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THE ECONOMIC POTENTIAL OF WASTE MANAGEMENT IN PENYENGAT ISLAND TOURISM, TANJUNGPINANG CITY, RIAU ISLAND PROVINCE, INDONESIA

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ABSTRACT

Penyengat Island is one of the tourist objects for Islamic religion and culture, and history in Tanjungpinang City, Riau Islands. The natural beauty and cultural heritage owned by Penyengat Island is a tourist attraction, so that the number of tourist visits with directed or tourism purposes. Tourism activities in the Penyengat Island area have a positive impact. However, besides that, tourism activities negatively impact the environment, namely, tourism waste in the form of garbage that can reduce the environment's quality and sustainability.

Penyengat Island also has limited land for waste management and is an island with a small area of less than 2 square kilometers. The research aims to identify the potential for waste generation from tourism activities in the Penyengat Island area, identify waste management in the Penyengat Island area, estimate the economic costs and benefits of alternative waste management in the Penyengat Island area, and estimate the costs that businesses and tourists

are willing to pay in the Island area. Stingers against the implementation of waste management to preserve the area. The method used is descriptive analysis, Benefit Transfer, and Contingent Valuation Method. The results showed that most tourism waste originating from tourists in one year was in plastic waste, while most of the tourist waste originating from business actors was organic waste. Waste management in the Penyengat Island area is currently still using a waste transportation collection system, with recommendations for alternative waste management to be carried out in the Penyengat Island area, namely the construction of TPS 3R (reuse, reduce, recycle). The estimated cost of waste management using the TPS 3R system consists of an investment cost of IDR 750,000,000 and an annual operational cost of IDR 62,747,000. The estimated economic benefits resulting from the sale of waste in the TPS 3R system are IDR 80,791,002/year. The value of willingness to pay tourists and business actors to implement waste management can meet the operational costs and investment costs of TPS 3R of 27.31%. Therefore, the TPS 3R project deserves to be implemented.

INTRODUCTION

Indonesia is an archipelago country that has great tourism potential. Natural wealth and socio-cultural diversity are the main assets for developing the tourism sector as an economic boost. Tourism encourages growth, but the resulting solid waste and other pollutants threaten the natural beauty (Small Island Developing States) of SIDS, residents' quality of life, tourists' attractiveness, and economic success. Policies that manage tourism demand improve economic and environmental health (Georges, 2002; O'garro, 2009; Kapmeier & Gonçalves, 2018). In 2019 January, there were 1,201,735 foreign tourist trips with growth in visits of 9.46 when compared to 2018 in the same month (Kemenpar, 2019). The increase in the number of tourists occurs because Indonesia has various tourist destinations that can be visited. Many tourist locations in Indonesia can become tourist attractions for tourists to come on vacation to Indonesia. Penyengat Island in Tanjung Pinang, Riau Islands Province, was declared a historic island that has become a world heritage. Penyengat Island is the Indonesian language's birth island, which comes from the Malay Riau Lingga language. The declaration contains an appreciation of the Indonesian language and the center for developing and fostering the Malay Language to give birth to six pillars of language, including spelling, dictionary, morphology, semantics, etymology, and language (Purnamasari, 2015).

One of the environmental problems in tourist areas is tourism waste generated from tourism activities (Singer et al., 2019; Zorpas et al., 2015; Ikhwan et al., 2020). The problem faced by Penyengat Island is tourism waste in the form of waste from tourism activities. It was originating from tourists and tourism business actors. Waste from tourism activities on Penyengat Island is a problem that needs to be dealt with collectively. The existence of tourism activities and an increase in tourists visiting the area can decrease environmental and tourism functions on Penyengat Island. Therefore, management must be sustainable in tourism activities to meet the current generation's tourism needs and not reduce the ability to meet future generations' needs for tourism (Machado, 2016; Maiden, 2008; Zolfani et al., 2015). The volume of waste on weekends has increased. Tourists will be disturbed by the pile of garbage scattered in the area. If waste from tourism activities is left unmanaged, it will threaten the

sustainability and preservation of the nature and environment of Penyengat Island.

Based on the Government Regulation of the Republic of Indonesia Number 81 of 2012 regarding household waste management and household-like waste, it is necessary to develop waste management based on the 3R (reuse, reduce, recycle) principle. However, it requires some costs for procurement and operations for waste management from tourist activities in practice. The procurement of waste management in the Penyengat Island area requires the community, tourists, and business actors who carry out tourism activities in the Penyengat Island area to manage waste on Penyengat Island, Tanjungpinang City. Waste management due to tourism activities on Penyengat Island needs to be seen to determine the extent of efforts in reducing the environmental impact of waste, recommendations that can be conveyed through calculations of estimated economic costs and benefits, and the value of Willingness to Pay for the implementation of waste management.

Research is useful as a material for consideration for institutions responsible for environmental development and environmental quality improvement. The community can provide clarity on the importance of protecting Penyengat Island as a cultural heritage island, which must be maintained and appropriately managed.

