



The Willingness of Fishermen Households to Accept Coral Reef Conservation in Order to Support Sustainable Marine Tourism in Gili Matra, Indonesia

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Abstract. Marine tourism activities that have been encouraged put more emphasis on the economic aspect, in which tourism activities are expected to provide maximum positive economic impact. Meanwhile, conservation aspects are less considered so that the condition of coral reefs and other marine life that become major tourist attractions are disregarded. This study aims at analyzing the potential for harmonization of marine tourism activities and sustainable marine conservation (including coral reefs), through payment for environmental services schemes. Through a quantitative research method, this study estimates the willingness to accept (WTA) of fishermen's households for a certain payment in return to coral reef conservation activities as an effort to support sustainable tourism in Gili Matra. The study found that the fishermen's WTA was significantly affected by income levels, family members and environmental awareness.

Keywords: Contingent Valuation · Payment for Ecosystem Services · Sustainable Tourism

1 Introduction

The North Lombok Regency in West Nusa Tenggara Province (NTB) in Indonesia has a very strategic position related to the development of the tourism industry because it is located in the golden triangle of tourist destinations namely Bali, NTT and Toraja. In this regency there is a leading tourist destination called Gili Matra consisting of a cluster of small islands namely Gili Air, Gili Meno and Gili Trawangan. The number of tourists that visits Gili Matra in normal times (no natural disasters like earthquakes nor non-natural disasters like covid-19 pandemic) relatively continues to increase has an impact on the increasing number of hotels, accommodation, and other supporting infrastructure of tourist activities. The rapid growth of the tourism industry can probably generate negative impact on the carrying capacity of the environment both on land and underwater if there is no effort to maintain its balance with environmental protection [1].

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The main attraction of tourist in Gili Matra is the beauty of the marine park including coral reefs and marine life around it. Marine tourism activities that have been encouraged put more emphasis on the economic aspect in which tourism activities are expected to provide maximum positive economic impact. Meanwhile, conservation aspects are less considered so that the condition of coral reefs and other marine life that become major tourist attractions are degraded. If this continues to happen, then in the long run marine parks in the region will no longer be attractive and will negatively impact the tourism sector as a result of the reduced number of tourists who come to visit. The next possible impact is that economic growth that previously relied on the tourism sector, will experience a slump, as happened when there was an earthquake in 2018 and covid-19 pandemic in 2020 and 2021 which triggered a decrease in tourism activity on the island of Lombok.

To prevent this condition, an effort is needed to harmonize between tourism activities and environmental conservation of the tourist destination. In this case, tourism activities in Gili Matra need to be aligned with conservation efforts, including coral reef conservation. However, the lack of funds to do so becomes an obstacle to the achievement of these efforts. As a solution, conservation funds can be obtained through voluntary donations or mandatory donations from parties who process the benefits of tourist activities, namely tourists and tourist businesses. The payment *for ecosystem services (PES)* program can be a way to implement conservation funds collection.

Associated with the concept of PES, tourists and tourism entrepreneur are on the demand side that acts as “buyers” of environmental services, which should pay a certain amount for the cost of conservation of coral reefs and other marine biota. On the supply side, there is a large role of fishermen households whose activities can affect the existence of coral reefs and marine life. Destructive behaviors of coral reefs carried out by fishermen related to their activities in the utilization of marine resources for their economic needs [2]. So, in the concept of PES, fishermen’s households can act as “sellers” of environmental services. Funds collected from the payment of environmental services are further channelled to coral reef conservation activities that can be done by involving fishermen groups and also as an incentive so that fishermen do not behave destructively to coral reefs. Furthermore, the environmental services funds can also be used for the empowerment of local communities at large. The problems that will be answered in this study are formulated in the form of research questions as follows:

- a) Do fishermen’s households in Gili Matra willing to accept the coral reef conservation?
- b) What are the factors that determine the willingness to accept the coral reef conservation programs in Gili Matra?

