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Estimate the Economic Value of the Ecosystem Services: The Case of Forest Landscape Conservation in Malaysia

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ABSTRACT

JandaBaik, Bentong, Pahang is one of the popular recreation and ecotourism sites in Malaysia. Apart from being surrounded by forest reserves, JandaBaik possesses a beautiful forest landscape and forest ecosystems. With the increasing demands for other forms of forest land use, multiple efforts are imperative to support forest management and sustain the forest resources without compromising the livelihoods of the local communities. Therefore, this study aimed to estimate the economic value of environmental services and to establish the Payment for Ecosystem Services (PES) scheme for the local communities in JandaBaikas financial incentives to be involved in environmental conservation. The contingent evaluation method (CVM) that involved double-bounded dichotomous choice was used in this study. A face-to-face interview which involved 322 visitors, was conducted in 2018. The estimated mean of WTP for conservation from various models ranged from RM 22 to RM 30. The results possibly can be used in developing the community-based PES scheme in the future.

Keywords: Willingness to Pay, Contingent Valuation Method, Ecosystem Services, Ecotourism, Forests

1. INTRODUCTION

Forest resource management in recent times has shifted from traditional conservation and restoration practices to a more dynamic approach for sustainable management. The shifting is for the reason that forest resources are continuously losing their capacity to provide the basic goods and services fundamental to livelihood due to human activities and other variables that threaten the ecosystem. The forest ecosystem provides a range of services of fundamental importance to human well-being, health, livelihood, and survival. Despite increasing recognition of their importance for human welfare, the ecosystems and biodiversity continue to decline at an unprecedented rate. In many cases, the losses are irreversible, posing a serious threat to sustainable development and human well-being in general. In a typical management system, the "fence-and-fine" approach has guided the management of forest areas classified as protected areas. However, it has frequently been ineffective in reducing anthropogenic activities that negatively affect biodiversity conservation (Leida et al., 2002). With the presence or

involvement of nearby communities, this approach is incompatible with the conservation of the forest environment or biodiversity. This approach failed to achieve effective management objectives and conserve forest biodiversity and ecosystems. The "participatory" approach is more favourable than the "fence-and-fine", where concerns about the local community's livelihood and respectful interpersonal relationships are balanced with the environmental management of a particular area (Stern, 2008).

Forest ecosystems are important for recreation and tourism and attract millions of visitors. Tourism is the second largest industry and job provider in Malaysia. It is fast developing, indicated by the total number of visitor arrivals. The number of visitors to Malaysia increased from 17.55 million in 2006 to 26.8 million in 2016. The income generated from tourism rose from RM36.3 billion in 2006 to RM82.1 billion in 2016. During these ten years, the growth rates were 76% for visitor arrivals and 113% for income generated. According to the Ministry of Tourism and Culture, about 10% of the tourists are expected to be ecotourists. Ecotourism is an agent of change, and as such, it has been linked to resource protection policies, protected area conservation efforts, sustainable development initiatives, and regional and community development strategies. Indeed, it has been suggested that community development is an essential part of planning nature-based tourism such as ecotourism. Ecotourism is seen as an opportunity for the local community to benefit from tourism development and the conservation of forests and protected areas. For an ecotourism programme to be successful, the implementers or authorities need to ensure that the benefits gained have a positive impact on the socio-economic and cultural livelihood of the local communities. When carefully planned and managed, an ecotourism development project, can provide a sustainable return, much of which can remain in the local community. In Malaysia, where most remaining forests are controlled by government agencies/institutions, ecotourism development offers local people opportunities to become more involved in the management of the forests. At the same time, they can seek material benefits from these forests. Developing ecotourism that benefits the local communities aligns with Malaysia's 5-year development plan. Under the 11th Malaysia Plan (2016–2020), strategic paper no. 12 (Growth through sustainable use of natural resources) outlines that sustainable natural resource management should improve the socio-economic benefits and alternative sources of income for the aboriginal and local communities.

