actual survey, a pretest was conducted to test the questionnaire, to ensure respondents' understanding of the questions and the range of bids used in the WTP questions. Respondents were interviewed for the pretest. Meanwhile, in terms of bids, the range of some modifications was made, such as reducing the bid range in order to avoid negative answers (*no* saying problem) in CVM. This is because, a critical problem in DC studies is the number of respondents saying *yes* to their lower bids amount and *no* to their highest bid amounts (Kealy, Montgomery & Dovidio, 1990). The personal interviews were administered to the visitors at Putrajaya Wetland by filling out the questionnaires at the chosen location. Each of the respondents was briefed on the details related to the purpose of preserving the wetland, facilities available, and format used in CV techniques. Respondents were asked the following question:

If entrance fees are charge by RM x, would you willing to pay so that you could continue to use this recreational area?

where x ranged from RM1.00 to RM10.00, represents a reasonable additional amount of entrance fee for Wetland in Malaysia. Currently, there are no entrance fees charged for this park. In fact, many recreational areas in Malaysia that charge entrance fees on minimum or zero accepts RM2 entrance permits to national parks and RM5 conservation fees to Marine Parks in Malaysia (Mohd Rusli et al., 2006). Thus, selection of the bids was based on a few reasons: (1) there is no current entrance fee charged in Wetland, thus a starting point is to set a lower bid of RM1; (2) most of the visitors are local people

and this area is located in the low to middle income group which were considerably reliable for the bids range due to the proportion of disposable income and surrounding; and (3) the entrance fees asked is reliable due to the current facilities and services provided in Wetland which were very much different compared to National Parks and Marine Parks.

Table 2 shows the reaction of respondents if the current price was increased from RM1 to RM10. The highest frequency of answering yes was recorded for the bid price of RM2 (25%), followed by RM1 (23.3%) and RM3 (20%). It was seen that only four respondents accepted the price of RM10. This study recorded that the majority of respondents (78.3%) accepted the price level from RM1 to RM4; which demonstrates that respondents were willing to pay for the price of RM4 and below. In order to alleviate bias such as starting point bias, the survey should pay attention to a starting bid level.

Table 2: Number of Respondents for each Price Level

Price (RM)	No		Yes		Total
	Frequency	Percentage	Frequency	Percentage	
1	6	4.29	14	23.33	20
2	5	3.57	15	25.00	20
3	8	5.71	12	20.00	20
4	14	10.00	6	10.00	20
5	17	12.14	3	5.00	20
6	17	12.14	3	5.00	20
7	19	13.57	1	1.67	20
8	17	12.14	3	5.00	20
9	20	14.29	0	0.00	20
10	17	12.14	3	5.00	20
	140		60		200

Thus, based on the reasons discussed above and the results during pretest, the bid range was reasonable. The ability to seek WTP is represented by the dichotomous variable of WTP with values of one for those willing to pay the additional amount of entrance fee and

zero for otherwise. An OLS regression of the above relationship with WTP as the dummy variable was beset by several problems namely: (1) non-normality of the error term, (2) heteroscedasticity, and (3) the possibility of the estimated probabilities lying outside the 0-1 boundary (Gujarati, 1998). Since the dummy WTP is actually a proxy of the actual propensity or ability of WTP, the probit and logit models guarantee that the estimated probabilities lie in the 0-1 range and that they are non-linearly related to the explanatory variables. The difference between these two approaches is mainly in the distribution of the regression error terms. The logit approach assumes that the cumulative distribution of the error term is logistic while the probit approach assumes that it is normal.

RESULT AND DISCUSSION

An initial estimation of the model using all the socio-economic characteristics as independent variables revealed that all variables are insignificant except for income and price. The maximum likelihood estimates of the specification for logit and probit models were estimated using Shazam, version 7.0 and the means of WTP were calculated using MATHEMATICA, version 2.2 (Sherlock, 1993). The results are given in Table 3. The value of adjusted McFadden's pseudo R^2 was 0.2594 and 0.2570 for logit and probit models, respectively. The percentage of right prediction is 81.05 and 81.00 for logit and probit models, respectively. The price and income in both models are significant at the one-percent level. However, the results demonstrated a little difference between the logit and probit models in terms of summary statistics. This is in accordance with a previous study by Bowker and Stoll (1988), which reported that neither models dominated the other empirically in the binary dependent variable case. It can be seen that the logit model performed slightly better than the probit model in terms of McFadden R^2 and percentage of right prediction. Hence, the mean WTP obtained from the logit model would be a more reliable measure.

Based on the estimation results, equivalent WTP measures were calculated using logit and probit models at income level (Table 4). The calculated mean WTP ranged from RM2.71 to RM4.74 for the logit model, and for the probit model ranged from RM3.23 to RM4.50 based on 95% confidence interval. As shown in Table 2, the logit model performed slightly better than probit model, both in terms of McFaddenR^2. In light of this, the mean WTP obtained from the logit model would be a more reliable measure. Therefore, the mean WTP value of RM3.77 would be taken as the conservative WTP measure.