METHOD

The sampling method for tourists is carried out by the nonprobability sampling method, where all research objects do not have the same opportunity to be selected as respondents (Narbuko & Achmadi, 2011). Tourist respondents were selected using a purposive sampling technique. Respondents were selected deliberately based on specific characteristics, namely representation of tourist origin, type of tourists, and tourist destinations (an adaptation of Uhar Suharsaputra, 2014). The selected respondents are over 17 years old and can communicate well and understand the questionnaire material given. The procedure is carried out by monitoring the tourists visiting Penyengat Island from arrival time to the time of return. The Lemeshow formula determines the number of tourist visitor respondents with unknown pollutants, so the number of respondents is sufficient for 140 people. Sampling was carried out on holidays and working days. The sample of business actors is the total population, namely food stalls, souvenir traders, street vendors, and homestays, totaling 24 business actors. The methods used are Descriptive Analysis, Benefit Transfer, and the Contingent Valuation Method (with the Polluter Pays Principle).

RESULTS AND DISCUSSION

Based on its geographical location, Penyengat Island is relatively close to Tanjungpinang City as the gateway to tourism for Penyengat Island. Tanjungpinang residents and visitors can see Penyengat Island from the Tanjungpinang coastline. The sea that separates the island 2 km from Tanjungpinang makes this island have a calm atmosphere, very different from

Tanjungpinang City. However, in certain seasons the sea conditions are choppy, preventing people from crossing to Penyengat Island or vice versa.

Amount and Composition of Tourist Waste

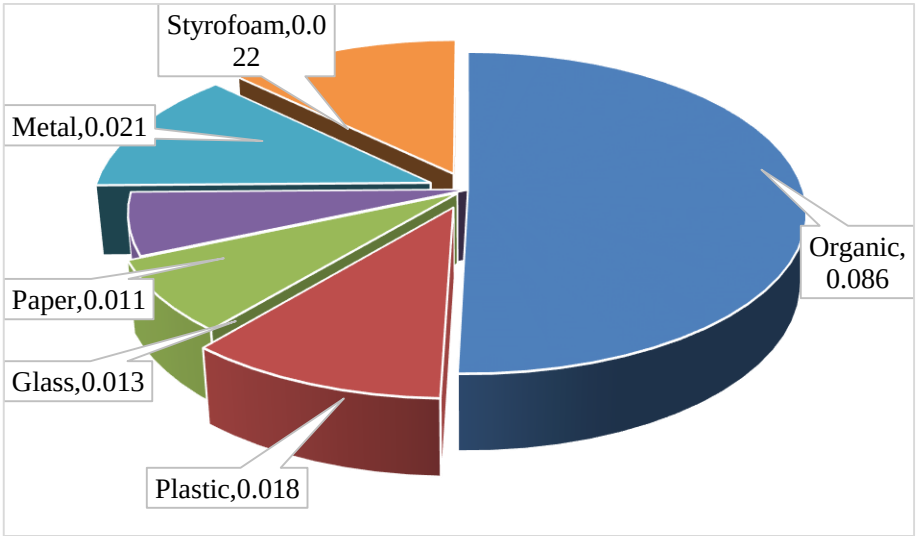

Figure 1. Composition of Tourist Waste Generation (Kg/Person/Day) on Penyengat Island in 2019

Generally, the waste from tourists is organic waste from leftovers of 0.086 (50.42%); and inorganic waste is styrofoam 0.022 (12.76%) and plastic 0.018 (10.71%) the amount of use of plastic and styrofoam, which is very dangerous for health and the environment. Suppose the waste from tourism activities is left unchecked and not properly managed. In that case, it can threaten the preservation of natural tourism areas and reduce tourist attraction, thereby reducing the function of tourism and the economic benefits obtained from these tourism activities.

Based on the results of interviews with tourists, they usually throw food scraps in trash cans or dispose of them carelessly because of the less accessible trash cans. Garbage should be brought back so that it is not dumped in the area; meanwhile, fruit peels are often found scattered on the ground. The type and amount of waste originating from business actors are identified based on each type of business unit in one year's operational time. Unlike the composition of tourist waste, the composition of waste originating from business actors is mostly organic waste, with more than 87.45% of the total waste. Business actors' organic waste consists of food scraps, banana peels, and cooking leftovers.