One area of environmental management where the extent of participation of the local communities is limited is in payment for ecosystem services (PES) scheme (Kosoy et al., 2008; Bosselmann and Lund, 2013). PES schemes are broadly represented in the literature as any market-based mechanism for conservation, for example, compensation of ecosystem services, eco-certification, and entrance or user fees. Increasingly, PES schemes have focused on the creation of markets through the establishment of property rights for ecosystem services, where within this market, there exists suppliers (producers) and buyers (beneficiaries) of ecosystem services (Banerjee et al., 2013). PES is a conservation strategy where land users receive incentives from ecosystem services buyers to motivate them to continue to protect the ecosystem services on their lands and public lands, such as protected areas (Pagiola et al., 2002). The theory behind a PES approach is that those who provide ecosystem services should be compensated for doing so and that those who benefit from the services should pay for their provision (Landell-Mills et al., 2002). A PES approach aims at protecting ecosystem services by compensating landowners or managers who adopt practices that are favorable to an ecosystem, with the landowners paid by those who use the ecosystem services (Pagiola, 2008).

This research project adds to the dearth of studies on community involvement in PES schemes. Through a description of the local community's involvement in the planning and implementationof the PES scheme, it was shown that even with market-based PES schemes, the communities can be involved in the design of such schemes and that such involvement helps to establish a potential successful PES scheme.

2. MATERIALS AND METHODS

This study was conducted in Ulu Tampik Waterfall (UTW), located at JandaBaik, Bentong, Pahang, Malaysia. The area is an approximately 45-minute drive from Kuala Lumpur city centre. Located in compartment 51, Lentang Forest Reserve (LFR), the surrounding is unique, and it is an exciting recreational area. The research area is located within the Titiwangsa Range in terms of topography. LFR is a hilly area with an altitude between 600 m and 800 m above sea level. The main physical component of LFR is its unique, clear waterfall. UTW and its surrounding is a popular leisure areas for residents of JandaBaik and visitors, both locals and foreigners (Figure 1).

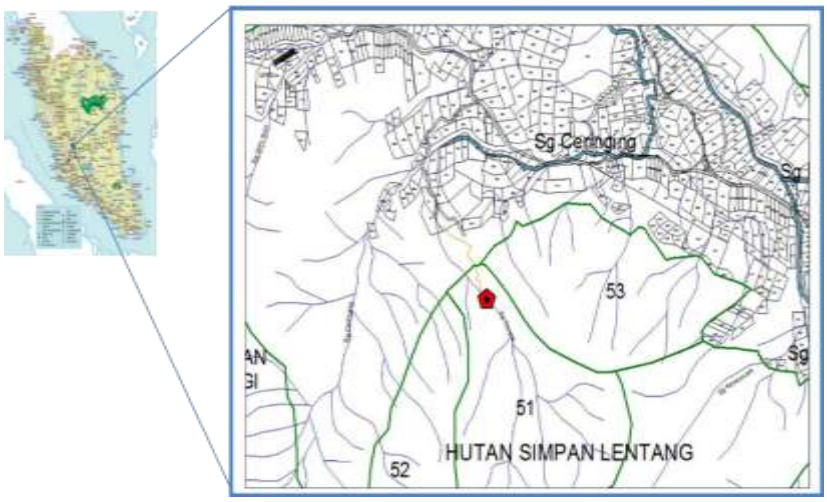

Figure 1. Location of Study Site at JandaBaik, Pahang

The structure of the study generally involves two main scopes. The first scope is an economic valuation of a nature tourism area. The focus is on estimating the economic benefits of preserving the project area based on public preferences. Measurements were made regarding whether people would pay for natural resource conservation. The contingent evaluation method (CVM) was used to quantify public preferences, while "willingness to pay" (WTP) was referred to for natural resource conservation. In this study, individuals were asked directly to reveal how much they were willing to pay to conserve the UTW nature tourism area and its ecosystem for recreational and ecotourism activity. The theoretical basis of CV used in this study is the equivalent surplus (ES) measure of welfare, which measures the amount a person is willing to pay or accept, to place him on a better utility or welfare level if changes in the quality of goods in question do not occur.

