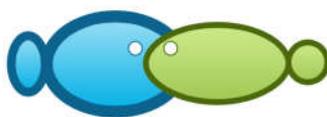


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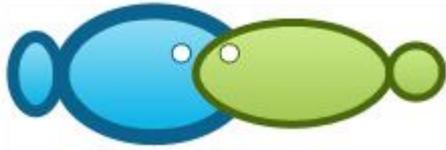
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Marine tourism in Gili Labak Island: willingness to pay method as an effort to preserve coral reef in Gili Labak Island, Madura, Indonesia

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Abstract. Gili Labak Island is a favourite tourism destination in Madura which is very dependent on the beauty of its coral reefs, especially for snorkelling tours. Coral cover can be as high as 74% which is in the good category. It is feared that tourism activities will have an impact on coral reef ecosystems. Research on the impact of tourism on coral reefs is needed to manage and conserve these resources. Furthermore, Gili Labak Island does not have sufficient income for the conservation of coral reef ecosystems. This study aimed to determine the willingness to pay (WTP) of visitors partaking in snorkelling tourism in the coral reef ecosystems around Gili Labak. The study was conducted on Gili Labak Island, a questionnaire was used to ascertain the WTP of all visitors who snorkel. Snorkelling visitors to the island of Gili Labak are mostly only willing to pay the lowest cost offered (IDR 10,000), with an average (estimated) WTP of IDR 17,000.

Key Words: snorkelling, willingness to pay, coral reef, marine tourism, Gili Labak, environment.

Introduction. Reef-building corals belonging to the Phylum Cnidaria, Class Anthozoa, Order Scleractinia are the foundation of coral reef ecosystems (Veron 1986). Corals are associated with photosynthesizing dinoflagellate unicellular algae of the genus *Symbiodinium*, widely known as zooxanthellae; this symbiosis enables the corals to obtain the energy needed to produce their calcium carbonate skeletons, the main constituents of the reef structure. The coral reef ecosystem itself is a habitat for many marine organisms (Hazrul et al 2016). Furthermore, coral reefs are highly productive ecosystems with high biodiversity with important functions and roles in the wider aquatic environment (Brandl et al 2019). Ecological functions of coral reefs include serving as a breeding ground for fishes, protection of the coast from abrasion and the onslaught of waves, stabilizing islands and coastlines against erosion due to powerful waves (Damanhuri 2003). From an economic perspective, coral reefs are very important for food security, employment, tourism, bioprospecting for pharmaceutical compounds, and coastal protection (Hoegh-Guldberg et al 2009; Rocha et al 2011). From the viewpoint of marine tourism, underwater tourism attractions such as coral reef ecosystems are economic assets that can be utilized (Adibrata 2013).

Gili Labak Island is a small island with an area of 5 hectares in Sumenep District, Madura Province, Indonesia. The high coral cover, which can reach 74%, is mostly in the good category based on Insafitri et al (2020). This makes the coral reefs a special attraction for tourists, many of whom enjoy snorkelling during their stay on this island. Reef-based tourism produces billions of rupiah (IDR) per year for the local economy (Brander et al 2007). However, in many tourism destinations the activities associated with tourism have had negative impacts on the abundance, composition and structure of the biotic communities which attract the tourists (Heil et al 2007). Coral reef ecosystems are in decline due to anthropogenic pressures including unsustainable fishing activities, tourism, pollution, and climate change, and coral disease (Pandolfi et al 2003; Hoegh-Guldberg et al 2009; Burke et al 2012). Irawan (2016) reported a coral disease prevalence of 8.06% in coral reefs around Gili Labak Island.

The Sumenep Smart City Masterplan data for 2019-2023 shows that the marine tourism sector, especially nature-based tourism around Gili Labak Island, is primarily focused on providing facilities and infrastructure to support tourist sites, such as improvements in port facilities, transportation, clean water supplies and lodging. There was a total absence of management efforts aimed at protecting the coral reefs around Gili Labak Island. It would be appropriate for the costs of providing solutions to the impact on coral reef ecosystems and of implementing actions to conserve coral reefs to come from the visitors themselves. This would not only lighten the burden on the government budget, but also to provide education about essential conservation values, and help raise the awareness of visitors. However, this participation requires that visitors should be willing to contribute to providing such funds, e.g. through payment of an entrance ticket. Therefore, there is a need to investigate the willingness to pay (WTP) of visitors to Gili Labak Island. This research aimed to identify, understand and quantify visitor willingness to pay for efforts to conserve the coral reefs around Gili Labak Island.