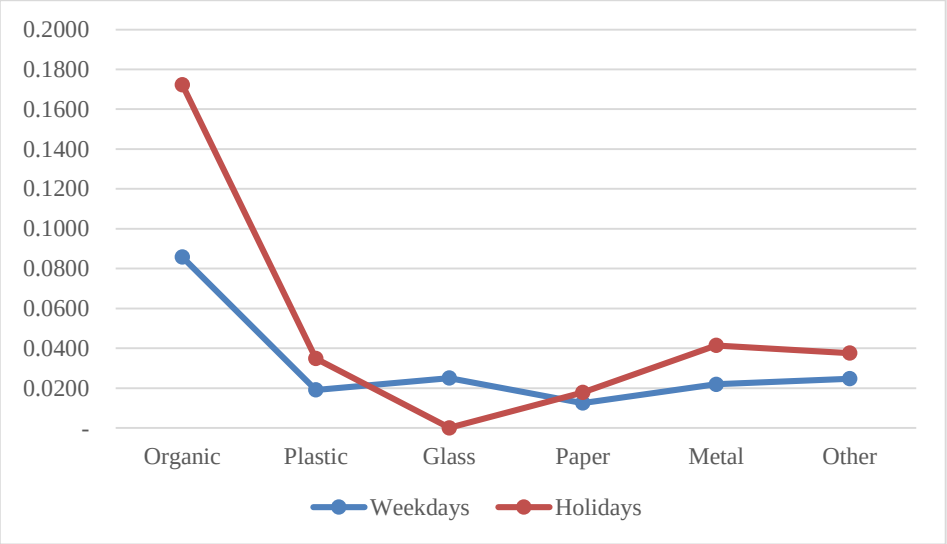

Figure 2. Comparison of type and weight of waste on holidays and weekdays

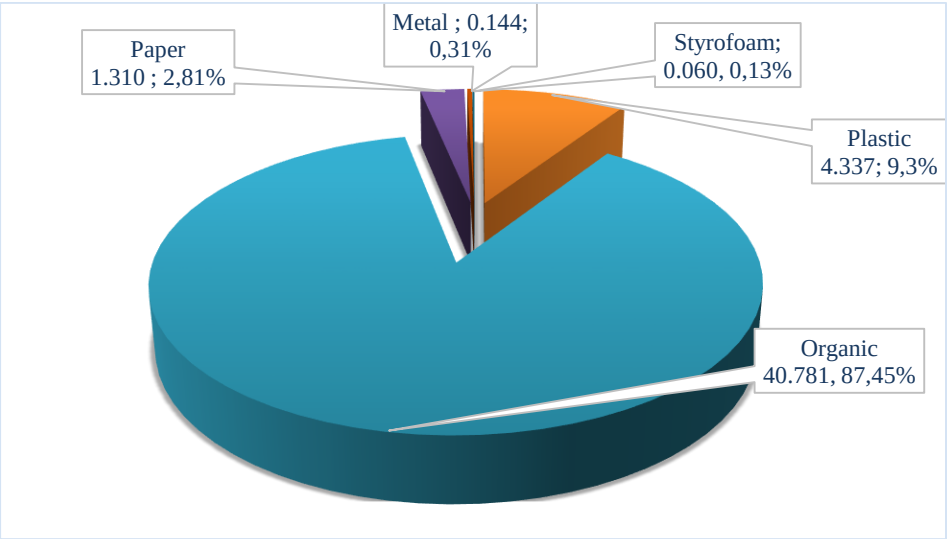

Figure 3: Types and Weight of Waste from Tourism Business Actors

The amount of waste obtained in Penyengat Island tends to fluctuate. The number of garbage increases on weekends and national holidays or Penyengat Island festivals. Based on field observations, garbage accumulation usually occurs on the coast because it is a busy spot for tourists and business actors. Waste due to tourism activities has begun to increase, triggering a decrease in environmental quality, impacting decreasing environmental functions and tourism functions. Tourism activities can hurt the environment, one of which is the waste produced.

Waste as residual or waste material resulting from the production process from human or animal activities that is not reused, if it is not managed correctly, will cause health problems, reduce environmental quality, and reduce environmental aesthetics (Ikhwan et al., 2019). Tourists' behavior in natural tourist objects that can disturb natural tourism areas is cleanliness, vandalism, and pollution

(Fadjarajani et al., 2019). Vandalism is a destructive human activity, and a widespread activity is doodling to show that they have come to the place or pick flowers and take plants. It was moving and disposing of sanitary facilities and other activities that interfere with environmental sustainability. Most of the trash found at tourist attractions is plastic goods, food wrappers, food scraps, cigarette wrappers, and fruit skins.

Pollution in tourist attractions is mostly caused by the behavior of tourists who do not maintain environmental cleanliness. Tourists throw garbage in any place, such as when sitting while eating, walking to enjoy the view, or riding a vehicle. Tourism waste that is carelessly dumped into water bodies results in a contaminated environment, disturbing public health, changes, and damage to aquatic vegetation, as well as aesthetic value. Tourist regulations are ignored. Pollution will be apparent, usually on Sundays or holidays, where the place is visited a lot. This pollution will also have an impact on tourists (Darmawan and Fadjarajani, 2016).

Based on the interview results, as many as 53.57% of tourists littered because the number of trash cans was insufficient; they were in a hurry and thought that garbage was the cleaning officers' responsibility. More than 26.43% of tourists have an awareness protecting thave awareness of preserving the Penyengat Island area. The waste generated by tourists from tourism activities is stored first (8.57%) when they cannot find the trash and then disposed of in the trash that has been provided. The need for education related to waste and environmental sustainability for tourists to increases tourists' awareness of not littering (Ikhwan et al., 2019; Darmawan and Fadjarajani, 2016). Penyengat Island area. As many as 25% of business operators dispose of their waste by collecting at one point of transportation; it is easier for officers to transport garbage. Most business actors have started to care about cleanliness and environmental hygiene in the Penyengat Island area by collecting garbage at one point, bringing it back, and managing simple waste such as landfilling and burning debris. As many as 37.5% of business operators are still littering. Cigarette butts are often disposed of carelessly because they are considered to have no impact and are more practical. This behavior can harm the environment in the form of a decrease in environmental quality (Darmawan and Fadjarajani, 2016). Tourism development has a significant effect on the ground, resource consumption, pollution, and waste (Denafas et al., 2014; Espinosa Lloréns et al., 2008; Gómez et al., 2009). People in areas heavily affected by tourism activities produce less waste than those in non-affected areas (Atthirawong, 2016; Phan Hoang & Kato, 2016) because their awareness of the importance of waste management will increase their income.

