APPLICATION OF CONTINGENT VALUATION METHOD ON ECONOMIC VALUATION OF CORAL REEF ECOSYSTEMS IN GILI GEDE MARINE AREA, WEST NUSA TENGGARA

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ABSTRACT

The most obvious way to measure non-market value is to question individuals directly about their willingness to pay for a good or service. This study evaluates the economic value of coral reef ecosystems using the contingent valuation method (CVM) technique by measuring the willingness to pay the community. Furthermore, this study aims to analyze the factors that influence the willingness to pay (WTP) *and the amount of the value of the community's willingness to pay (*WTP) for the conservation of coral reef ecosystems in Gili Gede waters. Sample determination in this study used purposive sampling techniques with interview structured data collection techniques guided by questionnaires. Data analysis used logistic regression for factors affecting *WTP* and multiple linear regression for factors affecting *WTP* values. The results of this study found that the average WTP value of the community was Rp. 7,257 / person in the mandatory scenario and Rp. 4,685 / person in the voluntary scenario. Factors that affect the willingness to pay the community for coral reef conservation fees in the Gili Gede fishing area are education and concern for the environment. For factors that affect the amount of the value of willingness to pay the community for coral reef conservation fees in the Gili Gede fishing area in the mandatory scenario are education, domicile and concern for the environment and in the voluntary scenario are gender, education, domicile and concern for the environment.

Keywords: *Gili Gede; Coral Reef Ecosystems; CVM; WTP; Influencing Factors*

INTRODUCTION

Indonesia, which is the largest archipelagic country in the world, with a coastline of 95,000 km and is the second longest after Canada, where two-thirds (⅔) of the country's territory is ocean, is known as a country with "mega biodiversity". Therefore, it is not surprising that Indonesia can be considered the heart of world biodiversity, including coastal and marine biodiversity (Sabet & Pungki Ari, 2022). With Indonesia's total sea area of around 5.8 million square kilometers (km²), consisting of 2.3 million km² of archipelagic waters, 0.8 million km² of territorial waters, and 2.7 km² of Indonesian Exclusive Economic Zone waters (Apridar et al., 2011), so that the location and position of the Indonesian archipelago is very important in the trade system and provider of raw materials for both national and international communities.

Arcipelagic State is a characteristic of an archipelago country that has many islands (Saksono, 2013). Small islands have strategic value for national economic development and improving community welfare, they can be used as sources of inspiration, creation and innovation that provide added economic value for the government and society, but on the other hand, small islands are also vulnerable to environmental damage. caused by one of them is wrong policies and management. According to Lasabuda (2013), in his research, marine and fisheries resource management requires comprehensive, intigrated and targeted policies, considering that this area has unique problems, potential and characteristics. So, a paradigm shift is needed in the development of marine resources and fisheries on small islands.

Gili Gede water area is located at a coordinate position of 8° 44' 18.016" LS 115° 53' 12.041" E, is a small island area. Gili Gede itself is included in the island village area with 80 percent of the people living as fishermen, 10 percent as boatmen and 10 percent as other livelihoods. Gili Gede's water area has clear waters and large potential marine and coastal resources. These potentials include the potential for fisheries, coral reefs, seagrass beds, mangroves and the beauty of marine scenery which is used as a tourism location. One of the most famous tourist destinations in the waters of Gili Gede is diving and snorkeling which presents the beauty of coral reef views.

Coral reefs are one of the marine resources that have great benefits or services for humans and the environment. The role and benefits of coral reef ecosystems consist of economic, ecological and socio-cultural benefits (Zurba, 2019). Coral reefs have an important role for society starting from direct benefits from coral reefs, namely as capture fisheries, tourism or recreation and research activities, then indirect benefits, namely as coastal protection and to absorb carbon content as well as the selected benefits of coral reef ecosystems as aquatic biodiversity (Maharmingnastiti et al., 2015). The coastal resource ecosystem which functions as a spawning ground, nursery ground and feeding ground for most fish makes the coral reef ecosystem a resource that has many benefits and productivity high (Suparmoko et al., 2014). Considering the importance of coral reef ecosystems which are valuable assets for the surrounding environment, the existence and sustainability of the use of coral reef ecosystems must continue to be considered.

