Willingness to Pay for Taman Hutan Raya Pocut Meurah Intan: Does Environmental Awareness Boost Ecotourism?

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Abstract: *Conservation areas play a significant role in protecting biodiversity, which functions as providers of ecosystem services, protecting threatened species, and mitigating climate change. Tahura, as a national park and tourist park, is a protected area. However, Tahura can be developed into a tourist attraction on condition that it maintains environmental conditions. This study aimed to analyze the willingness to pay (WTP) for Tahura ecotourism in Saree, Aceh Besar Regency. The analytical model was used to determine the value of WTP through multiple linear regression with a sample of 398 respondents obtained based on the Slovin formula. The study results showed that income, education, employment status, and environmental knowledge significantly affect WTP for Tahura TPMI's Ecotourism. The most significant influence on environmental knowledge helped boost the WTP by 64.77 percent. Based on the calculation of the economic evaluation, TPMI has an economic value of Rp1.023 billion rupiah per hectare. The total land area evaluation calculation shows that Tahura TPMI has a value of Rp6.4 trillion rupiah.*

Keywords: Ecotourism, Tahuran, WTP, Economic Valuation
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1. Introduction

Conservation areas play an essential role in protecting biodiversity and function as providers of ecosystem services, protecting endangered species, and mitigating climate change. Taman Hutan Raya Pocut Meurah Intan (further referred to as Tahura TPMI) is a conservation area, as stipulated in Law Number 41 of 1999. In recent times, Tahura TPMI has been worrying due to illegal logging and forest conversion for other activities ignoring its status as a protected forest.

Protecting protected forests is not easy because the existing regulations must support it. However, Tahura is included in the category of nature conservation so that its forest functions can be developed with activities related to the forest itself, one of which is ecotourism. Many studies have concluded that ecotourism can help raise public awareness to preserve forests, increase social and cultural values, and boost the surrounding communities' economy (Fandeli 2000; Purwanto et al. 2014; TIES 2015; Husama & Hudha, 2018). Proper forests utilization can offer significant benefits both to the forest itself and to humans. Nature and society must strive for mutual benefit (Satria, 2019). Conservation of nature can last long and guarantee people's income (Ekayani et al., 2014).

The assessment of the benefits of forests to humans can be carried out in various approaches, one of which is the Willingness To Pay (WTP) analysis. This most widely used approach is based on the contingent valuation method (CVM) (Sadikin et al., 2017). This assessment is essential because the forest area is currently being converted by communities around the forest for their daily business, such as agricultural and plantation business. The increase in exploitation is also driven by a lack of understanding of the environment and only focuses on economic value. Van Beukering et al. (2003) states that uncontrolled forest exploitation can cause drought, floods, fires, and an increase in the earth's temperature. These impacts will undoubtedly return to the community and disrupt human survival (Wolff et al., 2018). Assessment of WTP is crucial and must be done due to the increase of pressure on land use by the community and the threats (Nurhasanah, 2017). And various land degradation issues cause land and environment quality decline, which may also change the economic potential of the TPMI's use value.

Achieving the economic benefits and protecting forests from damage, an assessment of forest benefits needs to be carried out. This study aimed to contribute to the economic assessment of protected forest tourism objects. This is important in raising the community's awareness and attention regarding the benefits of this protected forest. The finding of this research is expected to be an alternative reference for policymakers and forest managers.

2. Literature Review

In this section, the researcher studies references that have relevance to this research. Daud (2006) analyzed the WTP for ecotourism at Taman Hutan Raya Muerah Intan in Aceh by studying socio-demographic variables such as education, income, age, and the number of dependents on ecotourism WTP through logistic regression. The findings of this study indicate that income has a significant positive impact while age, education, and the number of dependents have no impact on WTP.

Determining the value of WTP is expected to be an inspiration for environmental conservation. Ecotourism can be a powerful tool for sustainable development related to economic development and conservation efforts (Kiper, 2013; Sadikin et al., 2017). Ecotourism is considered a viable alternative to achieve ecological and economic goals because natural tourism environmental services are not exploitation but support conservation efforts to protect natural resources and the environment (Ekayani 2014). Purwanto et al. (2014) also stated that the availability of natural tourism objects and attractions is the main attraction of ecotourism, which comes from the beauty and uniqueness of the local community's natural resources and socio-cultural objects. It includes flora, fauna, and natural scenery, as well as value-added culture attractions.

Damanik and Weber (2006) identify ecotourism from three different angles: product, market, and development strategy. Ecotourism as a product is defined as all attractions that rely on natural resources. Meanwhile, ecotourism as a market is a journey aimed at protecting the environment. The last one is ecotourism as a sustained development strategy that uses and manages environmentally responsible tourism resources. Taken together, it is clear that tourism activities that benefit local communities and protect the environment are highly emphasized and are characteristics of ecotourism.