Table 1: Waste management that has been carried out in the Penyengat Island area

No	Pieces of information	Associated Managers		Traveler		Businessmen	
1	Waste management rules and policies	a	There is a regulation not to litter for anyone.	a	An appeal to keep clean and bring the trash back	a	There is a limit on the waste generated by each business unit.
		b	Prohibition and sanctions for littering	b	There are no sanctions and fines for littering	b	Obligation to manage waste generated from business activities
		c	Lack of addition and repair of facilities and infrastructure	c	Trash bins do not meet the requirements and are lacking in quantity		
2	Waste related programs	a	The officer swears in not all households		There is no education regarding 3R TPS waste management for tourists.		Waste from business activities has not explicitly been managed.
		b	Cooperation is not yet routine				
3	Allocation of waste management costs	The Government bears the allocation of waste management costs			not there yet		not there yet

So based on these results, it can be judged that the waste management that has been carried out in the Penyengat Island area has not been appropriately implemented because it has not accommodated the Republic of Indonesia Government Regulation No. 81 of 2012 concerning Management of Household Waste and Waste Similar to Household Waste. This indicates that a waste management system is needed by the Government of the Republic of Indonesia Regulation No. 81 of 2012.

Tourism contributes a significant amount of waste generation and has a strong influence on waste generation in Hoi An's city (Hoang et al., 2017). Also, environmental pollution associated with urban solid waste management has hurt the tourism industry. The condition of open dumping on Penyengat Island causes odor pollution from waste collection and processing sites; garbage left on tourist roads due to weak collection systems can negatively impact tourists (Ikhwan et al., 2019). The number of tourists visiting this city could decline due to environmental problems, impacting economic development. The following

are alternatives to waste management needed on Penyengat Island based on multi-stakeholder perceptions.

Improper waste management can impact environmental, economic, and social degradation, making it difficult to recover, such as the effects of greenhouse gases, land degradation, exploitation of resources resulting in water and soil pollution, air and loss of biodiversity, and positive value and attractiveness tourism locations (Kariminia et al., 2012; Shamshiry et al., 2011). Particular attention is paid to Penyengat Island because many historical sites and cultural heritages are protected and have special management rules.

Table 2: Alternative and Suggestions for Waste Management that can be done

No	Information	Associated Managers			Traveler		Businessmen
1	Waste management rules and policies	a	Prohibition of littering	a.	Sanctions for tourists littering	a.	Limitation of waste generated by each business unit
		b	Independent waste management	b.	The banner is an appeal not to litter	b.	Establishment of cleanliness awareness groups to assist officers in maintaining cleanliness
		c	Addition and repair of facilities and infrastructure	c.	Addition and repair of facilities and infrastructure		
		d	Assessment of regulations related to small island waste	d.	There is a deposit refund and trash change system	c.	The business unit performs waste sorting.
2	Waste related programs	a	Construction of TPS 3R (Waste Bank-Compost House)		Education about 3R TPS waste management		Participate in tourism waste management at TPS 3R
		b	Cooperation regularly				
3	Allocation of waste management costs		The government will bear the waste management costs.		Expenditures for personal tourism waste management		Retribution for waste management through waste environmental care agencies

Waste managed adequately will have potential value, such as providing employment, improving environmental quality and aesthetics, and other uses such as compost and biogas. Based on the Government Regulation of the Republic of Indonesia Number 81 of 2012 regarding household waste management and household-like waste, it is necessary to develop waste management based on the 3R principle. The location where the waste collection, sorting, reuse, and recycling activities are carried out can be in the form of TPS3R, which adopts community-based waste management principles. The existence of waste management procurement in the area requires community participation, namely tourists and business actors who carry out tourism activities in the Penyengat Island area to keep the area clean. They are the main elements besides the need for synergy with the government and the private sector.

The tourism industry can positively and negatively impact tourist destinations, such as Bali, Indonesia, and Thailand (Connell, 2002; Font et al., 2001). The benefits of the tourism industry include economic opportunities and job creation. Langkawi Geopark's tourism industry's negative impacts include damage to natural resources and increasing solid waste (Shamshiry et al., 2011). The principles of sustainable waste management include justice (every citizen has the right to a proper waste management system because of environmental health, promoting health problems for residents and tourists, and minimizing waste production for residents on the island), effectiveness (related to the safe disposal of waste management, protection, and environmental sustainability and maximizing the 3Rs), as well as efficiency and sustainability of waste management associated with increasing benefits and reducing costs. If not managed, the local waste production rate is only half of the waste produced by tourists (Shamshiry et al., 2011)

Research in Banyumas Regency shows that providing effective extension interventions increases knowledge and waste management (Widiyanto et al., 2019). The importance of the role of visitors in waste management in tourist areas (Roza, 2012). Business owners in several hotels based on research on millennials as visitors to the Borobudur hotel. Energy-saving and avoiding pollution programs are a part of hotel policies such as water-saving and electricity-saving plans. The hotel is furnished with handicraft items from recycled waste. Together with customers, they make changes to care for the environment (Tiurida et al., 2020). Business owners and visitors must be oriented towards reducing negative impacts to achieve sustainable development (Hsiao et al., 2014), in the form of optimal and best planning behavior (Han & Kim, 2010)

Settlement development is carried out for urban and rural development that is livable and independent in their residential environment. Efforts to create a healthy environment require adequate settlement of environmental sanitation. However, due to limited funds and a lack of understanding by the community and development planners on the importance of environmental management and technical implementation, environmental management still does not meet environmental hygiene services. There are still many developments of

environmental sanitation facilities/infrastructure that are not according to local conditions, the community's needs, and purchasing power; not all of them meet the basic infrastructure standards, not entirely according to the city development plan. Waste management's attention is not sufficient to fix waste management problems. Efforts are needed at the community level and city level involving all stakeholders.