The many benefits produced by coral reef ecosystems cause a high level of dependence on these resources so that the use of coral reefs has increased from year to year, in addition to bringing benefits to humans, this increase in utilization threatens the sustainability of coral reefs themselves, including in the waters of Gili Gede. Resource exploitation activities, especially coral reefs, are still carried out massively without taking into account sustainability aspects. This is due in addition to socio-economic conditions, namely the problem of poverty and underdevelopment, also by the assumption that coral reef resources are *common resources* so that everyone has access to exploit them (open access) in order to fulfill personal interests (self interest*) (Afifi, 2011).

The importance of the role and function of coral reefs in Gili Gede waters must be followed by public awareness as parties who utilize and sustainable coastal management policies, because the problem that is often faced is that natural resources cannot be transacted in the market like other general goods so that they do not have market prices, this causes the public's perspective on coastal and marine resources, especially coral reef ecosystems tends to be worthless. So that the coral reefs in the Gili Gede waters show conditions with the status of coral reefs tending to be badly damaged due to fishing activities and pressures from land which are thought to be several factors that influence the poor condition of the coastal ecosystem Buhari et al., (2021).

To be able to provide information, awareness and understanding to the community as utilizing parties and policy makers about the importance of the existence of coral reef ecosystems in Gili Gede waters both as economic potential and for the preservation of nature and the environment as well as for the benefit of sustainable management and use, it is necessary to conduct an economic valuation of coral reef ecosystems in Gili Gede water areas. Resource economic valuation plays an important role as a comprehensive instrument in providing price tags for the existence of coral reef ecosystem goods and services (Mahakena et al., 2021; Putri et al., 2009). Economic valuation can provide an overview of the condition and amount of quantitative value possessed by coral reef ecosystem resources so that the quantitative picture and value of coral reef ecosystem resources can be a guide in efforts to manage and utilize in a directed, effective and efficient manner and in accordance with the principles of sustainable development (Rani et al., 2020).

Based on this, the author intends to conduct research aimed at conducting economic valuation of coral reef ecosystems in Gili Gede waters by applying the contingent valuation method (cvm) Gumilar (2019); Talakua et al., (2019); Ureta et al., (2014); Solihin et al., (2019); (Fauzi, 2010); Shah et al., (2017); (Siregar & Istiqomah, 2022); Obeng & Aguilar (2021); (Laurans et al., 2013); (Tamsah & Nessa, 2019); (Marre et al., 2015). The reason for using the *contingent valuation method (cvm)* method is based on this method can be used to estimate the economic value of any thing including the value of existence that is not connected with usefulness (Lipton et al., 1995).

This study the author analyzes the factors that influence individual preferences on willingness to pay and the amount of value willing to be paid for conservation activities to maintain the existence and sustainability of coral reef ecosystems in Gili Gede waters. Lariviere dkk., (2014) states that familiarity with economic decisions can significantly influence how economic decisions are made including in willingness to pay. Such quantification would be useful

for designing strategic campaigns for coral reef conservation and for effectively raising awareness of this type of public good (Imamura et al., 2020).

RESEARCH METHOD

This type of research is quantitative descriptive research with sunber data, which is to be sourced from communities who receive or feel the benefits of coral reef ecosystems in Gili Gede waters either directly or indirectly. While the skunder data is sourced from the Fisheries and Marine Service of West Nusa Tenggara Province & Gili Gede Village Government, Sekotong District, West Lombok Regency.

The study population is a community that utilizes coral reef ecosystem resources either directly or indirectly from Gili Gede Indah Village. Sample determination using *purposive sampling* techniques with sample criteria and characteristics, namely at least 18 years old and a maximum of 60 years old, getting direct or indirect benefits from the existence of coral reef ecosystems, having a profession that has a relationship with coral reefs both directly and indirectly (fishermen, tourism sector workers, tourism business actors), and respondents were in the Gili Gede water area when it was done research. The number of samples in this study was 91 respondents.