The general objective of this research is the achievement of the sustainable harmonization of the tourism industry and the conservation of coral reefs as well as other marine biota in the Gili Matra Area. These general objectives can be further elaborated into some of the more SMART specific goals (significance, measurable, achievable, rationale, time bound), as follows:

To analyze *the willingness to accept (WTA)* for coral reef conservation in Gili Matra;
To analyze the determinants of fishermen households’ WTA for coral reef conservation;

and to analyze the opportunity to implement the *Payment for Ecosystem Services* (PES) program in the Gili Matra area as a form of harmonization of tourism and conservation activities.

2 Literature Review

2.1 Theoretical Background of PES

The Coasean Economics approach is the main conceptual basis of the PES approach [3, 4]. Coasean's theorem is based on the assumption that externality problems can be solved through direct negotiation between relevant parties that cause and/or are affected by externalities, regardless of the allocation of ownership rights [4–6]. In his article entitled, “*The Problem of Social Cost*”, Coase (1960) challenged Pigou's approach contained in “*The Economics of Welfare*” related to efforts to solve externality problems.

Pigou (1932) argues that negative externalities result in social costs that must be addressed by the government [7]. He proposed a tax system, known as the “Pigovian Tax”, to solve the problem of social costs. Pigou's solution implies market failure and asserts that government authority is necessary to improve the market so that an appropriate level of compensation for externalities will arise [8]. Yandle (1997) argues that pigovian approaches tend to be more appropriate and should be applied in large-scale cases, where there are many parties included in the system, and where it is too difficult to rely on contracts and market solutions [8].

On the other hand, instead of taxing or subsidizing those who cause externalities — to reduce or stop their harmful activities — the Coasean Economy shows that the market system can achieve a socially optimal level of environmental externality. Coase argues that those who produce externalities and those who suffer from them should be left in unregulated situations without government interference (such as pigovian taxes or subsidies) and that the transaction process will eventually be developed automatically regardless of who holds the ownership rights [9]. However, in practice, Coasean's solutions face several obstacles related to efficient bargaining, in particular high transaction costs, power imbalances, and poorly defined ownership rights [10]. Thus, the Coasean solution itself requires a clear definition and allocation of property rights (guaranteeing ownership of resources through the legal power of the state) and low transaction costs, which also require state intervention [3, 9].

In short, in a Coasean-style PES, environmental service beneficiaries make direct payments to environmental service providers based on mutually agreed voluntary negotiation procedures. In contrast, in Pigovian-style PES, the government intervenes, such as by providing subsidies to pay environmental service providers to ensure the provision of environmental services [10]. It is possible that the Coasean and Pigovian approaches will become one as a hybrid approach [11] that could result in a new policy paradigm that combines elements of a voluntary and mandatory policy-based system (based on mandate). An example of a hybrid approach is the PSA program in Costa Rica which combines Pigouvian and Coasean's approach to funding sources. Funding for the program comes from private electricity producer loans, taxes, and World Bank loans [12]. The PES system in West Lombok Indonesia is also a hybrid approach that combines

voluntary transactions on the supply side and government regulations on the demand side [11].

Based on Coase's thesis, the provision of environmental services should theoretically be optimal if there is payment from the beneficiaries of environmental services to the provider [13]. This is the fundamental assumption behind the concept of PES proposed by some scientists (see, for example, [14, 15]. Pagiola (2007) defines PES as a market-based mechanism centered on the principle of buying and selling environmental services from beneficiaries to service providers [16]. The principle of providing services as a condition for incentives provided to environmental service providers [17]. By emphasizing incentives as a key aspect for the provision of environmental services, PES defined as "the transfer of resources between social actors, aimed at creating incentives to align land-use and/or collective decisions with social interests in natural resource management" [3]. A common assumption about PES policy is that there should be a joint obligation contained in the contract between the service provider and the consumer [18].