Material and Method. The study was conducted in July-August 2019 on Gili Labak Island in Sumenep, Indonesia (Figure 1). Analysis of WTP for the conservation of coral reef ecosystems used the Contingent Valuation Method (CVM) (Hanley & Spash 1993). The CVM was implemented using a standard questionnaire, which was divided into three sections. The first section explained the purpose of the study and also included the personal information of the respondent. The second section addressed the general knowledge of the respondent regarding marine ecosystems, especially coral reefs. The third section addressed the current condition of coral reefs around Gili Labak, threats to the reefs, and their future without management. This section included a question about whether the respondent was willing or not to pay for conservation efforts in the form of entrance fee. If they were not willing, the respondents were asked to explain why not. When respondents were willing to pay, a ladder style series of payment options were presented, ranging from IDR 10,000 as the lowest to more than IDR 50,000 as the highest. The raw data were then analysed descriptively and correlations between WTP parameters were evaluated using the R Statistical Package version 3.6.1 (R Core Team 2019). Statistical significance was evaluated at the 95% confidence level ($\alpha = 0.05$).

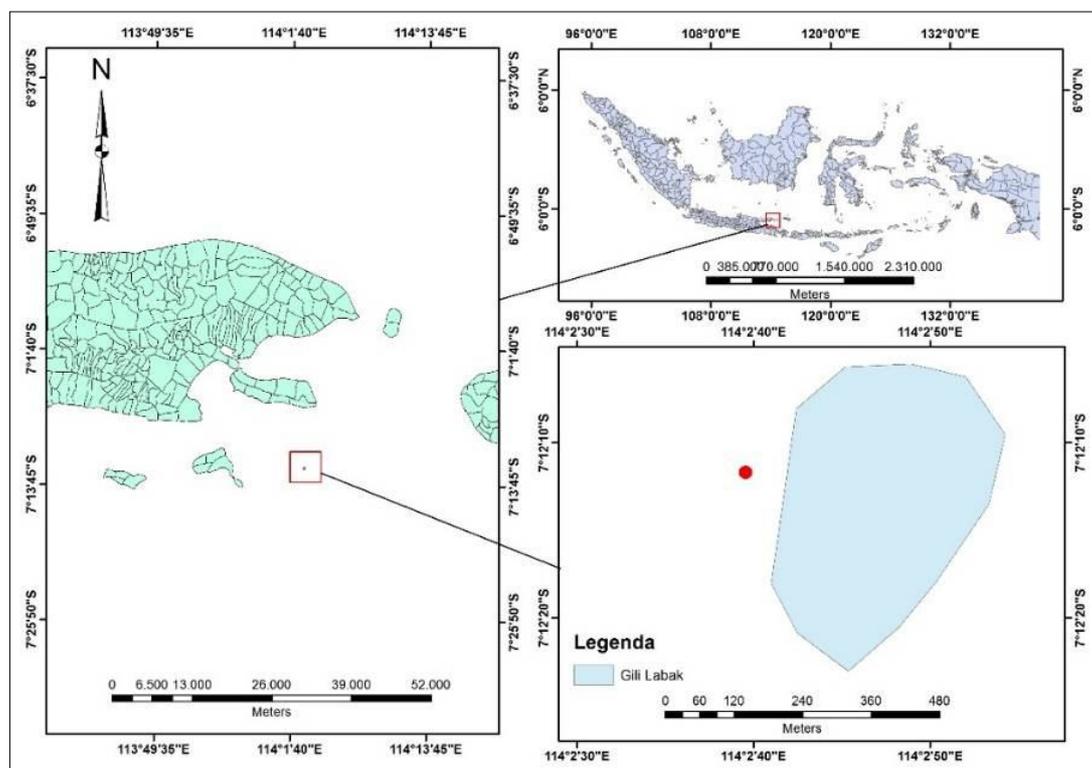


Figure 1. Study location in Gili Labak Island, Sumenep, Indonesia.