Data collection in this study used a survey method with data collection techniques structured face-to-face interviews directly guided by questionnaires. The questionnaire used is prepared based on the approach – valuation measures used. According to Lipton et al., (1995) The most obvious way to measure non-market value is to question individuals directly, this can be done with surveys or with a questionnaire-based approach to the valuation of non-market goods and services. The resulting value will depend largely on the nature of the market construction (hypothesis or simulation) of the goods or services described in the survey scenario. So it can be concluded that the quality of research results is very dependent on the survey scenario used in the questionnaire. The question scenario in a valid WTP CV should include three components: (1) a detailed description of the resources to be assessed, including initial and alternative conditions of the hypothetical scenario; (2) the form and frequency of payments, which include options such as higher income taxes, increases in utility bills, and payments to special trust funds; and (3) how respondents were asked their WTP (e.g. open-ended questions, payment cards, or referendums on specific dollar amounts) (Kotchen & Reiling, 2000). In this study, the survey scenario was structured as follows:

- Part one: Get respondent attributes.
  The first part in this research questionnaire is to obtain the attributes of respondents. The attributes collected from respondents include name, age, gender, marital status, education level, occupation, income per month, expenses per month, number of dependents and address.
- Part two: Provide respondents with information about the benefits of coral reef ecosystems. Good information can influence important economic decisions, including willingness to pay for an item. In this study, the information provided to respondents was in the form of a brief explanation of the benefits of coral reef ecosystems. Imamura et al. (2020) states that more concise, easy-to-understand information and the provision of detailed information are more effective ways to increase willingness to pay and reduce negative attitudes towards conservation efforts.
- Part three: Provide information to respondents about the condition of coral reefs in Gili Gede waters
  An understanding of the information provided about the impact of coastal and marine resource exploitation activities on biodiversity contributed greatly to the variation in respondents' willingness to pay (Spash et al., 2009). So to provide more detailed information in this study will be given to respondents about the current condition of coral reefs in Gili Gede waters.
- Part four: Asking about the level of concern for the environment

Concern for the environment can construct a willingness to pay. The relationship between attitudes and behaviors has given rise to interest in environmental attitudes as predictors of environment-based actions and participation decisions. These preferences then serve as criteria for assessing the appropriateness of certain behaviors. In this study, concern for the environment was measured based on the index of concern for the environment. Respondents are given questions that can provide an overview of the level of respondents' concern for the environment.

- Section five: Provide statements to reduce hypothesis bias

  One of the disadvantages of the *contingent valuation method* (*cvm)* technique *u*is the frequent occurrence of hypothesis bias (Lipton et al., 1995). Given technical difficulties such as hypothetical bias in measuring non-market resources, some authors doubt whether willingness to pay can be precisely measured (Frey & Pirscher, 2019). In *CVM* studies, where respondents are asked to express their maximum willingness to pay, it is possible to overestimate or understate their willingness to pay depending on the results the surveyor wants to see materialize (Sandorf et al., 2016). So as to reduce hypothesis bias, a *cheap talk* is given as an introduction to ask the willingness to pay respondents. *Cheap talks* are statements to encourage honest responses from respondents (e.g., citing that previous studies tended to overestimate *WTP* due to its hypothetical nature; reminding them that although the situation is hypothetical, they should express responses as if they were faced with a real situation) (Harder et al., 2006). *Cheap talks* seem to be one of the most successful and proven efforts to be potentially successful (Hensher, 2010).

- Part six: Asking about willingness to pay.

  Respondents will first be given a hypothetical scenario contained in the questionnaire before asking about willingness to pay for coral reef ecosystem resources. The provision of this hepotetic scenario aims to make respondents believe that the money they spend is used for the benefit of natural resource management (Brouwer et al., 2016). Hypotheses about coral reef ecosystem management plans in Gili Gede's water areas were immediately included with questions about willingness to pay for a response. This dichotomous option is given to determine the willingness to pay the respondent, if the respondent answers yes then the question is continued but if the respondent answers no then the interview is not continued.