2.2 Previous Studies on PES

Several studies on the contribution of PES programs to sustainable natural resource management and community empowerment have been conducted in various countries. For example, PES programs in Ecuador have made a positive contribution to community empowerment and sustainable management of natural resources [19]. Research conducted in China shows that an understanding of *Ecosystem services* can be the basis for harmonization of the relationship between people's economic livelihoods and environmental conservation [20]. However, this study prioritizes awareness and does not formulate a form of activity to harmonize between economic and conservation activities. Analysis on the willingness to pay *Scuba divers* to marine biodiversity on Barbados, a Caribbean island found that there is a potential for increased marine biota conservation through the economic benefits of diving tourism activities in the area [21]. However, this study has not recommended such a scheme to balance tourism activities with the conservation of coral reefs and marine life.

3 Methods

This study employs quantitative methods by collecting data through surveys, observations, and literature studies. A *Contingent Valuation Method* (CVM) survey were conducted to 100 household as the respondents.

The data collected was analyzed with quantitative methods to answer the research objectives that have been compiled above. Respondents' willingness to accept (WTA) is hypothesized to be influenced by a number of free variables, represented by vector x and formulated as the following functions:

$$WTP_i^* = \beta x_i + \varepsilon_i$$

In which β is the vector of the slope parameter and x_i is the observing vector on the explanatory variable for individual i . The error term (ε) is assumed to be a normal

distributed random variable with an average of zero. The free variables used in this model are age, education, income, number of family members and environmental awareness. Regression with the smallest square method (OLS) is performed to analyze this model. Thus, the econometric models tested in the study were:

$$WTA = f(\text{Education, Income, Age, Family Size, Environmental Awareness})$$

4 Result

The CVM survey showed that all respondents were willing to accept compensation payments to reduce activities that could potentially damage coral reefs. The average WTA for efforts to maintain the existence of coral reefs in Gili Matra is Rp 1,326,000 per month. Meanwhile, the highest WTA is Rp 5,000,000 per month and the lowest is Rp 250,000 per month.

The regression estimation result for the econometric model is presented in Table 1.

The results of the econometric analysis on the model showed that income affected the WTA at a significance rate of 99%, family size and environmental awareness also significantly affected the WTA at a significance level of 95%. Meanwhile, education and age of respondents did not affect the WTA.

Family income has a positive and significant relationship to the amount of money that is willing to receive as a compensation (WTA). Respondents with high family incomes tended to have greater WTA. An increase in revenue of Rp 1 million will lead to an increase in WTA of Rp 518,534 *ceteris paribus*. Respondents with larger family sizes (more family members) tended to be willing to receive higher compensation for maintaining coral reefs. The increase in the number of family members by 1 person, will be followed by an increase in WTA of Rp 181,587 *ceteris paribus*. Meanwhile, respondents with worse levels of environmental awareness (reflected by the high frequency of anchor use) tended to have a willingness to receive compensation for the existence of coral reefs with smaller amounts. The increase in the frequency of poor environmental awareness will be followed by a decrease in WTA of Rp 182,436 *ceteris paribus*.

Table 1. Regression Estimation Coefficient

| Variable | Betta | t statistic |
|-------------------------|-----------|-------------|
| Constant | 838137 | 1,18 |
| Education | -96053,18 | -1,05 |
| Income | 518534,9 | 3,18*** |
| Age | -10601,88 | -0,77 |
| Family size | 181587 | 2,24** |
| Environmental Awareness | -182436,8 | -2,40** |
| F statistic | 3,84*** | |
| Adj R2 | 0,1253 | |

Source: Data analysis results (** Significant at α 5% *** Significant at α)

5 Discussion

Several studies on people's WTA of payment for environmental protection discovered that a person's income has a significant impact on his/her willingness to accept the environmental protection program. People with enough financial means are more likely to embrace such a program [22, 23]. The current study, on the other hand, found the opposite consequence. The WTA is not considerably influenced by family income. This is similar with other previous studies who found that income is not closely correlated with people's WTA [24].

People with a higher education level frequently have a better understanding of the PES concept, making it easier for them to embrace the program [25]. This study discovered; education has a major influence on people's propensity to accept [22, 26, 27]. In contrast, Li discovered that knowledge level is not a factor of PES program participation [28].