The impacts of WTP for ecotourism have been widely studied, such as in Iasha et al. (2015), Myung (2018), Yadi et al. (2019), Musa et al. (2020), Noho et al. (2020), Tianyu & Meng

(2020), and Durán-Román et al. (2021). Iasha et al. (2015), for example, studied the object of Puncak Lawang Park in Sumatera Barat to examine the amount of WTP for ecotourism. Several socio-demographic indicators such as income, gender, and accessibility were examined in the study. Using a logistic regression approach, the study results showed that income, gender, and accessibility had a significant positive impact on the WTP for ecotourism at Puncak Lawang Park.

Meanwhile, Myung (2018) conducted a study of WTP on the environment in the United States by including environmental knowledge variables and environmental attitudes through the Probit model. The results showed that knowledge and environmental attitudes had a significant positive impact on WTP for the environment. The greatest influence was found in environmental attitudes because of the level of self-awareness to the environment so that there is a rapid response to push to pro-environment.

Yadi et al. (2020) conducted a study on WTP for the environment in Bondowoso by comparing the use of pine forest as ecotourism at the research location to the area of illegal logging where only the pine tree trunks were taken. This study used a non-probability sampling with a total of 100 respondents. The results revealed that 54 people paid WTP for Rp5,000, 36 people paid Rp10,000, and ten people paid Rp50,000. The average WTP for pine forest ecotourism was Rp11,000. An interesting finding from this research is the amount of income obtained from ecotourism, which is Rp72 million rupiah per year. On the contrary, if the forest is cut down entirely, the income will only be Rp19 million rupiah per year.

Furthermore, in Malaysia, Musa et al. (2020) assessed the contribution of the mangrove ecotourism through a logistic regression approach by involving as many as 400 respondents. The variables studied are ethnicity, age, marital status, number of families, occupation, and income. The results of this study indicate that ethnicity, marital status, occupation, and income have a negative impact. Meanwhile, age and number of families have a positive impact. The findings also show that the existence of different interests between races in the contribution of the WTP. The majority provide very little WTP value in self-employed jobs because this corresponds to their average income of under RM1,000 per month.

Nuho et al. (2020) tried a different approach by calculating WTP from travel costs for Lake Limboto ecotourism. The research method used in his study was descriptive analysis. The results show that the WTP gained varies from Rp15,000 to Rp75,000 due to education and employment considerations. The midpoint value of this WTP is Rp45,000. The potential of WTP for Lake Limboto is Rp43 million rupiah per year.

A different study was conducted by Tianyu & Meng (2020), in which the focus of the study is on the education level and the WTP for the environment in China. The respondents of this study used a household survey. The analysis method used was Heckman Two-Stage and Instrumental Variables. This study revealed that education has a significant positive impact on WTP for the environment, both in the Heckman method and the Instrumental Variable.

Finally, Duran-Roman et al. (2021) studied WTP in Andalusia. The variables studied were income and education level of WTP Tourism. The method used was logistic regression. The result of their study revealed that income above 25 thousand euros would pay more for WTP. The findings also explain that incomes ranging from 40 thousand to 50 thousand can pay for WTP up to 22 times. Meanwhile, education was found to be the trigger to determine the amount of WTP costs.

The WTP approach has been widely used to calculate the value of specific tourism destinations. The value of WTP is not the primary goal, but it is worth exploring whether the respondents appreciate the sustainability of tourism forests by giving a particular value. Based on these considerations, the WTP approach will be used in this study.

3. Methodology

The object of this study is the TPMI situated in Aceh Besar. This study employed a cross-sectional research design. The data were collected using the questionnaire method. The sample was taken from the population, but the users of environmental services are unknown. Therefore, an alternative with a hypothetical market approach was used so that the population in this study could be anyone (Callan & Thomas, 2013). The consideration of using the population from Banda Aceh city is seen as the right choice because Banda Aceh is considered capable of providing a more accurate value of environmental services. In addition, the population of Banda Aceh tends to have a higher level of education and income, making them more aware of the importance of the environment. Based on data from the Central Statistics Agency (2021), the number of households in Banda Aceh is 67,032 households. The number of samples is determined by considering representativeness so that the research results are accurate. Tejada & Punzalan (2012) suggest that in order for respondents to be more representative, the sample size must be equal to or less than 5 percent. Therefore, based on this calculation, the number of research samples was 398 respondents.