- Section seven: Offer the value of willingness to pay and *WTP collection scheme*

  After asking about the willingness to pay, the next is to offer the amount of the willingness to pay which is directly included with the scenario of collecting coral reef dues as payment for environmental services (PES). The concept of PES is based on Coasean economic theory which emphasizes the creation of voluntary or market-based transactions for ecosystem services and is based on Pigouvian economic theory that allows government intervention such as through regulations, taxes, or subsidies (Diswandi,2017) . So in this study the payment of environmental services in the form of coral reef conservation contributions uses *mandatory* scenarios (mandatory) and *voluntary* scenarios (voluntary). Value bidding is done using the *game bidding format* method where respondents are asked whether they are willing to pay a certain amount of money proposed as a starting *point* by giving a choice of *dichotomous choice or dichotomous* valuation*, yes or no*, or agree and disagree. If the answer is yes then the amount of the bid value will be increased to the agreed level. If the answer is no, the bid value is lowered until the agreed amount (Nababan & Simanjuntak, 2008). *The WTP starting point* in the study was set at IDR15,000-

The data analysis method in this study uses logistic regression to analyze the factors that influence the willingness to pay and multiple linear regression to analyze the factors that affect the amount of the value of willingness to pay by looking at econometric parameters, namely coefficient determination, simultaneous influence and partial influence of each variable.

1. Logistic regression

$$L_i = \ln\left(\frac{p_i}{1 - p_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + e$$

L_i = Opportunities for people to be willing or unwilling to participate (1 = willing to pay, 0 = not willing to pay)
β_0 = Constanta
$\beta_1 \dots \beta_9$ = Regression Coefficients
X_1 = Age
X_2 = Gender
X_3 = Marital Status
X_4 = Education Level
X_5 = Work
X_6 = Income
X_7 = Number of dependents
X_8 = Expenditure
X_9 = Address
X_{10} = Concern for the environment

2. Double linear regression

$$WTP = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + e$$

WTP = value of willingness to pay
β_0 = Constanta
$\beta_1 \dots \beta_9$ = Regression Coefficients
X_1 = Age
X_2 = Gender
X_3 = Marital Status
X_4 = Education Level
X_5 = Work
X_6 = Income
X_7 = Number of dependents
X_8 = Expenditure
X_9 = Address
X_{10} = Concern for the environment
E = Error

RESULT AND DISCUSSION

From the interview process that has been conducted, it was found that the characteristics of respondents in the study included the majority of respondents aged 36-50 years with a total of 43%, male types with a total of 60%, married status as much as 91%, elementary school education with a total of 38%, the majority of work as entrepreneurs by 37%, with the majority of respondents' income amounting to IDR 2.000,000 –IDR 2.900,000 as much as 40%, and the majority of respondents' expenses amounted to IDR 3.000,000 – IDR 3.900,000 with an amount of 33%, with 3 dependents amounting to 33%, domiciled the majority of respondents came from Gili Gede Indah village with a number of 79% and concern for the environment the majority of respondents had an index of concern for the environment with a very caring level of 56%,

Analysis of Willingness to Pay Society

After the respondents gave a statement that they would answer with the actual situation, respondents were then asked about their willingness to pay by being given a hypothetical market scenario to ensure that the money they would pay would be fully used for coral reef management in Gili Gede's territorial waters. The majority of respondents gave a "yes" compared to a "no" when asked about willingness to pay coral reef conservation dues. Of the 76.9% of respondents who answered "yes" the majority of respondents were aged 36 – 50 years, male, with married status, elementary school education level, with work status as fishermen, with an income of IDR 2,000,000 – IDR 2,900,000 and expenses of IDR 3,000,000 – IDR 3,900,000, the number of dependents was 3 people, located in Gili Gede Indah village and with an environmental concern index with a very caring status. Respondents who answered "yes" reasoned that as a community must participate in efforts to maintain coral reef ecosystems so that the benefits of the existence of coral reefs can continue to be felt and enjoyed both for them now and for future generations.

The remaining 23.1% of respondents answered "no" the majority of respondents aged 36 – 50 years, female, with married status, high school education level, with employment status as entrepreneurs, with an income of IDR 2.000.000 – IDR 2.900.000 and expenses of IDR 3.000.000 – IDR 3.900.000 the number of dependents as many as 3 and 2 people, located in Gili Gede Indah village and with an environmental concern index with caring status. Respondents who answered "no" are willing to pay gave reasons that conservation activities and safeguarding natural resources, especially coral reef ecosystems, are the authority and responsibility of the government and the community is positioned to support every effort made by the government but not by charging conservation fees to the community.