Estimation of Economic Costs and Benefits of Alternative Waste Management from Tourism Activities in the Penyengat Island Area

The effort to build 3R TPS requires a plan in the form of a budget. TPS 3R investment from the data on the number of units and the allocation of funds in 2019. The costs allocated by the Directorate General of Human Settlements for the procurement of TPS 3R include financing for the physical construction of TPS 3R, procurement of organic waste processing plants, waste processing machines, and facilities and infrastructure that support waste processing activities at 3R TPS.

Waste management using TPS 3R (compost house and waste bank) Penyengat Island requires fuel for transporting waste to the management site, which requires ± 2 liters/day for a three-wheeled motorbike (emperor) and 1 unit dredger @ IDR 450,000/week used to transport garbage from Penyengat Island to Pelantar Laut on Bintan Island. The amount of fuel costs for transporting waste assumes that transporting waste is the same as the previous waste management. The fuel cost for waste processing machines such as sieving machines and chopping machines refers to fuel cost for waste processing machines located at TPS 3R in Tanjung Unggat Village with the same capacity, namely 500 kg/hour requires ± 2 liters/day of using diesel fuel. Based on local fuel prices, fuel costs for waste processing machines as shown in Table 3, the amount of waste produced by Penyengat Island follows the capacity of the 3R TPS engine provided.

Table 3: Estimated Costs for the Development of 3R TPS Management

No	Type of fee	Information		Cost (IDR)
1	Investment fee for expansion TPS 3R[a]		IDR	750,000,000
	Total investment cost (operating period 20 years) [e] (g)		IDR	750,000,000
2	Operational costs			
	Fuel	Rickshaw @IDR 105,000/week[c]	IDR	5,460,000
		Boat Kerug @IDR 450.000/month[c]	IDR	5,400,000
		Processing machines @IDR 126.000/week[c]	IDR	6,552,000
	Equipment	5% of the investment cost[f]	IDR	37,500,000
	Water	@ Rp 25.000/month	IDR	300,000
	Electricity	@ Rp 60.000/month[b]	IDR	720,000
	Stater(EM4)	@ IDR 35,000/bottle (9 bottles/year)[d]	IDR	315,000

	Labor	4 people @ IDR 1,500,000 / month[b]	IDR	6,000,000
	Annual operating costs (h)		IDR	62,247,000
	The total cost of TPS 3R per year (i=(g/20) +h)		IDR	**99,747,000**
z				

a = Number of Work Units and Fund Allocation in 2015 Riau Islands Province b = TPS 3R Ranggamekar Bogor City c = Price in the local area d = Khairunisa's research in Jakarta, 2011, adjusted e = Technical Instructions for TPS 3R 2017 of the Ministry of Public Works f = Rahim and Ali's research in Makassar 2014

As shown in Table 3, maintenance costs are issued to recondition or repair the entire waste management operational infrastructure. The maintained infrastructure is divided into buildings and machines; the costs incurred annually are 5% of the investment cost. Other operational costs such as electricity, water, and labor costs are sourced from TPS 3R Tanjung Unggat using the TPS 3R Technical Guidance reference issued by the Ministry of Public Works and Public Housing, Directorate General of Human Settlements, using prices in the area around Tanjungpinang City. The workforce required is five people consisting of a machine operator, a transportation officer, a sorting and composting officer, and two people who work in a waste bank. Organic waste is processed into compost as much as $0.2m^3$/day or 73 m^3/year requiring 9 (nine) bottles of compost or EM4 microorganism material. This amount can be saved using liquid fertilizer or without using it because the composting process uses a magot without a bio activator. If this goes well, it will have economic value beneficial to both managers and the surrounding community. Clean and healthy living behavior through waste management will have economic value. Inorganic waste that has been sorted and organic waste that has been processed into compost will provide economic benefits for the community (Abdel-Shafy & Mansour, 2018; Anabaraonye et al., 2019).

The sales of waste processing products on Penyengat Island can be used as income for the TPS 3R Waste Care Agency to cover operational costs and provide incentives for the surrounding communities on Penyengat Island. The calculation of the estimated economic benefits of waste management multiplies the total amount of waste generated by the selling price of waste in the area around Tanjungpinang City.