Results

Socio-economic characteristics of respondents. Most visitors to Gili Labak Island were aged between 15-40 years, with the largest percentage (around half) aged 20-30 years. When this research was conducted, there were no visitors over 50 years old who went snorkelling. Meanwhile, in terms of gender, nearly two thirds of visitors who went snorkelling were male. Most visitors were educated to high school or university level. Visitors to Gili Labak Island identified mostly their employment status as self-employed entrepreneurs or private sector employees, with small percentages of teachers, civil servants, students and others. Monthly incomes ranged from IDR 500,000 to over IDR 10,000,000 (Table 1). The majority of respondents were not aware that snorkelling activities could be a threat to the coral reefs if not done properly. Approximately 41% of visitors said they were aware that improper snorkelling could threaten or damage the coral reefs.

Table 1

Socio-economic demographic of respondents

<i>Variables</i>	<i>Description</i>	<i>Percentage (%)</i>
Age (years)	< 20	23.66
	21-30	50.38
	31-40	19.85
	> 40	6.11
Gender	Male	64.06
	Female	35.94
Education	Elementary	5.69
	High School	45.53
	University	48.78
Occupation (Job)	Private employee	28.33
	Entrepreneur	40.83
	Teacher	7.50
	Government employee	7.50
	Student	6.67
	Other	9.17
Income (in millions IDR)	< 1	12.24
	1-3	30.61
	3-5	42.86
	>5	14.29

Willingness to pay. The majority of visitors (81.03%) were willing to pay fees to be able to snorkel around Gili Labak Island. Of those willing to pay fees, 85.71% were willing to pay using a ticket system and the remainder using a donation model. Quantification revealed that the WTP of visitors to Gili Labak Island taking part in the study decreased in magnitude with increasing levels of payment (Figure 2). While nearly two-thirds (63.95%) were willing to pay IDR 10,000 (the lowest price offered) for coral reef conservation and current routine activities, just 8.14% were willing to pay 50 thousand or more. There were 5.81% who were not willing to pay the lowest price offered (IDR 10,000), even though they were willing to pay an entrance fee; from this it can be assumed that they are only willing to pay the current ticket price of IDR 5,000.

Based on the results obtained, the estimated WTP indicates that the fees of up to IDR 17,000 could be applied on Gili Labak Island. Although on average men had a higher WTP than women, the gender (sex) difference in WTP was not significant (t-test, $p > 0.05$).

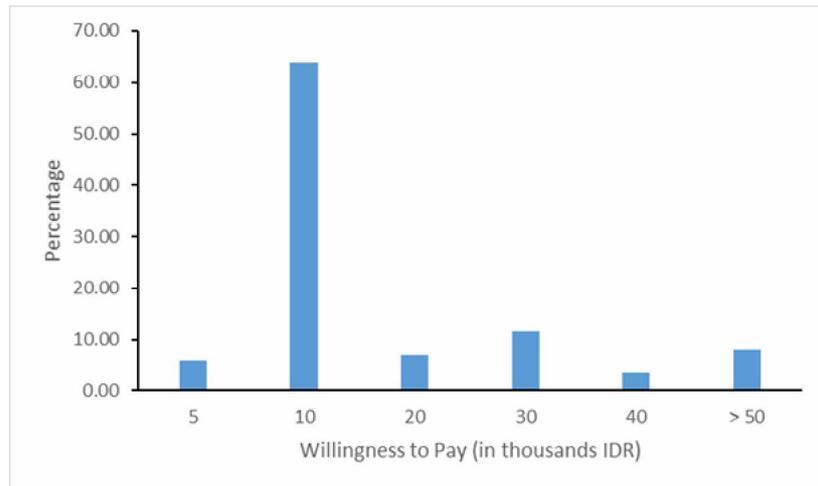


Figure 2. Willingness to pay of respondents for snorkelling activities while on Gili Labak Island.