Similar to other previous studies, family size also positively influence the WTA [28]. However, this finding is in contrast to Nyonsea who found that Family size is not significant to influence farmer WTA for PES [25].

The most significant factor that influence people WTA for PES is environmental awareness. This finding in line with some other previous studies [22, 24, 29].

6 Conclusion

There is considerable potential for the application of compensation in maintaining the existence of coral reefs in the Gili Matra area by fishermen households domiciled around the region. Willingness to Accept (WTA) of fishermen households is significantly affected by income levels, number of family members and environmental awareness.

This research found a supply side in the Environmental Services Payment (PES) program with coral reef objects in the Gili Matra area. Further to that, the study recommends the establishment of the PES Program with the involvement of stakeholders such as local government as regulator and the establishment of independent institutions for environmental services program managers.

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References

1. Diswandi, D., Afifi, M., Fadliyanti, L., & Hailuddin, H. (2021). Tourism enterprises' willingness to contribute to payment for ecosystem services (PES) program in Gili Matra, Indonesia. *2nd Annual Conference on Education and Social Science (ACCESS 2020)* (pp. 418–421).
2. Latifah, S., Afifi, M., & Diswandi, D. (2015). The influence of personal religious practices on destructive behavior to natural resources and environment. *Journal of Economics and Sustainable Development*, 6, 20.

3. Muradian, R., Corbera, E., Pascual, U., Kosoy, N., & May, P. H. (2010). Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, 69(6), 1202–1208. <https://doi.org/10.1016/j.ecolecon.2009.11.006>
4. Matzdorf, B., Sattler, C., & Engel, S. (2013). Institutional frameworks and governance structures of PES schemes. *Forest Policy and Economics*, 37, 57–64. <https://doi.org/10.1016/j.forpol.2013.10.002>
5. Coase, R. H. (1960). The problem of social cost. *Journal of Law and Economics*, 3, 1–44.
6. Engel, S., Pagiola, S., & Wunder, S. (2008). Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics*, 65(4), 663–674. <https://doi.org/10.1016/j.ecolecon.2008.03.011>
7. Pigou, A. C. (1932). *The economics of welfare*. Palgrave Macmillan.
8. Yandle, B. (1997). *Common sense and common law for the environment: Creating wealth in hummingbird economies*. Rowman & Littlefield Publishers.
9. Turner, R. K., Pearce, D., & Bateman, I. (1994). *Environmental economics, an elementary introduction*. Prentice Hall Press.
10. Sattler, C., & Matzdorf, B. (2013). PES in a nutshell: From definitions and origins to PES in practice—Approaches, design process and innovative aspects. *Ecosystem Services*, 6, 2–11. <https://doi.org/10.1016/j.ecoser.2013.09.009>
11. Diswandi, D. (2017). A hybrid Coasean and Pigouvian approach to payment for ecosystem services program in west Lombok: Does it contribute to poverty alleviation? *Ecosystem Services*, 23, 138–145. <https://doi.org/10.1016/j.ecoser.2016.12.005>
12. Sánchez-Azofeifa, G. A., & Pfaff, A. (2007). Costa Rica's payment for environmental services program: Intention, implementation, and impact. *Conservation Biology*, 21(5), 1165–1173. <https://doi.org/10.1111/j.1523-1739.2007.00751.x>
13. Pattanayak, S. K., Wunder, S., & Ferraro, P. J. (2010). Show me the money: Do payments supply environmental services in developing countries? *Review of Environmental Economics and Policy*, 4(2), 254–274. <https://doi.org/10.1093/reep/req006>
14. Wunder, S. (2005). *Payments for environmental services: some nuts and bolts*. Center for International Forestry Research (CIFOR).
15. Wunder, S. (2008). Payments for environmental services and the poor: Concepts and preliminary evidence. *Environment and Development Economics*, 13(3), 279–297. <https://doi.org/10.1017/S1355770X08004282>
16. Pagiola, S. (2007). *Guideline for 'Pro-Poor' PES*. World Bank.
17. Sommerville, M. M., Jones, J. P. G., & Milner-Gulland, E. J. (2009). A revised conceptual framework for payments for environmental services. *Ecology and Society*, 14(2), 400–434. http://murdoch.summon.serialssolutions.com/2.0.0/link/0/eLvHCXMwTz0xDsIwDEUjd pZKMHOBSEmchHqqDgAHMCO7bFT7y-SCiSmfwHr_-X7fedu0LRU7ZcRc6IoZCV n5qRBU-vpgT8Uw9FJ_XPzdXIn3S7uvT5ey9N_xwC8DGS5p4KJjTUYFwxU58DCpF0 BcG6DoiLGLg9VxQBkghyLZbtDRu6hG6_uTKM0vu3Hc518APwwKjQ
18. Kroeger, T. (2013). The quest for the 'optimal' payment for environmental services program: Ambition meets reality, with useful lessons. *Forest Policy and Economics*, 37, 65–74. <https://doi.org/10.1016/j.forpol.2012.06.007>
19. Bremer, L. L., Farley, K. A., Lopez-Carr, D., & Romero, J. (2014). Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for 'win-win'? *Ecosystem Services*, 8, 148–165. <https://doi.org/10.1016/j.ecoser.2014.03.007>
20. Allendorf, T. D., & Yang, J. (2013). The role of ecosystem services in park–people relationships: The case of Gaoligongshan Nature Reserve in southwest China. *Biological Conservation*, 167, 187–193. <https://doi.org/10.1016/j.biocon.2013.08.013>