2.1 Questionnaire Design

The survey questionnaire is an instrument that sets out a number of questions to elicit the monetary value of a change in a non-market good. Contingent valuation method (CVM) uses survey questions to

elicit society's preference for public goods by creating a hypothetical market. CVM questionnaires can be designed to elicit willingness to pay (WTP) or willingness to accept (WTA) estimates for a change in the level of provision of a public good (Mitchell and Carson, 1989). A questionnaire was designed to gather primary information such as socio-demographic profile, attitude, and peoples' willingness to pay for recreational and ecotourism activity in UTW ecosystem. For the purpose of this study, primary data from respondent were collected through a face-to-face interview. The dichotomous choice – double bounded format was used as an approach of CVM for this study. The format gives the respondent an opportunity to choose the amount of WTP. Through this format, the response 'yes' or 'no' was needed for the WTP questions. Six different bids were given to different respondents randomly. Each respondent only has to say 'yes' or 'no' to the bid posed to them. Six bids were selected for use: RM2, RM5, RM8, RM10, RM15, and RM20. The charges are chosen based on a pilot study.

2.2 Econometric Models

2.2.1 Estimation Model

The exploration of whether a person is willing to pay for conservation of the area was done using Logistic model. This model was chosen because of its ability to deal with a dichotomous dependent variable and a well-established theoretical background. The model is specified as follows:

$$P_i = E(Y=1|X_i)=[1/\{1+e^{-(\beta 0+\beta i\sum Xi)}\}] \quad \text{(Eq. 1)}$$

where P_i = the probability that Y =1, X_i is a set of independent variables explained above and $\beta_i$are coefficients to be estimated corresponding to logistic distribution. Taking a natural logarithm of Eq. (1) we obtain

$$L_i = ln\{P_i/(1-P_i)\} = \beta_0 + \beta i\sum X_i + e_i \quad \text{(Eq.2)}$$

where L_i , which is called logit, is the log of the odd ratios and is linear in both independent variables and parameters. The estimation method used was the maximum likelihood estimator (MLE).
Following this, another nonlinear model using bivariate probit was employed to estimate the values with a binary dependent variable, the "yes" and "no" responses to the WTP question. For this model, the estimation of mean and median WTP was done by using the estimated coefficients which is given by Cameron and Quiggin (1994). The estimation of the coefficients using bivariate probit model include two related models, which can be expressed as:

$$Y^*_1 = \alpha_1 + ß_1 B_1 + \sum_{i=2}^{n} ß_i x_i + \varepsilon_1 \quad \text{(Eq.3)}$$

$$Y^*_2 = \alpha_2 + ß_1 B_2 + \sum_{j=2}^{m} ß_j x_j + \varepsilon_2 \quad \text{(Eq.4)}$$

$$corr[\varepsilon_1, \varepsilon_2] = \rho$$

Where Y_1 and Y_2 are the binary responses to the WTP questions; B_1 and B_2 are the bids in the first and second bid question; X_i represents socio-demographic variables and α's and ß's are the coefficients to be estimated.

3. RESULTS AND DISCUSSION

3.1 The Willingness to Pay Levels

This section presents the results of the survey undertaken for this study. Data obtained from 322 respondents using a questionnaire were used in the contingent-valuation method (CVM) analyses. The survey results are related to the economics and valuation of Ulu Tampik Waterfall (UTW). The economic data described the factors that influence the demand for UTW nature tourism area, JandaBaik, Pahang.In measuring visitors' Willingness-to-Pay (WTP) to UTW, the visitors were asked to indicate their willingness to pay for the conservation of resources at UTW.

The analysis shows that 78% of the respondents agreed to contribute to the conservation of the UTW area, while the other 22% did not agree (protest bidders). The study used the double-bounded dichotomous choice (DBDC) format to collate data. The format allows the respondent to choose the amount of WTP they can afford. A "yes" or "no" response is needed for the WTP questions by using this format. The WTP questions were divided into six different bid prices: RM2, RM5, RM8, RM10, RM15, and RM20.

For this study, estimations were taken using the single- and double-bounded dichotomous choice models. For a single-bounded dichotomous choice model, the WTP was estimated using a logistic model. Meanwhile, a bivariate probit model was used for the double-bounded dichotomous choice analysis. Results for the logistic model show that the coefficients for bid offered (BID1) are negatively correlated with the probability of acceptance as expected (Table 1). The negative and statistically significant coefficients on bid suggested that the higher the amount respondents were asked to pay, the less likely they would pay. This is consistent with the theory of demand for normal goods and the findings of similar studies (Trang, Toan, and Hanh, 2017; Emiru and Gemechu, 2017).