A linear regression of WTP against age (Figure 3) showed a very strong ($R^2 \approx 0.91$) positive and significant correlation ($p < 0.05$).

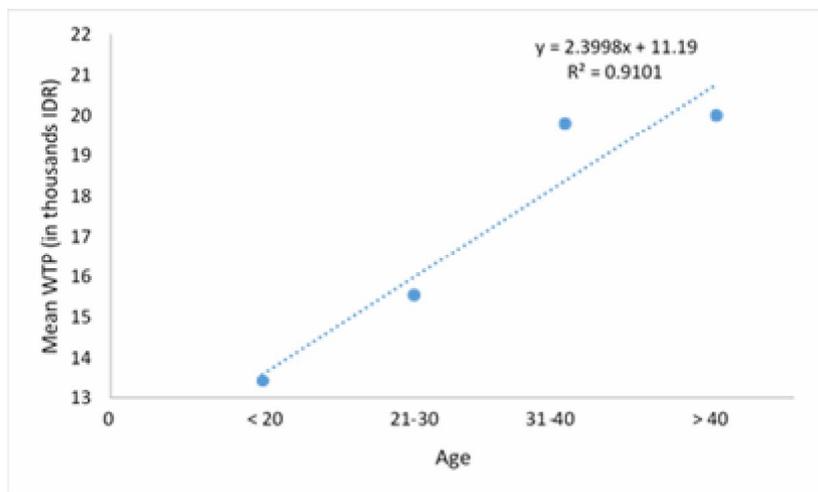


Figure 3. Correlation between visitor age and willingness to pay on Gili Labak Island.

The higher WTP with increasing visitor age could reasonably be thought likely to indicate a higher ability to pay. However, the correlation between visitor income and WTP was weak and not significant ($p > 0.05$) (Figure 4).

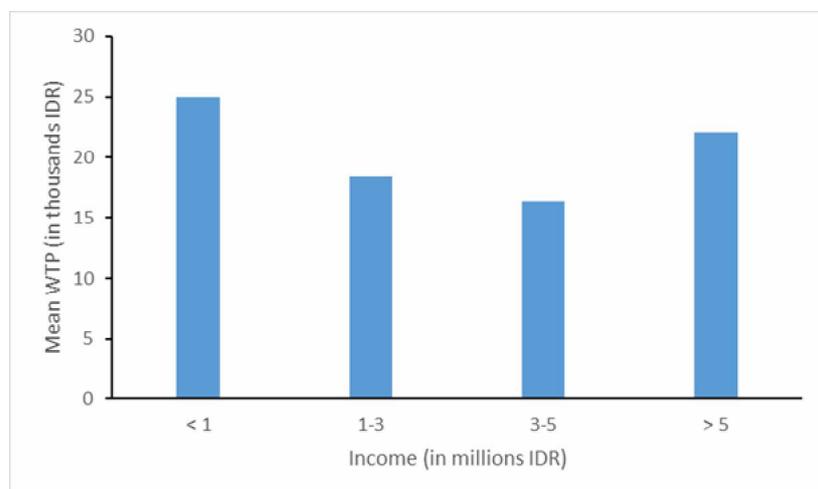


Figure 4. Mean willingness to pay by visitor income class on Gili Labak Island.

WTP had a strong positive and significant correlation with education level ($p < 0.05$). On average, visitors with a higher educational attainment were willing to pay higher entry fees (Figure 5).