Following are the results of the analysis of the economic benefits generated from waste management in tourism activities, which can be seen in Table 4

Table 4: Analysis of Economic Benefits Results from Waste Management from Tourism

			Price (IDR/kg)	Weight of waste (Kg/year)	Economic weight (Kg/year)	(IDR/year)
(a)			(b)	(c)	(d)	(e=b*d)
A. Benefit						
Inorganic waste						
	1	Plastic	2,000	3,008.53	3,008.53	6,017,050
	2	Glass	500	361.44	361.44	180,719
	3	Metal Al	2,000	138.86	138.86	277,720
	4	Carton	1,500	262.69	262.69	394,028
	5	Crafts	5,408,000			5,408,000
Organic waste						
	1	Compost	10,000	19,155	6,704	67,044,157
	2	Maggots	32,000	10	10	320,000
	3	Liquid fertilizer	4,000	287	287	1,149,328
		Total economic benefits (f)				**80,791,002**
B. Management Fee (g)						
	1	Operational				**62,247,000**
C. Transportation Costs (h)						
		Transportation Costs to TPA @ IDR 100.000-, /month				**1,200,000**
		Total net benefits **(i=f-(g+h))**				**17,344,002**
					per month	**1,445,333**

Source: Analysis of the net economic benefits of waste management on Penyengat Island

Information: *) = selling price in the local area

**) = The yield of the amount of organic waste into compost is 35%
(Wahyono, 2001; Ayilara et al., 2020; Esekhade et al., 2003)

Table 4 shows the net economic benefits generated from the waste management of IDR 17,344,002/year. The benefits obtained from the TPS 3R processing

assume that the waste generation on Penyengat Island is processed entirely based on the waste category. The results obtained from the sale of processed waste can only meet the operational costs of TPS 3R and cover the cost of transporting waste in one operational year. The economic benefits obtained can be an incentive for the TPS 3R institution that has been formed and is in the process of carrying out waste management on Penyengat Island.

Efforts to carry out waste management on small islands using the TPS 3R approach need enforcement of regional policies and strategies. Regional policies and strategies (Jakstrada) for managing household waste and household-like waste are policy directions and strategies in reducing and handling household waste and household-like waste at the provincial and district/city levels in an integrated and sustainable manner. Jastrada is stated in the Regulation of the Mayor of Tanjungpinang Number 43 of 2018 concerning Jakstrada for managing household waste and household-like waste. The policy direction for reducing and handling household waste and household-like waste includes improving performance in the areas of (a) reducing household waste and household-like waste and (b) handling of household waste and household-like waste. Reduction of household waste and household-like waste is carried out by (1) limiting the generation of household waste and household-like waste; (2) recycling of household waste such as household waste; (3) reuse of household waste and household-like waste. The handling of household waste and household-like waste is carried out through sorting, collection; transportation; processing; and final processing.

Garbage can cause water pollution due to toxic metals and organic metals, which will impact the economy and the environment (Hsiao et al., 2014). Chitosan derivatives carry out pollution prevention in several places are widely studied as absorbents for water treatment to reduce or eliminate heavy metal contamination from waste (Habiba et al., 2017). Chitosan-based materials are a suitable absorber for AR1 absorption from liquid waste samples (Al-Abbad & Alakhras, 2020). In the Riau Islands Province, generally including Penyengat Island, there is a traditional food in barking a type of snail.

Open dumping system waste management impacts air pollution in Palembang City, the volume of waste increases. In contrast, waste management services are only 70% of the total volume of waste produced. Those who live in the Sukawinatan landfill with low nutritional status are at 12 times risk of suffering from the impaired vital capacity (Zulkarnain et al., 2018). The method of monitoring and evaluating waste management policies in DIY has similarities in five districts/cities (Yogyakarta, Bantul, Slemen, Kulon Progo, and Gunung Kidul); that is, it has not been outlined in standard procedures but has fulfilled its responsibilities in accountability and transparency of public services (Mulasari et al., 2014). Likewise, on Penyengat Island, it is even more difficult if there are strict regulations. Because the understanding of the community, including business owners who are there, are not responsible for waste management. Therefore, socialization and assistance need to motivate their participation.

The high level of waste production is only one problem because the destination is very limited for waste management (Diaz, 2017; Chen et al., 2005) The tourism industry will also affect the local community's lifestyle everything is practical. As a result, everything is convenient, food in packaging and plastic based. The amount of waste generation continues to increase, considering that Penyengat Island does not have a waste processing system. Therefore, developing a program to increase knowledge, understanding, attitudes, and behavior and comprehensive community awareness for sorting waste is necessary. Community counseling is used to build awareness of a sense of need, change attitudes and behavior fundamentally and sustainably. This strategy can be used to increase awareness and responsibility about nature and the environment. Promoting attitude changes based on awareness and sincerity to maintain and maintain a sustainable environment must be implemented (Desa et al., 2012). It needs support for the operational costs of TPS 3R through community waste fees, environmental service fees, or environmental compensation from tourists and APBD allocations or funding allocations from the Village Fund. The waste management system is expected to reduce waste by 30% of household waste and household-like waste. In comparison, 70% for its handling, before the national policy and strategy for handling household waste and household-like waste in 2025 key, of this processing is the effectiveness of sorting waste. With effective sorting from sources, waste processing at 3R TPS will be more comfortable, and the product quality is much better than those with mixed raw materials.