The mainREC is significant at a 1% significance level and has a positive sign. The coefficient of visitors who said UTW is a suitable area for outdoor recreational activities and outdoor education/nature education activities (outdoorREC and natureEDU) is also significant, with each at the 5% significance level. The variable of outdoorREC has a positive sign, while natureEDU has a negative sign. People who mentioned UTW is a suitable area for outdoor recreational activities are willing to pay more. The coefficient on perception on the beauty of the environment and landscape of the UTW nature tourism area (landscapBEUTY) is significant at the 5% level of significance and has a positive sign.

On the other hand, estimated probit model found that the variable outdoorREC has a statistically significant positive impact on both the respondent's initial and subsequent decision on their contribution toward a willingness to pay for the preservation of UTW. This variable only proved to be a statistically

significant determinant of an individual's initial bid on willingness to pay for the preservation of UTW. The regression coefficient is -1.4911, which means that for respondents who go to UTW solely to carry out recreational activities, the probability of accepting the initially proposed willingness-to-pay value increases compared to respondents who come for other purposes. Those who plan to visit UTW for recreational activities would be willing to pay more.

Table 1. Estimated parameters for the
Conservation of Forest Landscape by Using Logit and Probit Models

Variables	Coefficients		
	Logit Model	Bivariate Probit Model	
	WTP (Initial Bid)	WTP1	WTP2
Constant	-0.3605 (1.3044)	-0.1207 (0.7495)	-0.0259 (0.6770)
mainREC	2.6985 (0.8429)***	1.4911 (0.5116)***	0.6815 (0.4698)
outdoorREC	1.3788 (0.7294)*	0.8597 (0.4274)**	1.1213 (0.3536)***
natureEDU	-2.4039 (0.8655)***	-1.3701 (0.4769)***	-0.9223 (0.3319)***
landscapeBEUTY	1.1281 (0.4514)**	0.5797 (0.2588)**	0.5948 (0.2325)**
satisFACI	0.9406 (0.3894)**	0.5399 (0.2176)**	0.7531 (0.1963)***
resAGE	0.0220 (0.0158)	0.0099 (0.0089)	-0.0081 (0.0075)
	-0.1771 (0.0335)***		
BID 1 (starting bid)		-0.1001 (0.0187)***	
BID 2			- 0.0675 (0.0145)***
-2 log likelihood	104.727	235.028	
No. of obs. (n)	250	250	
Pseudo R^2	0.22		

Note: Standard errors in parentheses

* *denotes significant at the 10% level (p<0.10)*

** *denotes significant at the 5% level (p<0.05)*

*** *denotes significant at the 1% level (p<0.01)*

Estimation of the mean willingness to pay

Two approaches,Logistic and Bivariate Probit models were used to estimate the mean WTP in this study. The calculated mean and median values according to the different approaches are listed in **Table**

2. For positive WTP responses, the mean WTP is quite close to the median WTP for the Logistic model. The estimated mean WTP is RM23.05. Using the Bivariate Probit model, the mean WTP ranges from RM23.83 to RM30.89, slightly higher than the Logistic model

Table 2. Means and medians WTP from different models

Model		**Mean Willingness to Pay**	**Median Willingness to Pay**
Logistic	Initial bid	23.05	22.95
Bivariate Probit	Initial bid	23.83	22.86
	Follow-up bid	30.89	28.92

4. CONCLUSION

The most significant policy implication of this study concerns the conservation fee and revenue mechanism for UTW. With the increase in the number of visitors and mean WTP, the management of UTW should consider imposing conservation fees/charges to generate revenue for UTW. The mean WTP resulted in the study RM23 to RM30 could be imposed and will contribute more revenue. Therefore, the revenue collected would be useful in improving the management and maintenance of the site in UTW.

This study is one of the initiatives and strategies carried out to improve forest management and biodiversity resources efficiency through active involvement and cooperation of the local communities. Through this initiative, the active participation of the local community can reduce environmental damage and restore forest areas. This project has highlighted innovation in a community-based PES scheme involving ecotourism and ecosystem services in supporting the country's sustainable forest management (SFM).

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