Furthermore, the independent variables used in the research model were processed and analyzed using logistic regression with the aim of testing the hypotheses proposed in the study, namely age, gender, marital status, education, occupation, income, expenditure, number of dependents, address and concern for the environment affect the willingness to pay the community for coral reef conservation dues in Gili Gede water areas. The logistic regression analysis is as follows:

a. Determination Test

Table 1 Test determination

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	69.564	.271	.410

source: output spss

Based on the process that has been carried out, the *value of Nagelkerke R Square* is 0.410. This means that the independent variable is able to explain the dependent variable by 41 percent, while 59 percent is explained by other variables outside the model. For simultaneous tests, the significance value of simultaneous tests is 0.001 where the value is smaller than alpha 0.05 (0.000 < 0.05) so that it can be interpreted that the independent variables used in the model together significantly affect the willingness to pay the community for the conservation of coral reef ecosystems in the Gili Gede area.

b. Simultaneous influence test

Table 2 Test simultaneously

		Chi-square	df	Sig.
Step 1	Step	28.753	10	.001
	Block	28.753	10	.001
	Model	28.753	10	.001

(source: output spss)

Based on the process that has been carried out, it shows that the significance value of simultaneous tests is 0.001 where the value is smaller than alpha 0.05 (0.000 < 0.05) so that it can be interpreted that the independent variables used in the model together significantly affect the willingness to pay the community for the conservation of coral reef ecosystems in the Gili Gede area.

a. Partial influence test and model interpretation.

Tabel 3 Partial test

	B	Sig.	Exp(B)	Information
Age	.046	.330	1.048	Insignificant
Gender	1.068	.321	2.909	Insignificant
Marital status	1.578	.315	4.844	Insignificant
Education	.610	.091	1.841	Signific alpha 0.1
Work	-.213	.370	.808	Insignificant
Income	.000	.856	1.000	Insignificant
Expenditure	.000	.707	1.000	Insignificant
Number of dependents	-.211	.398	.809	Insignificant
Address	-1.135	.302	.321	Insignificant
Environmental concern	.351	.011	1.421	Signific alpha 0.05

(Source: primary data, processed)

From the logistic regression analysis that has been carried out, the variables age, gender, marital status, occupation, income, expenditure, number of dependents and domicile have nilia *sig*. more than APLHA 0.1 so that these variables do not significantly affect the willingness to pay coral reef conservation dues. While the education variable has *a sig* of 0.091 which is smaller than alpha 0.1 and the variable of concern for the environment has a Sig value. 0.0113 is smaller than alpha 0.05 so that the variables of education and concern for the environment significantly affect the willingness to pay coral reef conservation contributions. So based on this, the variables of education and concern for the environment are factors that affect the willingness to pay coral reef conservation fees based on the resulting significance which is further explained as follows:

• Education

The education variable has a *Sig* value of 0.091 where the value is smaller than alpha 0.1 (significance 10%) so that the significant educational variable affects the willingness to pay respondents at a 90% confidence level. The education variable also has a positive coefficient with an Exp(b) value (odds ratio) of 1,840 which can be interpreted that the education variable has a relationship and has a positive influence on the willingness to pay respondents. Where if the higher the level of education of respondents, it will increase willingness to pay coral reef conservation fees. An increase in education by 1% can increase willingness to pay by 1,840% *cateris paribus*.

This is in line with the results of research conducted by Arista & Saptutyningsih (2020) who found that education had an effect on willingness to pay. Likewise with research conducted by Adamu dkk., (2015) which found that education had a positive relationship with willingness to pay whereas someone with a higher education was more likely to pay. This can be caused by the higher the level of education, the greater public awareness and concern about the benefits of maintaining sustainability and environmental quality. This is in accordance with the field facts found by researchers where respondents with tertiary education backgrounds provide more arguments about the importance of preserving coral reef ecosystems and the importance of community participation in these activities compared to respondents with primary and secondary school education levels.

- Concern for the environment.