The initial effort in TPS3R was to increase the capacity of the TPS3R administrators and managers. Efforts made are MOT to the management related to Triggering of Waste Management on Penyengat Island. The follow-up efforts triggered the RW4 community and strengthened the triggers and the environmental care school program's declaration in two elementary and junior high schools on Penyengat Island. The composter process has been carried out at the ecperimental stage, and magot use in producing compost, liquid compost, and animal feed. The next follow-up plan is to collaborate between the government, the community, and the private sector to support community empowerment in waste management on Penyengat Island. For example, cooperation with farmer groups on Penyengat Island, or development of cooperation with the Tourism Office and Pokdarwis for environmental tourism programs, by forming educational tour packages through training on making handicrafts from waste photo spots caring for the environment and providing more attractive souvenirs and educating with raw materials from waste, especially plastic waste.

Estimation of the Willingness to Pay of Tourists and Business Actors on the Implementation of Waste Management from Tourism Activities in the Penyengat Island

Estimating the value of the respondent's willingness to pay is needed to estimate tourists and business actors' willingness to implement waste management from tourism activities to maintain sustainability and environmental quality.

Table 5 Willingness to pay respondents for management implementation waste in Penyengat Island, Tanjungpinang City

No		Willingness to pay and the reason	Tourist		Business Actors	
			Total	Percentage	Total	Percentage
1	Not willing to pay		32	22.86	7	29.17
	a	Because of the government's responsibility	20	62.50	4	57.14
	b	Do not want to know	12	37.50	3	42.86
2	Willingness to pay		108	77.14	17	70.83
		Total	140		24	

The method used in estimating respondents' willingness to pay is the Willingness to Pay (WTP) analysis method. The results of the implementation of the WTP analysis stage are making a hypothetical market. Obtaining the value of the WTP request. The respondents' WTP value was obtained using the bidding game technique. This technique is carried out by providing an offer to the respondent regarding their willingness to participate in willingness to pay to start with the starting point for tourists, which is IDR 4,500 and business actors IDR 15,000. If the respondent is willing, the bid is increased to the highest bid the respondent can afford. WTP's value from direct interviews with respondents has various values, namely tourist respondents ranging from IDR 4,500 to IDR 10,000 and business tourists ranging from IDR 15,000 to IDR 25,000. From a sustainable development perspective, tourism growth must be economically viable, ecologically sustainable, and ethically and socially just for the local population and will have a positive impact (Makers, 2012; UNEP, 2006)

Calculate the estimated mean value

The average distribution of WTP of tourist and business actors in the Penyengat Island area can be seen in Table 6.

Table 6: Distribution of Average, WTP of Tourist Respondents and Perpetrator Respondents Efforts towards the Implementation of Waste Management in the Penyengat Island

No	Value of WTP (IDR /person)		Respondent		Mean WTP
1	Tourist		Total	Percentage	
	a.	4,500	55	39.29%	1,767.86
	b.	5,500	32	22.86%	1,257.14
	c.	6,500	33	23.57%	1,532.14
	d.	7,500	20	14.29%	1,071.43

		Total	140		5,628.57
2	Business Actors				
	a.	15,000	8	33.33%	5,000.00
	b.	16,000	6	25.00%	4,000.00
	c.	17,000	5	20.83%	3,541.67
	d.	18,000	3	12.50%	2,250.00
	e.	19,000	2	8.33%	1,583.33
		Total	24		16,375.00

Based on Table 6, the average value of WTP on the implementation of tourism waste management in the Penyengat Island area of tourist respondents is IDR 5,628.57 / visit and IDR 16,375 / month for business actor respondents with price distribution can be seen in Table 6. However, not all respondents are willing to pay as much as Rp. this value is for implementing waste management in the Penyengat Island area. As many as 19 people (62.14%) of tourist respondents were unwilling to pay more than IDR 5,628.57/visit, while as many as 13 people (58.33%) of business respondents were unwilling to pay more than IDR 16,375/ month.

Table 7: Estimated revenue obtained from the WTP value of management implementation waste originating from tourists and business actors on Penyengat Island

Respondent's WTP (IDR)	% Respondent	Σ Population	Estimated revenue (IDR/ year)
(a)	(b)	(c=b*N)	(d=a*c)
Tourist 5,628.57/ visit	37.86%	7,412.99	41,724,521.87
Business actor 16,375/ month x 12	41.67%	10.00	56,290.20
Total			41,780,812.07

Information: N tourists = 20,075 people
N Business Actors = 24 business actors

Based on Table 7, the estimated revenue obtained from the WTP value of tourist respondents and business actors in the Penyengat Island area is carried out to implement the development of TPS 3R waste management. If the WTP value is applied, the total revenue value is IDR 5,628.57 / visit for tourists, and IDR 16,375 / month for business actors is IDR 41,780,812.07 / year.

consumption and production are also determined so that products and consumption patterns are environmentally friendly. This is in line with the 12th Sustainable Development Goal (SDGs). The development goal of point 12 related to sustainable production and consumption is associated with the efficient use of natural resources, reducing its negative impact, and mitigating and adapting to climate change. So under the mandate conveyed in point SDG's where consumers must ensure consumption and production patterns before buying an item for consumption. Following the strategy for achieving SDG's targets (number 12, which reads responsible consumption and production), namely by disseminating information on the availability of environmentally friendly products for consumers / the public regarding these products' benefits (Willis, 2019). Producers before producing an item. Goods and packaging must be safe. Following SDG's Strategy Target No.12 point 4: Developing measurable environmentally friendly product standards to give birth to concern for the management of nature and the environment for sustainability.