Cross-sectional data analysis was carried out using a quantitative descriptive approach through econometric methods. The econometric model used was multiple linear regression in semi-log. This model provides an overview of the effect of independent variables on the dependent variables (Gujarati & Porter, 2009). The specifications of this research model are as follows:

$$WTP = f(INC, EDU, JOB, FS, ENV) \tag{1}$$

The equation (1) is formed in econometrics, so that:

$$LWTP_i = \beta_1 + \beta_2 INC_i + \beta_3 EDU_i + \beta_4 JOB_i + \beta_5 FS_i + \beta_6 ENV_i + \varepsilon_i \tag{2}$$

L is the natural logarithm, WTP is the willingness to pay based on the Contingent Valuation Method (CVM) approach, INC is income, EDU is education, JOB is work, FS is family member, and ENV is environmental knowledge. β_1 is a constant, $\beta_2 - \beta_6$ is the coefficient of the research variable while ε_i is the residual. The expectation of this research is β_2 to $\beta_6 > 0$. To find these coefficients, the Ordinary Least Square (OLS) estimator technique was used. This estimator aims to minimize variance but requires several assumptions such as normality, heteroscedasticity, and multicollinearity. If this assumption is fulfilled, the research model is the Best Linear Unbiased Estimator (BLUE). Data analysis was performed with statistical software EViews. The assumptions used are normality, heteroscedasticity, and multicollinearity.

4. Finding and Discussion

4.1 Descriptive Statistics of Variables
Descriptive statistics can describe the situation in the distribution of research data. The variables of WTP showed a relatively high and low difference in value, so it is too unequal.

This WTP assessment is relatively unequal, some respondents give a relatively good rating, and many give a poor rating. The same pattern is also shown in income data. Meanwhile, the FS data showed low inequality. The lowest value of WTP is Rp115,004, INC is Rp4.7 million rupiah, EDU was 16.34 years, ENV was 0.86, which is almost close to having environmental knowledge, WS was 0.76, and FS is 3.64 (rounded to 4) family members.

Table 1: Descriptive Statistics

	WTP	INC	EDU	ENV	WS	FS
Mean	115,004	4.70	16.34	0,86	0,76	3.68
Maximum	375,000	15	22	1	1	10
Minimum	12,500	0.5	9	0	0	0
Std. Dev.	65,845	2.70	1.90	0.33	0.425	1.56

Source: researcher's calculation

Meanwhile, the maximum value for WTP is Rp375,000, with a minimum value of Rp12,500. The maximum value for INC was Rp15 million rupiah. EDU was 22 years or equivalent to a doctoral degree. In collecting the data, the lowest value for INC was Rp500,000, and EDU was nine years.

4.2 Classical Assumption Test

After presenting descriptive statistics, the next stage is testing the classical assumptions. The estimator used in this study is OLS. The estimator requires several assumptions such as normality, heteroscedasticity, and multicollinearity to obtain the BLUE criteria. The results of testing of these assumptions are explained as follows:

Jarque-Berra was chosen in normality testing. Table 2 shows that the statistical *prob* value of 0.000 is less than 0.05 (5 percent), which means that H_0 is rejected, suggesting that the error term is not normally distributed. According to Asteriou and Hall (2011), samples above 100 are often found not normally distributed. In contrast, samples < 100 require normal distribution. Therefore, in this study, the violation of the normality assumption is not a problem, and the estimation results are still legitimate.

Table 2: Normality Test Results

Testing	Tool	Statistical Value	P-value	Result
Normality	Jarque-Bera	204.63	0.000	Heteroscedasticity
Heteroscedasticity	Breusch-Pagan	5.64	0.000	Residuals are not normally distributed
Multicollinearity	VIF	< 10		No multicollinearity

Source: Researcher's calculations

It can be observed in Table 2 that there is no inequality of variance from the residuals of one observation with other observations. This can be seen from the prob value greater than 0.05 in the Breusch-Pagan test, with a prob value of 0.000 < 5 percent, suggesting that H_0 is rejected. In other words, the regression model in this study is heteroscedasticity. Should there be a violation, the estimation results can still be used, and they are not biased, although they are inefficient.

Multicollinearity is conducted by using the VIF value. Table 2 is the result of testing these assumptions whether the regression model does not have multicollinearity problems. If the VIF value in the independent variable is <10, it can be concluded that there is no multicollinearity (H_0 is accepted) between the independent variables in the regression model. As shown in the table, all independent variables are below the value of 10, so it can be concluded that there is no multicollinearity.

4.3 Regression Estimation Results of WTP for Tahura TPMI Ecotourism

Before proceeding to the analysis stage, the researcher must estimate each variable towards WTP Ecotourism at TPMII Tahura. These variables are income (INC), education (EDU), employment status (WS), knowledge of the environment (ENV), and the number of families (FS).

The estimation of the equations in Table 3 is carried out using a semi-log model so that the estimation results are more in line with the model. As a result, the estimation results cannot be interpreted directly. Therefore, the result must be re-transformed so that it can be interpreted easily. The estimation results in the transformation are provided in the last column of Table 3.