The variable of concern for the environment has a *Sig.* value of 0.011 where the value is smaller than alpha 0.05 (significance 5%) so that the variable concern for the environment significantly affects the willingness to pay respondents with a confidence level of 95%. The variable of concern for the environment also has a positive coefficient and an Exp(b) value (*odds ratio)* of 1,421 which can be interpreted that concern for the environment has a relationship and has a positive influence on the willingness to pay respondents. Where if the higher the concern for the environment of respondents, it will be able to increase the willingness to pay coral reef conservation dues. A 1% increase in environmental awareness would increase willingness to pay by 1,421% *cateris paribus.*

This is in line with what was developed by Vicente et al. (2021) that participation in community activities affects the tendency of individuals to engage in collective activities of preserving the environment and their willingness to pay for environmental protection. This is also in accordance with field facts found by researchers where people who are directly related to marine resources and live in coastal areas have a good awareness of the importance of protecting the environment and the resources in it. This attitude can be seen from the agreed rules in using and utilizing existing resources.

Analysis of the Value of Willingness to Pay the Community

As many as 73.9% of respondents who were willing to participate and pay dues for the coral reef ecosystem conservation agenda in Gili Gede waters were then asked how much they were willing to pay. It is possible that respondents are not consistent with their commitment to choice during real-life surveys, so as to reduce the potential for such bias, especially in the amount of willingness to pay that may be exaggerated, in asking how much value respondents are willing to pay, given a means of collecting conservation contributions. In a number of studies in developed countries found evidence that the means of payment affect *WTP* for public goods while correcting biases that can occur (Harder et al., 2006). In this study, the means of collecting coral reef conservation dues are *mandatory* and *voluntary schemes*. With the means of collecting coral reef conservation dues, both *mandatory* and *voluntary* schemes are included with an offer of IDR 15.000 as a *starting point* for the amount of contributions paid by respondents. The *WTP* value of each scheme for collecting coral reef conservation dues is as follows:

Table 4 Respondent's WTP Value

Payment scheme	*BID WTP*	Total (%)	WTP average
Mandatory	IDR15.000	4%	Rp.7.257
	IDR12.000	1%	
	IDR11.000	1%	
	IDR10.000	21%	
	IDR 8.000	2%	
	IDR 7.500	2%	
	IDR 7.000	1%	
	IDR6.000	5%	
	IDR 5.000	36%	
	IDR 1.000	2%	
Voluntary	IDR10.000	12%	Rp.4.685
	IDR 5.000	29%	
	IDR 4.000	3%	
	IDR 3.000	11%	
	IDR 2.500	11%	

IDR 2.000	11%

(Source: Primary data, processed)

Of the 70 respondents who stated the amount of willingness to pay (WTP), in the mandatory scheme the majority of respondents as many as 36% stated WTP of Rp. 5,000 then as much as 21% of Rp. 10,000, as much as 5% of Rp. 6,000, as much as 4% of IDR 15,000, as much as 2% in IDR 8,000, IDR. 7,000 and IDR 1,000 and 1% of Rp. 12,000, IDR 11,000 and Rp. 7,500. The highest WTP value at the mandatory collection facility is IDR 15,000 while the lowest WTP value is IDR 1,000 with an average WTP value of IDR 7,257. As for the voluntary scheme, the majority of respondents as many as 29% stated WTP of IDR 5,000, then as much as 12% of IDR 10,000, then as many as 11% stated WTP of IDR 3,000, IDR 2,500 and IDR 2,000 and as much as 3% of IDR 4,000. The highest WTP value in voluntary collection facilities is Rp. 10,000 while the lowest WTP value is IDR 2,000 with an average WTP value of IDR 4,671.

Overall, all respondents indicated their WTP at different price levels which was included with the reason why respondents were willing to pay some money to preserve coral reef ecosystems in Gili Gede's waters. The varying WTP scores of respondents indicate that respondents have different preferences in assessing coral reef ecosystems, this can be because each individual has a series of personal values held with different ranks and weights (Kotchen & Reiling, 2000). Although the WTP value obtained from both coral reef contribution collection schemes varied, it was found that the majority of respondents stated that the WTP value of both mandatory *and* voluntary schemes was Rp. 5,000. The amount of WTP value, both the average value and the most value chosen by respondents, can be information in the formulation of coral reef management policies in Gili Ged waterse.