Waste Management Financing Scheme in Penyengat Island Area

The total value of revenue if the value of WTP from tourists and business actors is applied and the value of economic benefits obtained from the sale of waste processing products can be used to finance waste management plans from tourism activities in the Penyengat Island area, namely TPS 3R.

It can be seen in Table 8 that there are four financing schemes for waste management in the Penyengat Island area. The revenue obtained from the WTP value can meet the operational and investment costs of TPS 3R of 27.31%, while the revenue obtained from the sale of waste processing can only meet the operational costs of TPS 3R of 330.17%, with investment costs paid by third parties. Therefore, it can be interpreted that the implementation of waste management development, namely TPS 3R, can be implemented in the Penyengat Island area. The construction of a 3R TPS waste management system in Penyengat Island has advantages and obstacles in its application.

Picking of ordered items is carried out by selecting the location to be used as the 3R TPS. The waste from waste processing can damage the environment and must be disposed of outside Penyengat Island. Dissemination and purification and an explanation of the governance and implementation of TPS 3R to improve business actors, communities, managers, and even tourists. Regulations related to PNBP are not allowed to collect fees outside of PNBP in Penyengat Island.

One of the obstacles faced is the mechanism for cleaning funds from applying the WTP value of tourists and business actors in the Penyengat Island area, which is not allowed to collect fees outside of Non-Tax State Revenues (PNBP). Therefore, an enabling policy is needed related to the sanitation fund mechanism related to waste management in 3R TPS. In its implementation in the future, TPS 3R can run by the potential results previously described by being managed by the institution. The waste care agency will coordinate and manage these funds as a form of community empowerment with full supervision from the community at Penyengat Village.

Table 8: Scheme of financing for waste management from tourism activities in Penyengat Island area

Scheme 1 No Investment Costs				
A	Reception			
	1	Benefits of selling processed waste	92,362,633	
	2	Value of WTP of Tourists and Business Actors	41,780,812	
		Total Revenues (a)	134,143,445	
B	Cost			
	1	Operating Costs	27,974,000	
		Total Cost (b)	27,974,000	
		Covering costs (c=(a/b)*100)		479.53
Scheme 2 with Investment Costs				
A	Penerimaan			
	1	Benefits of selling processed waste	92,362,633	
	2	Value of WTP of Tourists and Business Actors	41,780,812	
		Total Revenues (a)	134,143,445	
B	Cost			
	1	Investment Costs	125,000,000	
	2	Operating Costs	27,974,000	
		Total Cost (b)	152,974,000	
		Covering costs (c=(a/b)*100)		87.69
Scheme 3 without receiving sales results				
A	Reception			
	1	Value of WTP of Tourists and Business Actors	41,780,812	
		Total Revenues (a)	41,780,812	
B	Cost			
	1	Investment Costs	125,000,000	
	2	Operating Costs	27,974,000	
		Total Cost (b)	152,974,000	
		Covering costs (c=(a/b)*100)		27.31
Scheme 4 without WTP and without investment costs				
A	Reception			
	1	Benefits of selling processed waste	92,362,633	
		Total Revenues (a)	92,362,633	
B	Cost			
	2	Operating Costs	27,974,000	
		Total Cost (b)	27,974,000	
		Covering costs (c=(a/b) *100)		330.17

The advantage of the TPS 3R is to reduce tourism waste as much as possible using the 3R concept, which has the principle of reducing, reusing, and recycling waste by utilizing and processing waste in locations as close as possible to the source of waste. The waste management system can be integrated

and implemented on a community-based basis, such as a waste bank, to increase public awareness. Educate on waste management to local communities and tourists. Collaborative partnerships for environmental NGOs and environmental NGOs, and stakeholders that have increased with stakeholder engagement, access to resources, financial support, transparency, and accountability, and implementing key initiatives (segregation of resources, expansion of collection services, revision of costs, reuse of materials, education and awareness and planning) of sustainable waste management (Willmott & Graci, 2012).

The balance of supply and demand for compost will make composting effective and limiting the amount of waste, an effort to reduce landfill waste on small islands (Sekito et al., 2019). Processed waste in the form of handicrafts can be used as souvenirs and has a selling price to provide economic benefits for managers and the community. Revenue can be used to improve the performance of TPS 3R and develop a waste management system that can support the performance of TPS 3R in Penyengat Island.

CONCLUSION

Waste management in Penyengat Island is still a system that collects and transports waste, a recommendation to use the TPS 3R system. The estimated cost of waste management using the TPS 3R system consists of an investment cost of IDR 750,000,000 and an annual operational cost of IDR 62,747,000. The estimated economic benefits resulting from the sale of waste in the TPS 3R system of IDR 81,203,974/year can only meet operational costs, so investment costs need subsidies or assistance from related parties or the private sector form of CSR funds. The average WTP value of tourists to the contribution of waste management costs is IDR 5,628.57/visit, and the average WTP value of business actors is IDR 16,375/month. Operational TPS 3R is 27.31%. Based on the estimated financing, waste management from tourism activities in the Penyengat Island area using the TPS 3R system can be implemented. The WTP value is the basis for estimating waste management fees, which will later be used to finance the management of TPS 3R, with a mechanism for returning deposits and collecting funds for changes to waste as an alternative mechanism that can be done. There is a need for socialization, updating, and assistance for the 3R TPS system waste management to tourists and business actors.

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