Table 3: Parameter Estimates for Dichotomous Choice Model for Putrajaya Wetland Park

	Logit Model	Probit Model
Intercept	0.7598 (1.7049)	0.3961 (1.5413)
Price	-0.5141 (-6.3171)*	-0.2919 (-6.8512)*
Income	0.00049 (2.6911)*	0.00029 (2.8468)*
Log-likelihood	-90.483	-90.703
McFadden R^2	0.2594	0.2570
% Right Prediction	81.05%	81.0%

* Significant at 1% level

Table 4: Estimating of Mean WTP for Putrajaya Wetland Park

	Lower Limit 95% Confident Interval	Mean	Upper Limit 95% Confident Interval
Logit Model	RM2.71	RM3.77	RM4.37
Probit Model	RM3.23	RM3.80	RM4.50

WTP estimation for the logistic model is represented by the area under the cumulative distribution function (CDF), which explains the relationship between the probability of accepting the bid to the bid offered. Calculating the area below the CDF yields the mean WTP estimate for each respondent. From these values of consumers' surplus or the WTP for Putrajaya Wetland Park, one can compute the additional net benefit of the park for the respective year by multiplying WTP by the number of visitors to this park (Table 5). The number of visitors had increased from 14,218 in January 2004 to 24,791 in June 2004, and dhecreased to 9,909 in October 2004 because of the fasting month in Malaysia. The number of visitors can be translated to huge monetary economic benefits for the relevant authorities.

Table 5: The Estimation of Net Benefit of Putrajaya Wetland Park, 2004

Month	No. of Visitors[a]	Expected Net Benefit[b]
January	14,218	53,601.86
February	15,372	57,952.44
March	14,197	53,522.69
April	23,003	86,721.31
May	21,538	81,198.26
June	24,791	93,462.07
July	16,777	63,249.29
August	20,738	78,182.26
September	21,347	80,478.19
October	9,909	37,356.93
November	13,350	50,329.50
December	10,678	40,256.06
TOTAL	205,918	776,310.86

Note: [a] Source form Putrajaya Wetland Park Annual Report, 2004
[b] Calculated from Table 3 figure

CONCLUSION

The objective of this study was to estimate the economic value of outdoor recreational resources in Putrajaya Wetland by using environmental economic tools to assist decision makers in terms of revenue generation by implementing entrance fees to the park. The CVM method was used to estimate the value of the park, based on visitors' expressing willingness to pay (WTP) to gain access to the park. The study has shown that visitors to the Putrajaya Wetland Park are willing to pay about RM3.77 for the entrance fee. The revenue collected from the visitors could be used as an additional support to the limited funds allocated for maintenance and conversion of the park.

The estimated entrance fee in this study is very low compared to a study undertaken by Nik Mustapha (1993) using a similar method at the Tasik Perdana recreation area located near the central business

district in Kuala Lumpur. In his study the visitors were asked "if the annual membership fee of the club was 'X' in 1991, would you have joined the club so that you could continue to use the recreational areas throughout the year"? RM 'X' ranged from RM1 to RM 500. The values were chosen to represent a reasonable entrance fee to privately-managed recreational facilities which was a definite difference of *public good* compared to Putrajaya Wetland in terms of basic facilities and services.

Nik Mustapha's study also presented the estimated mean of WTP as RM84, with a median value of RM36 from a logit model that produced higher estimates of WTP compared to this study. Being in Kuala Lumpur, the Tasik Perdana recreational area has an above-average quality of facilities (tennis, badminton, squash courts, sport club, gymnasium, flower, butterfly, and deer parks; flowers and orchid gardens) compared to those in Putrajaya Wetland. A greater proportion of higher income groups use Tasik Perdana recreational areas compared to Putrajaya Wetland. All these suggest a higher WTP value for Tasik Perdana compared to the WTP value derived in this study.

The implication of this study is important as a guideline to assist the decision makers in terms of welfare measures such as recreational benefits, especially considering the importance of our natural resources in order to meet developmental needs and other economic activities. This kind of study depicts how an environmental valuation exercise can be a useful tool which is able to estimate the recreational benefits in supporting the decisions whether or not a particular natural resource is to be scarified for alternative uses or economic motives.

For the Wetland Park, the result of this study provides an economic ground for its management's effort as well as the policy makers' decision to continue maintaining the area as a wetland sanctuary. The result of this study may also be incorporated in the economic analysis for determining the viability of conserving the area in the long run. Furthermore, the estimated benefits obtained from this study (source) may be transferred to other similar wetland sites (targets) for the purpose of policy or management decisions affecting the target resource.

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