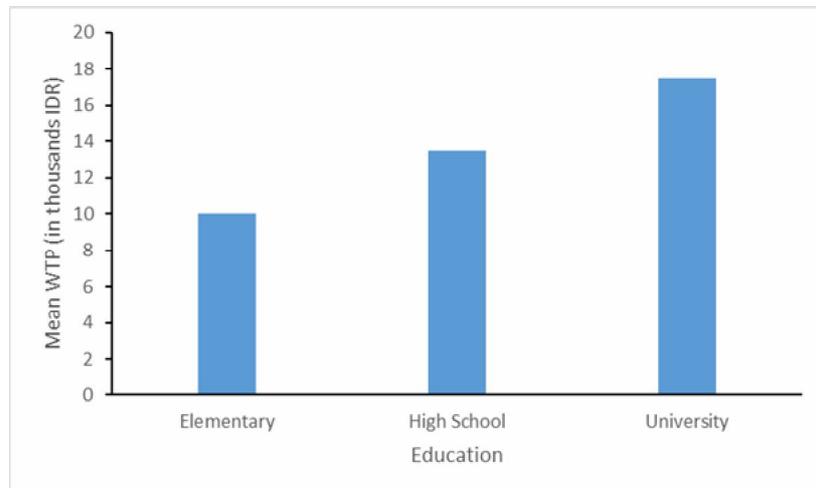


Figure 5. Mean willingness to pay by visitor educational attainment on Gili Labak Island.

Discussion. Gili Labak Island in Sumenep District, Indonesia is an emerging marine tourist destination. Tourism activities began in 2015 with activities mostly consisting of sightseeing, beach walking, and snorkelling. Recent data from Sumenep Tourism Agency show that around 31,000 people visit Gili Labak Island per year. However, based on our observations, only about 10% of visitors actually take part in snorkelling activities.

In terms of marine tourism management, there were no management practices whatsoever regarding the marine environment below the intertidal zone. There was an entrance fee of IDR 5,000 collected from visitors by local community which was only used to clean the beach. There had been no efforts to conserve the coral reefs, even though the condition of coral reef had declined in recent years. The decline in reef condition was mainly attributed to environmentally unfriendly tourist activities and coral disease (Nugraha et al 2019). One of the environmentally unfriendly tourist activities that can damage the reef is physical contact with the reef; when snorkelling, contact can occur through sitting or kneeling on the coral colony or hitting the corals with fins while swimming; novice tourists are much more likely to make physical contact with the reef when snorkelling than experienced snorkelers (Akhmad et al 2018). If there is no change in management practices on the Island, the reefs will continue to deteriorate, and the tourism will not be sustainable. However, the entrance fee is too small to cover management, and therefore the fee should be increased.

Out of 130 respondents, 18.97% did not want to pay any fees to enter the Island to go snorkelling. The reasons they do not want to pay were that they consider that the government should pay for the management and conservation activities; that they believe their snorkelling activities do not damage the coral reef; and that they do not believe that the money collected would be used for conservation.

Most of the respondents who were willing to pay chose the entrance ticket option rather than a donation for the mode of payment. This is not surprising because issuing a ticket is common practice in tourist destinations around Indonesia for both terrestrial and marine based tourism. In other destinations with marine based tourism, such as Karimunjawa Island, Nusa Penida, and Gili Trawangan, divers and visitors also opted for tickets rather than donations (Dodds et al 2010; Tania et al 2011; Baskara et al 2017).

Mostly, visitors to Gili Labak Island were only willing to pay IDR 10,000, with an estimated mean WTP of IDR 17,000. Such fees are on par with a WTP study in Karimunjawa (Baskara et al 2017), but lower than in WTP studies in Gili Trawangan, West Nusa Tenggara and Nusa Penida, Bali where most visitors were willing to pay more than IDR 20,000 with average fee of more than IDR 50,000 (Dodds et al 2010; Tania et al 2011). It is not surprising to find such different WTP values between Gili Labak and

Karimunjawa compared to Gili Trawangan and Nusa Penida, because of the difference in visitor characteristics. Most visitors to Gili Labak and Karimunjawa are domestic tourists, with incomes of less than IDR 5 million (roughly US\$ 350) per month. In contrast, visitors to Gili Trawangan and Nusa Penida are mostly foreigners with incomes of at least US\$ 1,500 per month. Moreover, in Gili Trawangan, dive fees had already been implemented, so that visitors already perceived the payment of fees as something quite usual. Another factor that might be a cause of low domestic tourist WTP in Gili Labak is the high level of tourist interest in other marine tourism attractions in Sumenep such as the islands of Gili Iyang, Mambuburit, and Gili Raja, which generally do not implement a payment system or are free to enter. This means that most visitors do not have basic knowledge or prior experience about the importance of funds for conservation management efforts in sustainable marine tourism destinations (BPS Sumenep 2018). This surmise is corroborated by Arfiyanto & Andini (2017) who found that one of the factors attracting domestic tourists to the island of Gili Labak was an attractive marine tourism destination with cheap tourist ticket prices.