Factors Influencing the WTP Size of Society

From the means of collecting coral reef conservation dues, namely mandatory schemes and voluntary schemes, the amount of willingness to pay respondents was obtained. The amount of WTP value is then analyzed factors that affect the amount of WTP value of respondents. WTP analysis provides an opportunity to study the content and context validity of a research survey (Kamri, 2013) (Sari & Muslimah, 2014). By using multiple linear regression, the factors that affect the WTP amount of respondents from each contribution collection facility are analyzed by making a model that is arranged based on the WTP magnitude function. The functions are as follows:

Model 1:

WTP Mandatory Mass (Y1) = f (gender, marriage, education, income, address, environmental concern index, occupation, expenses, number of dependents, age)

Model 2:

Voluntary WTP (Y2) = f (gender, marriage, education, income, address, environmental concern index, occupation, expenses, number of dependents, age)

The results of multiple lilnear regression analysis of each model are as follows:

Table 5 Econometric parameters of double regression results

Parameter	Mandatory		Voluntary	
	Coefesien standardized	Significant	Coefesien standardized	Significant
constant		.054		.085
Age	0.127	.355	0.041	.997
Gender	0.213	.146	0.181	.064*
Marital status	0.153	.224	0.072	.484

Education	0.354	.012**	0.237	.003***
Work	-0.096	.493	0.076	.246
Income	0.102	.472	0.078	.393
Expenditure	0.012	.939	0.053	.621
Number of dependents	-0.022	.831	0.165	.859
Address	-0.219	.060*	-0.194	.032**
Environmental concern	0.336	.005***	0.324	.018**
R-squared	0.323		0.310	
F-Statistic	3.823		3.597	
Sig (F-statistic)	0.000301		0.018	

Information:
* = significant at 10% alpha
** = significant at alpha 5%
*** = significant at alpha 1%

(Source : primary data, processed)

Based on the econometric parameter table of each, the relationship and influence of each independent variable on the dependent variable can be explained so that factors that affect the amount of the value of the willingness to pay respondents for coral reef conservation contributions in Gili Gede waters both from mandatory *and* voluntary *schemes*, which are explained as follows:

a. Coefficient Determination.

In the mandatory scheme model, the R-Squared value is 0.323, which means that the ability of the independent variable to influence the dependent variable in the mandatory scheme model is 32.337% and as much as 67.66% is influenced by other variables outside the study. Furthermore, in the voluntary scheme model, the R-Squared value is 0.226, which means that the ability of the independent variable to influence the dependent variable in the voluntary scheme is 22.6% and 77.4% is influenced by other variables outside the study. With the R-Squared value generated from each model, both the mandatory scheme of 32.337% and the voluntary scheme of 22.6%, it can be stated that these values are good enough in CVM studies (Spash et al., 2009). This is also in accordance with the opinion of Mitchell and Carson who state that the value of R-square in natural resource and environmental economics research can be tolerated up to 15% (Sutopo et al., 2016).

b. Simultaneously test (f-statistic*)*

In the mandatory scheme model, the prob value (F-statistic) is 0.0003 where the value is smaller than alpha 0.05 (0.0003< 0.05) so that it can be interpreted that the independent variables in the mandatory scheme model are equally significant (99% confidence level) affects the amount of willingness to pay respondents for coral reef conservation contributions in Gili Gede waters. Similarly, with the voluntary scheme model, the prob value (F-statistic) is 0.0005 where the value is smaller than alpha (0.0005< 0.05) so that it can be interpreted that the independent variables in the voluntary scheme model are equally significant (99% confidence level) affect the amount of willingness to pay respondents for coral reef conservation contributions in Gili Gede waters. So it can be concluded that the independent variable in the model in both the mandatory scheme and the voluntary scheme both significantly affect the willingness to pay, but when viewed from the level of significance of the mandatory scheme has a smaller prob value (F-statistic) than the voluntary scheme (0.0003 < 0.0005)

c. Partial test (T Test)

From the multiple lienar regression analysis that has been carried out, it was found that in the mandatory scheme the variables of age, sex, marital status, occupation, income, expenditure and number of dependents have sig values. above alpha 0.05 so that the variables – variebal do not significantly affect the amount of nilia willingness to pay respondents. While the variables of education, address and concern for the environment have GIS values. below alpha 0.1 so that these variables significantly affect the amount of the value of willingness to pay respondents.

