

RECREATIONAL VALUES OF MANGROVE FOREST IN LARUT MATANG, PERAK

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AHMAD S. 2009. Recreational values of mangrove forest in Larut Matang, Perak. The mangrove forest of Larut Matang is a highly productive ecosystem providing many benefits to local residents such as returns from fish and shrimp catching, cockle rearing, timber harvesting and non-timber products. Recreation is another important activity in the mangrove ecosystem. However, estimating benefits from outdoor recreation is less direct because recreation has no market price. The study was aimed at estimating recreational benefits (direct service values) of the mangrove ecosystem. A total of 331 local recreationists were interviewed using the contingency valuation method (CVM). To reduce biasness in CVM, emphasis was given to appropriate selection of sample and proper designing of the questionnaire. The mean willingness to pay (WTP) per recreationist was RM44.58 per visit while the estimated value was RM41.18 per visit.

Keywords: Contingency valuation method (CVM), non-market goods, non-consumptive use, survey design, questionnaire format

AHMAD S. 2009. Nilai rekreasi untuk hutan paya bakau di Larut Matang, Perak. Hutan paya bakau di Larut Matang merupakan sebuah kawasan ekosistem yang produktif yang menghasilkan faedah kepada penduduk tempatan melalui hasil tangkapan ikan dan udang, ternakan kerang, kutipan hasil kayu bakau dan keluaran bukan kayu. Di kawasan hutan ini kegiatan rekreasi juga menjadi satu kegiatan yang penting. Namun untuk menganggar faedah daripada kegiatan rekreasi bukanlah satu langkah yang mudah dilakukan secara langsung kerana penglibatan dalam rekreasi tidak mempunyai harga pasaran. Kajian ini dijalankan untuk menganggar faedah rekreasi (nilai khidmat langsung) yang diperolehi daripada ekosistem hutan paya bakau di Larut Matang. Kaedah penilaian kontigensi digunakan untuk menemu bual 331 orang penggiat rekreasi tempatan bagi menganggar faedah rekreasi. Kesan ralat daripada penggunaan kaedah penilaian kontigensi dikurangkan dengan memberi penekanan dalam pemilihan sampel yang sesuai dan dalam pembentukan borang soal selidik. Purata kesediaan membayar bagi setiap penggiat rekreasi adalah sebanyak RM44.58 bagi setiap lawatan, manakala nilai yang dianggar ialah RM41.18 bagi setiap lawatan.

INTRODUCTION

Although public awareness on the importance of conservation of natural resources has increased, their understanding of the benefits of conserving the natural ecosystem is still low. This mainly stems from the difficulty in measuring the benefits in a more tangible form. Many people consider protecting forest resources, wildlife, land and water by not harvesting them is a waste (Smith 1993). Financial short-term returns become more important in determining development returns and social goals of the conservation are often given lip-services.

For goods that are exchanged in the market, price is often accepted as an indicator of benefit/value to the purchasers. However, for goods that

have no market prices, the indicator of benefits is more difficult to estimate. Benefits to individuals can be related to direct and indirect *in situ* use and non-use or intrinsic values. The total economic or use values of natural resources include both use and non-use values (Turner 1997). For use values, the estimation of benefits is more straightforward. For example, in the mangrove ecosystem, human derives direct use values in the form of outputs such as fish, timber and charcoal in addition to needs or service values such as recreation, which have no market price. Indirect uses of the mangrove ecosystem include its function as floodwater storage and flood protection, effluent storage and storm buffering.

Non-use values which are not associated with current or intended future use of an asset are more difficult to estimate. Although use and non-use values can be estimated using methods which infer willingness to pay (WTP), the techniques for monetary valuation are often debated (Turner 1997). The estimation of non-market values of natural resources is often criticized because an individual has both the characteristics of rational self-interested maximization behaviour and of a citizen who is influenced by ethical rationalities, duties, obligations and needs (Smith 1993).

In contrast to indirect valuation techniques such as the travel cost method, where preferences are revealed through the actual behaviour, all transactions in the contingency valuation method (CVM) technique are hypothetical. There are vast amount of reviews concerning the potential biases and inaccuracies in the CVM approach (Lockwood 1997, Bateman *et al.* 1995). One of the criticisms of the CVM is that respondents who are unfamiliar with the goods to be valued will have difficulty forming a monetary valuation for it. This gives rise to population choice bias (Bateman *et al.* 2002). The values that respondents give in CVM studies may also be influenced by strategic bias, payment vehicle bias and information bias. There are other factors beyond the control of the researchers that influence the responses to CVM surveys (Smith 1993).

Nonetheless, the role of economic valuation is still important in determining policies and in goal setting and, thus, various steps should be taken to reduce the effects of biases. Once a choice is made it will infer an opportunity cost which carries an implicit cost (value) in relation to alternative goals. A general model for the valuation of natural resources should take into consideration the possibilities of substitution by users for the activity and location where the activity takes place. In addition, the quantity of the resources which is measured in terms of the locality and types of activities that can be undertaken must also form a variable in the model.