21. Schuhmann, P. W., Casey, J. F., Horrocks, J. A., & Oxenford, H. A. (2013). Recreational SCUBA divers' willingness to pay for marine biodiversity in Barbados. *Journal of Environmental Management*, 121, 29–36. <https://doi.org/10.1016/j.jenvman.2013.02.019>
22. Chu, X., Zhan, J., Wang, C., Hameeda, S., & Wang, X. (2020). Households' willingness to accept improved ecosystem services and influencing factors: Application of contingent valuation method in Bashang Plateau, Hebei Province, China. *Journal of Environmental Management*, 255, 109925. <https://doi.org/10.1016/j.jenvman.2019.109925>
23. Yu, L. L., & Cai, Y. Y. (2015). Ecological compensation based on farmers' willingness: A case study of Jingsan County in Hubei Province, China. *Ying Yong Sheng tai xue bao= Journal of Applied Ecology*, 26(1), 215–223.
24. Feng, D., et al. (2018). Factors influencing willingness to accept in the paddy land-to-dry land program based on contingent value method. *Journal of Cleaner Production*, 183, 392–402. <https://doi.org/10.1016/j.jclepro.2018.02.142>
25. Nyongesa, J. M., Bett, H. K., Lagat, J. K., & Ayuya, O. I. (2016). Estimating farmers' stated willingness to accept pay for ecosystem services: Case of Lake Naivasha watershed payment for ecosystem services scheme-Kenya. *Ecological Processes*, 5(1), 1–15. <https://doi.org/10.1186/s13717-016-0059-z>
26. Asrat, P., Belay, K., & Hamito, D. (2004). Determinants of farmers' willingness to pay for soil conservation practices in the southeastern highlands of Ethiopia. *Land Degradation & Development*, 15(4), 423–438.
27. Aura, S. (2016). Determinants of the adoption of integrated soil fertility management technologies in Mbale division, Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, 16(1), 10697–10710.
28. Li, H., Yang, X., Zhang, X., Liu, Y., & Zhang, K. (2018). Estimation of rural households' willingness to accept two PES programs and their service valuation in the Miyun Reservoir Catchment, China. *Sustainability*, 10(1), 170.
29. Seroa da Motta, R., & Ortiz, R. A. (2018). Costs and perceptions conditioning willingness to accept payments for ecosystem services in a Brazilian Case. *Ecological Economics*, 147, 333–342. <https://doi.org/10.1016/j.ecolecon.2018.01.032>

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