In the voluntary scheme, the variables of age, marital status, occupation, income, expenditure and number of dependents have *sig values.* above alpha 0.05 so that the variables – variebal do not significantly affect the amount of nilia willingness to pay respondents. While the variables of gender, education, address and concern for the environment have GIS values. below alpha 0.1 so that these variables significantly affect the amount of the value of willingness to pay respondents.

From the two schemes, namely the *mandatory scheme and the* voluntary *scheme*, the same variables significantly affect the amount of the value of willingness to pay, namely education, address and concern for the environment. So based on this, factors are obtained that affect the amount of the value of willingness to pay coral reef conservation contributions based on the significance of the resulting influence.

Furthermore, the factors that affect the amount of the value of willingness to pay are explained as follows:

- Address

The variable of respondent's domicile in the mandatory scheme and voluntary scheme significantly affects the amount of the value of willingness to pay with a level of trust above 90% and has a negative relationship and influence on the amount of respondent's WTP value where the increasing distance of the respondent's residence from the conservation site, namely the Gili Gede water area, will reduce the amount of WTP value   coral reef conservation dues. This is reinforced by research conducted by Iqbal & Mozahid, 2022) that the respondent's residential address is negatively related to the amount of WTP given by the respondent. Respondents who live in Gili Gede have a sense of ownership of the sunber of coral reef power in the area which has an influence on their attitudes and the way they assess coral reefs which is reflected in the amount of WTP given and Gili Gede residents are willing to provide a large WTP compared to respondents who are not from Gili Gede.

- Education

The respondent's education variable in the mandatory scheme and voluntary scheme significantly affects the amount of the value of willingness to pay with a level of confidence above 95% and has a positive relationship and influence on the amount of respondent's WTP value where the higher the respondent's education level can increase the amount of WTP value coral reef conservation dues. This is in line with research conducted by Xiong et al. (2018) which states that the level of education is positively correlated significantly with the size of the respondent's WTP with the explanation that the population who have a higher and stronger level of education can form perceptions and sensitivity to a good ecological environment. This is in accordance with the fact that respondents with a good level of education are more excited and passionate when discussing environmental issues, especially coral reef ecosystems.

- Concern for the environment

The variable of concern for the respondent's environment in mandatory schemes and voluntary schemes significantly affects the amount of the value of willingness to pay with a level of trust above 95% and has a positive relationship and influence on the amount of respondent's WTP value where the higher the concern for the environment, it can increase the amount of WTP value   coral reef conservation dues. This finding is in line with research conducted by Sadikin et al. (2017) that the variables of knowledge and concern of respondents for a natural resource are

positively related to the amount of WTP given. Marbuah in Vicente et al. (2021) said that participation in membership of environmental organizations and donating money to environmental organizations increases the likelihood of agreeing to higher environmental taxes.

CONCLUSION

Based on the research that has been carried out, the following conclusions can be drawn: 1) The willingness of the community to pay coral reef conservation fees in the Gili Gede fishing area is significantly influenced by the variables of education and concern for the environment, so it can be stated that the factors that affect the willingness to pay the community for coral reef conservation activities in Gili Gede waters are education and concern for the environment. 2) The amount of willingness to pay the community for coral reef conservation fees in Gili Gede waters is on average Rp. 7,257/person/month in the mandatory scheme, and Rp. 4,685/person/month in the voluntary scheme. 3) The amount of the value of willingness to pay the community for coral reef conservation fees in the Gili Gede fishing area is significantly influenced by variables of education, domicile and concern for the environment in the mandatory collection scenario and variables of gender, education, domicile and concern for the environment in the voluntary scenario. So that from the two scenarios used to obtain the WTP value, the factors that affect the amount of the value of the willingness to pay the community for the conservation of coral reef ecosystems in the Gili Gede water area are gender, education, domicile and concern for the environment.

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