Table 3: Estimation Results of WTP for *Tahura TPMI Ecotourism*

Variable	Coefficient	Std error	t-stat	Prob	Exp(coef.)
INC	0.151***	0.004	37.33	0.000	16.37
EDU	0.008*	0.005	1.69	0.090	0.88
WS	0.081***	0.023	3.51	0.000	8.49
ENV	0.499***	0.030	16.43	0.000	64.77
FS	-0.002	0.005	-0.32	0.732	-
Constant	10.156***	0.083	121.51	0.000	25.745

R	= 0.948	DW	=2.067	
R^2	= 0.9000	F_{count}	= 706.31***	
Adj. R^2 = 0.8988		F_{Prob}	= 0.000	

Source: Researcher's calculations. ***, * is 1 percent significance, 10 percent.

The estimation results in Table 3 show that all coefficients are theoretically and statistically significant except for the family size variable. The most considerable effect of the coefficient is ENV of 64.77. This coefficient illustrates that if the respondent knows the environment, the WTP will increase by 64.77 percent, assuming that other variables are *ceteris paribus* (other variables are considered constant). This result is significant that the community's concern for the environment is considerable. It is expected that, through this, environmental sustainability in Aceh can be improved. The results of this study are in line with research conducted by Myung (2018), who demonstrated that knowledge of the environment is related to the current and future impacts. Environmental knowledge also encourages a person to increase self-sensitivity.

The second-largest coefficient is income (INC), with a coefficient of 16.77. This coefficient confirms that an increase in income of Rp1 million rupiah will have an impact on an increase in WTP of 16.37 percent, assuming *ceteris paribus*. People with high incomes are increasingly concerned about environmental sustainability. This result is significant because high-income communities can join efforts to preserve the environment. These findings are in line with studies conducted by Daud (2006), Iasha et al. (2015), and Durán-Román et al. (2021) but different from the research conducted by Musa et al. (2020).

The third-largest coefficient is employment status (WS), with the value of its influence on WTP of 8.49. This coefficient shows that respondents who have a permanent job (dummy = 1) influence 8.49 percent on the increase in WTP with the assumption *of ceteris paribus*. This result is in line with the previous two variables. Respondents who know the environment, have income, and are supported by permanent jobs will be more concerned about environmental sustainability because the value of WTP is more excellent. This finding is different from the research conducted by Musa et al. (2020), where work has a negative effect.

Finally, the education coefficient is 0.88, indicating an increase in the education period of 1 year, suggesting that WTP has increased by 0.88 percent with the assumption *of ceteris paribus*. The effect of this coefficient is minimal, indicating that higher education has not been able to influence environmental sustainability. However, the benchmark of understanding will be preserving the environment through educational efforts, which is essential to care more. These findings are different from the study conducted by Daud (2006).

4.4 Total Economic Evaluation of Tahura TPMI

The calculation of economic valuation is the most critical thing in examining the benefits of the object to be studied. Several related data are needed to perform this, such as goods, land, and others. The calculation of the economic valuation of Tahura TPMI can be done by following the pattern done by van Beuking et al. (2003). The study uses the value of the Gunung Leuser National Park. This benchmarking method is best if the object under study has similarities, such as TNGL and Tahura TPMI. According to van Beukering (2003), three categories are used, namely low values, medium values, and high values. Each of these values has a different commodity and is adjusted to the demand price in the market. In total, the economic valuation of GLNP reaches USD57,947,460 dollars multiplied by the GLNP area of 792,675 hectares is USD45 million dollars or Rp643 trillion rupiahs (USD1 = Rp14.000). The value per hectare is USD73,103 dollars or Rp1 billion rupiah. The value per hectare is used as a benchmark and is used for the area of the forest. The total economic value of this forest is USD460 thousand dollars or Rp6.4 trillion rupiah.

5. Conclusion

This study aimed to analyze the impacts of environmental knowledge on WTP for ecotourism and determine the economic value of Tahura TPMI. A total of 398 respondents were used using a hypothetical market approach. The analysis used was multiple linear regression with a semi-log form of income, education, occupation, number of families, and environmental knowledge. The study results showed that income, education, occupation, and environmental knowledge positively impacted WTP for Tahura TPMI ecotourism. The impact of this environmental knowledge can help boost the WTP for ecotourism to 64 times. This study also found that the economic value of this object is Rp6.4 trillion rupiah with the TNGL benchmark, where the conditions of Tahura and GLNP have similarities. This research recommends that the preservation of Tahura TPMI should be the primary concern for the government and the community, especially the local community. Efforts to preserve this forest can be made in the form of ecotourism. Ecotourism can help reduce the damage of the forest. The research is limited to a hypothetical market sample, so it is necessary to conduct direct interviews with the community members living near the research location.

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