The estimated WTP that could be applied on Gili Labak Island is IDR 17,000. Data from Sumenep Tourism Agency show that Gili Labak Island is visited by around 30 thousand visitors yearly (Jannah & Idajati 2018). If 10% (3000 visitors) are assumed to take part in snorkelling activities, then there is potential income of IDR 51,000,000. If a fee equivalent to the calculated WTP was applied to all visitors, the potential income would be around IDR 510 million. Such fees could benefit the Island through enabling conservation activities such as coral transplantation, installation of mooring buoys, and visitor education on coral reef health. Visitor education is very important since our questionnaire showed that 58.70% of the respondents were not aware that snorkelling activities could threaten the coral reefs. Moreover, our field observations found that most snorkelling visitors do stand on top of massive corals when tired and some were accidentally kicking corals with their fins. Snorkel tourist behaviour such as stepping on corals, kicking corals, as well as holding onto corals and stirring up the sediment with their fins can cause many kinds of damage to the corals. These include bruising, laceration and other tissue damage as well as fracturing of coral colonies and increasing vulnerability to disease and coral bleaching (Nugraha et al 2019; Insafitri et al 2020). These impacts have the potential to severely damage or even destroy coral reefs (Muhidin et al 2017). According to one study in the Seribu Islands, damage from snorkellers could damage around 8.2% of corals per year, with kicking and trampling of corals causing the most damage followed by holding on to corals and taking or collecting corals (Yusnita 2014). Hawkins & Robert (1992) found that the impact on coral reefs caused by the environmentally unfriendly behaviour of each individual snorkeler or diver was very small, but cumulatively these behaviours can put significant pressure on coral reefs and results in substantial reductions in percentage coral cover.

Our results showed that WTP was significantly correlated with visitor age and educational attainment, but did not correlated significantly with visitor gender or income. These results are in contrast with those from a WTP study in Nusa Penida (Tania et al 2011) and in the Ponta do Ouro Partial Marine Reserve Mozambique (Daly et al 2015), both of which found that education was not significantly correlated while income was significantly correlated with WTP. Our questionnaire results suggest that visitors who are aware of the impacts of snorkelling mostly had university level education, although some only had high school education. Moreover, those who were aware mostly had a monthly income of more than IDR 2 million, suggesting a threshold-related step change rather than a linear relationship. Purbaya et al (2015) found that basic knowledge about coral reef ecosystems is positively correlated with a conservation-oriented attitude towards marine tourism; the more the tourists know about the benefits of coral reefs to the marine ecosystem, the greater their level of concern regarding coral reef conservation. The educational attainment and income levels of most of the respondents who were aware of the potential threats to coral reefs place them as members of the middle class in Indonesian society. These respondents would therefore be likely to have better access to information and news, generally and on environmental issues, which in turn might contribute to a higher level of awareness regarding nature conservation issues (Webler &

Jakubowski 2016). Awareness and action regarding coral reef conservation also need to be supported by the participation of local communities living on the island of Gili Labak. One of the challenges for coral reef conservation in the context of efforts to develop sustainable marine tourism on the island of Gili Labak is the attitude of local communities. In general, the local people have minimal knowledge and experience of conservation, and are only used to passive participation, as is typical of people who still depend on government or other outside agencies for efforts such as those needed to conserve coral reefs (Dwi Anita & Supriono 2018).

Conclusions. Visitors to Gili Labak Island were mostly only willing to pay IDR 10,000, with an estimated mean WTP of IDR 17,000. The potential annual income was estimated at IDR 51 million rupiah from snorkelling visitors alone, rising to IDR 510 million if the fee based on WTP was implemented for all visitors. This income could be used for conservation activities such as coral transplantation, installation of mooring buoys, and to educate visitors about coral reef health. The absence of any management for marine ecosystems means that establishing a governing body to implement management and conservation should be a priority. Such a body could be set up by local communities using a local agreement; with support from government and academia, this could result in improved management practice and better conditions for the marine environment and the local community.

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