The main objective of the study was to estimate the direct service values of the mangrove ecosystem to local recreationists in the community. The study is also aimed at testing the credibility of the results since proper sampling technique and questionnaire design are undertaken to reduce biases in solicitation of non-market values for the services of mangrove resources.

MATERIALS AND METHODS

Study area

The mangrove forest of Larut Matang covers an area of 40 711 ha, along a 52 km stretch of the northern coast of Perak. Managed by the Forestry Department of Perak, it is the single largest mangrove forest reserve in Peninsular Malaysia, accounting for 40% of the total mangrove forest in the peninsula. The mangrove forest forms a lagoon (52 km in length and 13 km at its widest part) stretching from Kuala Gula in the north to Kuala Panchor in the south. A total of 74% of the Larut Matang mangrove forest is gazetted as productive forests for the purpose of logging and regeneration while 24% has been designated as protective area for ecotourism activities and another 1% is kept as virgin jungle reserve for research purposes (Ahmad Mahdzan 2006).

The Larut Matang mangrove ecosystem includes the surrounding village communities, which in one way or another, are dependent on the forest. The Malay and Chinese communities are mostly involved in agricultural, forestry and fishing sectors (fish, prawn and crab catching and cockle farming). The mangrove forest in Larut Matang provides employment to almost 12 500 villagers in the forestry and fisheries sectors.

The mangrove forest of Larut Matang is a well-known location for bird watching activity. It is a rich habitat for migratory and local forest birds (Jasmi *et al.* 1992). More than 58 species of migratory birds have made stopovers in mudflats of the mangrove forest. Storks and terns are the main attraction for bird watchers in the location. Other attractions found in the area include charcoal kilns, ancient civilization archaeological sites, fishing villages and the untouched mangrove forest.

Data collection

The questionnaire was divided into three parts. Part one contained questions relating to socio-demographic backgrounds of the recreationists. This was to account for the characteristics of the recreationists who were want-dominated rational economic persons. Part two was related to the recreational characteristics of the individuals with respect to the use of the mangrove ecosystem for recreational activities. Finally, part three

contained questions relating to the conservation of the ecosystem. For the purpose of the study, it was assumed that the maximum WTP can be used to infer contributions of the visitors to the conservation of the mangrove ecosystem for recreational purposes.

The format used to determine WTP included both open-ended and close-ended questions. The latter were designed to reduce the problem of free-riders (people who obtain benefits but not willing to pay) and to help reduce interviewer biases. The open-ended format was used to allow flexibility and freedom for respondents to answer without pressures; thus avoiding the starting point bias and reducing the hypothetical biases (Hanemann 1994, Boyle 2004).

For goods that have no market price, eliciting the values using the CVM implies the maximum WTP if changes are expected in the availability of natural resources. The value of WTP equals the indifferent point between levels of income and enjoyment of natural resources (Henly 1992). The recreationist was assumed to be able to assign a value for recreational experience.

To reduce strategic bias, information regarding the management of the mangrove forest was given to respondents. It was stressed that participation among visitors (users) was important in managing and conserving the ecosystem and that to properly manage the mangrove forest, a substantial amount of financial resource was needed. Respondents were asked to indicate a hypothetical amount that they were willing to pay in order to achieve the objective of conservation of the ecosystem (part three of the questionnaire is given in Appendix 1).

Sampling

Based on a general observation by the Forestry Department, the number of visitors to the area may range between 1500 and 3500 per month, of which about 75% are Malaysians. Taking into consideration the constraints in resources for data collection, a sample of 331 (representing about 13% of the locals) visitors were selected for a 10-week survey period. To ensure that the sample represented the recreationist population, convenient selection and enumeration of the respondents were done on a staggered time frame which included week ends, school holidays and public holidays. Also, enumerators were stationed

at strategic spots to intercept recreationists to the site.

Test of validity

Brown (2004) suggested three approaches to determine the validity of a CVM measure; they are called criterion, construct and content validity. For criterion validity, an experimental hypothetical referendum was needed; this requires lengthy investigation in order to allow respondents to base their responses to subsequent WTP questions without seeming to be against a perceived need to take action to mitigate a damaging situation. Construct validity test was done by determining the relationship between the measure and variables that the theory suggested should affect the measure. Whereas the content validity was tested using the questionnaire design and the selection of appropriate sample to represent the target population.

RESULTS AND DISCUSSION

Socio-demographic characteristics

The characteristics of the sampled visitors are given in Table 1. Most of the local visitors were residents living in the vicinity (Kuala Gula, Kuala Sepetang and Kuala Kurau) of the mangrove forest area. Recreationists originating from town areas, namely Taiping and Bagan Serai, formed about 18% of the sample.

Other socio-demographic characteristics of the sample indicated consistent features of a rural–semi-urban population. The educational attainment, the occupational types and the main income levels supported an inference of the rural–semi-urban characteristics of the recreationists.

Participation in recreational activities

Although many types of activities can be carried out in the mangrove forest area, activities which have direct usage of the mangrove forest resources are fish, prawn and crab catching, bird watching and wildlife observation. The distribution of the recreationists involved in the activities is given in Table 2.

Although all activities could be carried out during a visit, the table indicates that fishing

Table 1 Socio-demographic characteristics of visitors to the Larut Matang mangrove forest

Items	% of samples	
Origin of recreationists		
Kuala Gula	16.4	
Kuala Kurau	19.3	
Kuala Sepetang	46.4	
Taiping	15.0	
Bagan Serai	2.9	
Age of recreationists		
15–24	13.6	
25–40	45.0	
45–64	31.4	
> 65	14.0	
Educational attainment		
No formal education	6.4	
Primary school	35.7	
Secondary school	29.3	
Post secondary	28.6	
Occupational types		
Government services	14.3	
Private sector	25.0	
Business	17.1	
Fishing/farming	20.0	
Retired/others	23.6	
Income levels month ⁻¹	Primary source	Supplementary source
< RM300	31.5	25.7
RM301–RM500	37.1	14.3
RM501–RM1000	23.6	-
RM1001–RM2000	4.4	-
> RM2001	1.4	-
Mean (RM)	675	178

Note: RM3.23 = USD1; primary incomes are from primary occupation, whereas supplementary incomes are from secondary jobs or in some cases from children's contribution.

Table 2 Recreational activities participated

Types of activities	% of sample	Frequency of participation year ⁻¹
Fishing	52.1	1690
Prawning/crabbing	6.8	212
Bird watching	31.8	1050
Wildlife observation	9.3	302

was the most popular (in terms of purpose of visit) activity participated by recreationists. The mangrove forest of Larut Matang is an essential habitat for many species of birds. During certain months (July to April), migratory birds from colder regions of China and Russia use the mudflats and mangrove forest as a transit site in their journey to warmer climates of the southern hemisphere.

Knowledge of benefits in conserving the mangrove forest

The mangrove ecosystem provides various benefits to the coastal communities ranging from timber, fuel, food and medicinal herbs and other forest products. The uniquely adapted flora and fauna provide feeding and nursery grounds for many aquatic and terrestrial organisms. Generally, the recreationists in the study sample were aware of the main benefits that could be obtained from the mangrove forest (Table 3).

Recreational values of mangrove ecosystem

The CVM was used to estimate the recreational values of the mangrove ecosystem. The recreationist was assumed to be able to assign a value for recreational experience. Table 4 shows the distribution of the respondents' WTP for the use of the mangrove forest resources for recreational purposes.

Almost 96% of the respondents were willing to pay to ensure that the mangrove forest is

Table 3 Knowledge of benefits derivable from the mangrove ecosystem

Types of benefits	% of sample
Source of food for growth of marine lives	90.7
Breeding area for marine organisms	86.6
Transit for migratory birds	77.1
Breeding habitat for birds	72.9
Timber sources	91.4
Charcoal resources	96.4
Prevention against erosion	85.7
Source for livestock feed	77.1
Natural filter of industrial effluents	32.9
Medicinal and food sources	18.6

conserved for recreational activities. The mean value of WTP was RM44.58 and the median, RM18.95 per visit. The result of a multiple regression analysis to determine the influence of various socio-demographic variables on the WTP of recreationists is shown in Table 5.

The goodness of fit tests showed that the estimated function was acceptable. The influence of income (main and supplementary) was significant (t values 3.47 and 2.69 respectively) and consistent *a priori*. As main income increased by RM1, WTP increased by RM0.02 per person per visit. Whereas for each RM increase in the supplementary income, WTP would increase by RM0.04 per person per visit. Age was inversely related, as expected, considering that the physical environment of the mangrove forest is a major constraint restricting older age groups to be involved in recreational activities in the forested area. At the mean values of the variables in the estimated function, the WTP of the recreationists was RM41.18 per visit. A gross estimation of the benefits to local recreationists is given in Appendix 2. The total value of the mangrove forest to local recreationists is about RM3.35 million per year. Besides the direct service value from recreation, the total economic value of the mangrove forest must also include other non-use values.

Table 4 WTP of recreationists

Amount (RM)	% of sample
0 (protest response)	3.6
1–20	43.6
21–50	27.9
51–100	14.3
101–150	5.7
> 150	5.0

WTP = Willingness to pay

Table 5 Factors influencing WTP

Variable	β	t
Constant	49.48	3.18
Age	-0.545	2.08
Main income	0.024	3.47
Supplementary income	0.038	2.69

$r^2 = 0.515$; Adjusted $r^2 = 0.509$; $F = 44.45$

Validity of CVM values

For criterion validity, the measure obtained from the study has to be compared with an experimental hypothetical referendum which is closely related to the theoretical construct. As there was no experimental hypothetical referendum done, the comparison was impossible.

The construct validity is concerned with whether the measure under study relates to other measures as predicted by theory. In this case, it was shown that the WTP was influenced by the income and age of respondents. Theoretically these are relevant variables influencing WTP.

To test content validity the quality of the instrument used to obtain the measure was analysed. One of the criteria of the test was whether items to be valued were unambiguously described to respondents. In the present study, this was accomplished since respondents were local residents and the majority had some knowledge of the mangrove forest. Another criterion is related to the payment vehicle; this was described to the respondents in the questionnaire. As indicated only less than 4% of the respondents were not willing to pay. This may imply that the local community accepted the payment vehicle as reasonable. A third criterion is the representativeness of the sample; since the sample population were local recreationists, it was assumed that the sample used represented the community. The statistical model used to derive the value could also be used to determine the content validity. Although there are several complex models that can be used, a simple but complete model is more useful. The goodness of fit test showed that the model was sufficient and acceptable.

It is also necessary that the design of the questionnaire asked respondents questions that are relevant for stated preferences; and the responses given are answers to the questions. This is important since a wrong question or a misinterpreted answer will not measure the underlying construct of CVM.

CONCLUSIONS

The conservation of the mangrove forest of Larut Matang is vital for the livelihood of the local communities. The mangrove forest has supported the local communities in the form

of direct benefits from logging for poles and charcoal to fishing and agricultural activities. At the same time, the mangrove forest offers a valuable source for local residents to participate in recreational activities.

The estimation of the direct service values from recreation, which has no market price, is done using the CVM. Although the monetary valuation of the benefits using CVM has been criticized, the debate has been focused on technical issues relating to methods of data collection. With proper sampling and questionnaire design, the effects of the biases can be reduced. The recreational values of the mangrove forest to local recreationists were estimated at RM44.58 per visit, and at the mean, the WTP function indicated the recreational value of RM41.18 per visit.

Fishing is the most popular activity among the local recreationists as the mangrove forest is a rich breeding ground and source of food for many aquatic life. Birds and other terrestrial animals which depend on the mangrove forest for food are complementary assets which local residents can use for recreational endeavours. The estimation of the non-market values of the mangrove resources derived from recreation forms a part of the total economic value of the mangrove ecosystem.

The mangrove forest in the Larut Matang forest district is well managed mainly for timber products. Nonetheless, non-timber products form a substantial value derived from the forest. Policies to enhance the conservation of the mangrove forest will benefit not only the forestry industry but also the local communities as well as the recreationists.

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Appendix 1

Part 3: Payment Vehicle to Elicit WTP

Now we would like to get your views on the conservation/protection of the mangrove forest in this area for recreational purposes.

You may realize that there are many types of benefits that can be derived from the mangrove forest (recreation is one of them); thus conserving/protecting the forest is important for sustainable use.

Conservation and managing the mangrove forest require cooperation from every member of the society—fishermen, farmers, users from town areas, government agencies and private sector. One of the means to ensure conservation and protection of the resources so that you can participate in recreational activities is by having more manpower to undertake the management of the forest. With proper management, harvesting of the resources could be done in a more sustainable manner. However, to increase the manpower requires an increase in the financial resources.

If an independent agency/organization is established to undertake the conservation of the mangrove forest resources and the financing of the independent body is done through collection of donation from every member of the society:

- a. If you are required to donate an amount of RM ____ per visit in order to help in the conservation process,
- b. Are you willing to pay (donate)?
 - 1. Yes ____ (if yes go to c)
 - 2. No ____ (if no go to d)
- c. What is the maximum donation you are willing to pay (donate)?
RM ____ (above the level in a)
- d. What is the maximum donation you are willing to pay (donate)?
RM ____ (below the level in a)

Appendix 2 Estimation of gross benefits to local recreationists in Larut Matang mangrove forest

At the median, the WTP of the recreationists	RM19.00 visit ¹
No. of local recreationists month ⁻¹	1500
Total benefit to sampled recreationists = RM19 × 331	RM6289
Total no. of local recreationists year ⁻¹	18 000
Assuming sample is representative	
Average frequency of participation year ⁻¹ = Average frequency of visit year ⁻¹ = 3254/331	9.8
Total no of visit year ⁻¹ = 9.8 × 18000	176 000
At the median, total WTP (benefit) to local recreationists year ⁻¹ = RM19.00 × 176 000	RM3 351 600.00
Equivalent to USD (USD1 = RM3.23)	USD 1037 647.06
